European Commission

EU Reference Scenario 2016

Energy, transport and GHG emissions
Trends to 2050

This publication was prepared for the Directorate-General for Energy, the Directorate-General for Climate Action and the Directorate-General for Mobility and Transport by the E3M-Lab of the Institute of Communication and Computer Systems at the National Technical University of Athens (ICCS-NTUA), Greece, in cooperation with the International Institute for Applied Systems Analysis (IIASA) and EuroCARE and represents those organisations' views on energy, transport and GHG emissions facts, figures and projections. These views should not be considered as a statement of the Commission's or the Directorate-General's views.

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The manuscript was completed on 15 July 2016

Europe Direct etc

References for Publications Office etc.

Luxembourg: Publications Office of the European Union, 2016

Cover: © iStock/Thinkstock

Print	ISBN 978-92-79-52373-1	doi: 10.2833/9127	MJ-01-15-793-EN-C
PDF	ISBN 978-92-79-52374-8	doi: 10.2833/001137	MJ-01-15-793-EN-N
EPUB	ISBN 978-92-79-52372-4	doi: 10.2833/554470	MJ-01-15-793-EN-E

Printed by Imprimerie Centrale in Luxembourg

PRINTED ON ELEMENTAL CHLORINE-FREE BLEACHED PAPER (ECF)

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ABBREVIATIONS & UNITS

AD	Anaerobic Digestion
BEV	Battery Electric Vehicle
BGR	Federal Institute for Geosciences and Natural Resources (Bundesanstalt für Geowissenschaften und Rohstoffe)
CAPEX	Capital Expenditure
CCGT	Combined Cycle Gas Turbine
CCS	Carbon Capture and Storage
CDM	Clean Development Mechanism
CHP	Combined Heat and Power
CIS	Commonwealth of Independent States
CNG	Compressed Natural Gas
CO_2	Carbon dioxide
DG ECFIN	Directorate General for Economic and Financial Affairs
EED	Energy Efficiency Directive
ENTSO-E	European Network of Transmission System Operators for Electricity
EPBD	Energy Performance of Buildings Directive
EPC	Economic Policy Committee
ESCO	Energy Service Company
ESD	Effort Sharing Decision
ETS	Emissions Trading System
EU	European Union
EU13	Member States joining the European Union after 2004 (Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovenia, Slovak Republic)
EU15	European Union of 15 Member States before the 2004 enlargement (Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom)
EU28	European Union of 28 Member States
Eurostat	Statistical Office of the European Union
EV	Electrically chargeable Vehicle
FOD	First Order Decay
FQD	Fuel Quality Directive
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GIC	Gross Inland Consumption
GWP	Global Warming Potential
HDV	Heavy Duty Vehicle (HGVs and buses)
HFC	Hydrofluorocarbon
HGV	Heavy Goods Vehicle
IATA	International Air Transport Association
ICE	Internal Combustion Engine
IEA	International Energy Agency
IEA-WEO	International Energy Agency World Energy Outlook
ILUC	Indirect Land Use Change
IPPC	Integrated Pollution Prevention Control
JRC	Joint Research Centre
LCV	Light Commercial Vehicle

LDV	Light Duty Vehicle (LCVs and passenger cars)
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LSU	Live Stock Units
LULUCF	Land Use, Land Use Change and Forestry
MENA	Middle East and North Africa
MS	Member State
NREAP	National Renewable Energy Action Plan
NTC	Net Transfer Capacities
OECD	Organisation for Economic Cooperation and Development
OPEC	Organization of the Petroleum Exporting Countries
OPEX	Operational expenditure
PES	Primary energy supply
PFC	Perfluorinated Compounds
PHEV	Plug-in Hybrid Electric Vehicle
PPA	Power Purchase Agreement
PV	Solar Photovoltaic
RES	Renewable Energy Sources
RES-E	Renewable Energy Sources for Electricity
RES-H&C	Renewable Energy Sources for Heating and Cooling
RES-T	Renewable Energy Sources for Transport
RP	Resource-Production
TEN-T	Trans-European Transport Network
TYNDP	Ten-Year Network Development Plan (adopted by ENTSO-E)
USGS	United States Geological Survey
WACC	Weighted Average Cost of Capital

bn	billion
boe	barrel of oil equivalent
Gpkm	giga passenger-kilometre, or 10^9 passenger-kilometre
Gtkm	giga tonne-kilometre, or 10^9 tonne-kilometre
GWh	gigawatt-hour or 10^9 watt-hours
km	kilometre
ktoe	1000 toe
Mt	million metric tonnes
Mtoe	million toe or 10^6 toe
MW	megawatt or 10^6 watt
MWh	megawatt-hour or 10^6 watt-hours
p.a.	per annum
pkm	passenger-kilometre (one passenger transported a distance of one kilometre)
t	metric tonne
toe	tonnes of oil equivalent
tkm	tonne-kilometre (one tonne transported a distance of one kilometre)

INTRODUCTION

1 Introduction

1.1 The EU Reference Scenario: approach and process

The purpose of this publication is to present the new "EU Reference Scenario 2016" ("Reference Scenario"). This report is an update of the previous Reference Scenario published in 2013[1]. It focuses on the EU energy system, transport and greenhouse gas (GHG) emission developments, including specific sections on emission trends not related to energy, and on the various interactions among policies in these sectors. Its time horizon as in the 2013 version is up to 2050 and it includes all EU28 Member States individually. The Reference Scenario acts as a benchmark of current policy and market trends. As such, it can help to inform future policy debate and policy making.

1.1.1 The EU Reference Scenario 2016 approach: projection not a forecast

This report focuses on trend projections – not forecasts. It does not predict how the EU energy, transport and climate landscape will actually change in the future, but merely provides a model-derived simulation of one of its possible future states given certain conditions. It starts from the assumption that the legally binding GHG and RES targets for 2020 will be achieved and that the policies agreed at EU and Member State level until December 2014 will be implemented[2]. Following this approach, the Reference Scenario can help inform the debate on where currently adopted policies might lead the EU and whether further policy development, including for the longer term, is needed. This update is based on the latest available statistical data from Eurostat at the time of the modelling. The "2015 Ageing Report"[3] has been the starting point of this exercise giving long term population and GDP growth trends while the short and medium term GDP growth projections were taken from DG ECFIN.[4]

The fuel price projections have been updated to take into account recent developments. Some technology development projections have changed since the EU Reference Scenario 2013 and therefore technology cost assumptions have been updated based on more recent evidence[5].

Projections are presented from 2015 onwards in 5-year- steps until 2050.

1.1.2 Description of the Reference Scenario process

The Reference Scenario benefited from interactions with Member State experts at various stages of the process, organised via a specific European Commission Reference Scenario expert group. It started from responses to a detailed policy questionnaire (received in January 2015). The draft outcome of the energy, CO_2 emissions and transport modelling and of the sectorial activity projections were consulted with experts from the Member States (October 2015). Written replies were provided by the vast majority of Member States. Member States were also consulted on the draft biomass supply, non-CO_2 emissions and LULUCF projections. A large majority of Member States provided comments as well.

Overall, Member States' comments have been accommodated to the extent possible while striving to provide a consistent Reference Scenario approach based on harmonised assumptions.

1.2 The EU Reference Scenario 2016 modelling framework: the suite of models and their interactions

1.2.1 Introduction

The modelling suite used for the Reference Scenario is based on a series of interlinked models which combine technical and economic methodologies. The models have been peer-reviewed and/or have been

[1] "EU Energy, transport and GHG emissions trends to 2050 - Reference scenario 2013" Please see for this and earlier trend scenarios e.g. http://ec.europa.eu/energy/en/statistics/energy-trends-2050

[2] Regarding EU policies, two amendments to existing Directives approved early 2015 were also taken into account. See section 2.1.

[3] European Commission (2014), The 2015 Ageing Report: Underlying Assumptions and Projection Methodologies. European Economy 8/2014. Directorate-General for Economic and Financial Affairs (DG ECFIN) http://ec.europa.eu/economy_finance/publications/european_economy/ageing_report/index_en.htm

[4] European Commission (2014). European Economic Forecast. Autumn 2014. European Economy 7/2014. Directorate General for Economic and Financial Affairs (DG ECFIN). Annual macro-economic data available at: http://ec.europa.eu/economy_finance/db_indicators/ameco/zipped_en.htm

[5] See notably the European Commission's Joint Research Centre ETRI 2014 report, available at: https://setis.ec.europa.eu/publications/jrc-setis-reports/etri-2014

used for numerous publications in peer-reviewed journals[6].

The models produce detailed projections per sector and per country. They use detailed and updated databases. The calibration ensures continuity between historical data and projections.

The models used follow an approach which is based on micro-economics, they solve for a price-driven market equilibrium, and combine engineering with economic representations for all sectors. The energy system model PRIMES, central to the modelling suite, allows for mixed-complementarity to enable handling of multiple targets through dual variables (shadow prices) associated with targets constraints. This is for example useful for analysing simultaneously emissions reduction, energy efficiency and renewable energy targets. This approach is also able to incorporate technology dynamics (vintages) in order to represent in detail technology progress that influences emission formation and emission reduction.

The Reference Scenario modelling suite is owned by a consortium led by E3MLab hosted at the National Technical University of Athens. The model codes are not available in the public domain. This report provides information on the inputs and outputs of the models and summarises main results.

Models only represent the real world as defined in the respective simplifying assumptions. Moreover, each projection into the future is subject to significant uncertainties.

1.2.2 Description and role of each model

The PRIMES modelling suite was the core element of the modelling framework for transport, energy and CO_2 emission projections, whereas the GAINS model was used for non-CO_2 emission projections and the GLOBIOM-G4M models deployed for LULUCF emission and removal projections, further supported by some more specialised models. The GEM-E3 macroeconomic model was used for value added projections by branch of activity. In addition, the PROMETHEUS global energy model was deployed for projections of world energy prices and the CAPRI model for agricultural activity projections.

The interactions between the various models in the preparation of the Reference Scenario are summarised in Figure 1. A brief description of the models is provided below [7].

PROMETHEUS

PROMETHEUS, operated by ICCS/E3MLab is a world multi-regional energy model, providing projections of energy demand, energy supply, and emissions from energy and world energy prices.

The purpose of this model within the Reference Scenario process is to provide fossil fuel price trajectories used for the EU modelling as EU import price assumptions. The world energy prices projections are used as inputs to PRIMES and GEM-E3.

GEM-E3

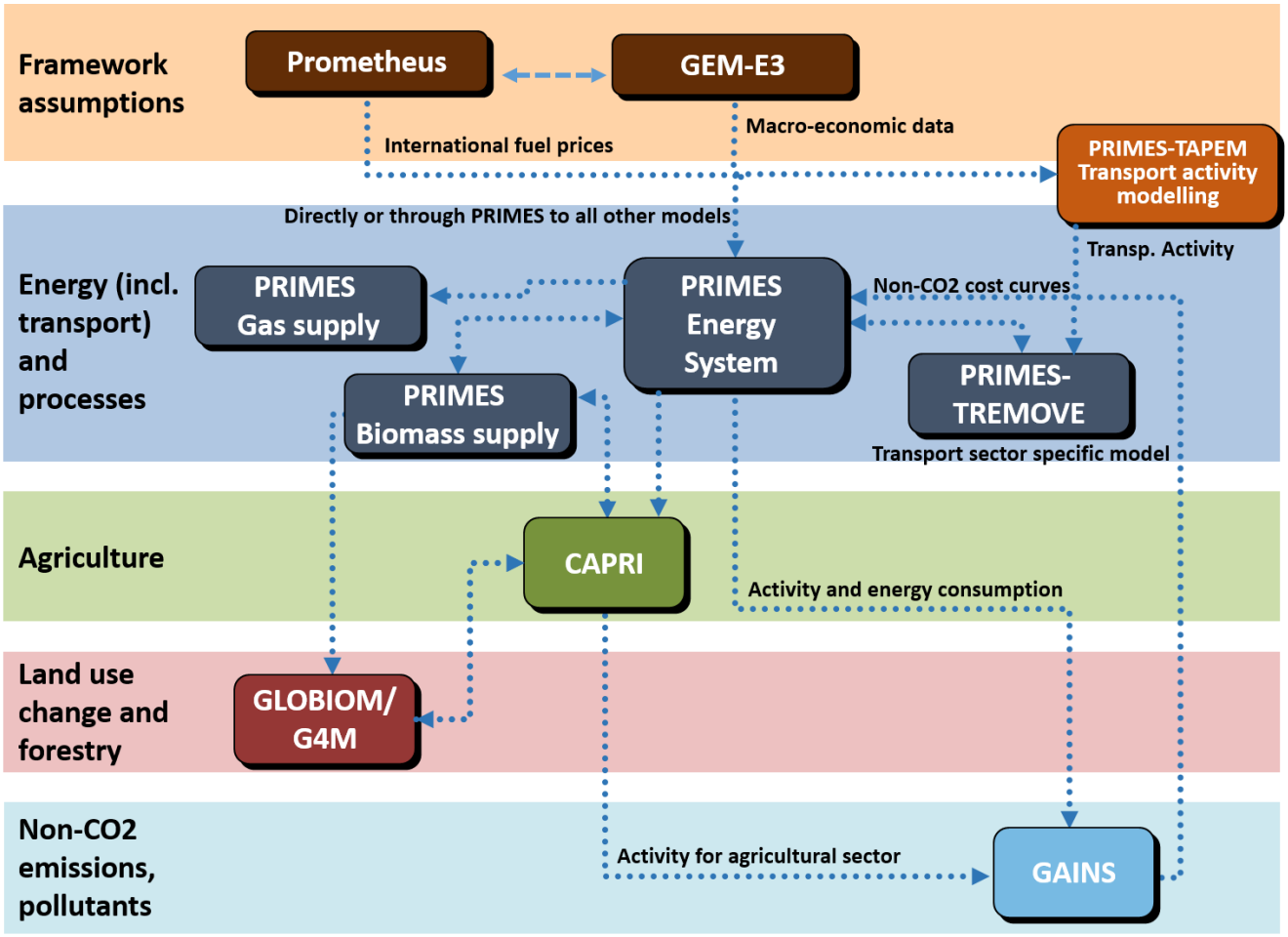
GEM-E3, operated by ICCS/E3MLab is a macroeconomic, multi-country and multi-sectorial computable general equilibrium model for integrated economy-environment analysis, either for Europe or for the World. The model provides macroeconomic and multi-sectorial projections to PRIMES, GAINS and uses the results of all the other models (energy, transportation, agriculture, biomass, air quality, climate effects, etc.) to perform macroeconomic and social impact analysis. The model closes the loop between sectorial and economy-wide analysis for emissions, air quality, emission reduction and costs, and provides the economic, employment and social implications. It can also close the loop regarding the effects from environmental damages.

The purpose within the Reference Scenario process is to prepare consistent sectorial value added and trade projections which match given GDP and population projections by country from the 2015 Ageing Report, to be used as input by PRIMES and GAINS.

[6] Indicatively see [8], [9], [30], [73].

[7] Detailed model descriptions can be found at http://ec.europa.eu/clima/policies/strategies/analysis/models.

FIGURE 1: MODELLING SUITE FOR EU REFERENCE SCENARIO 2016



PRIMES-TAPEM

PRIMES-TAPEM, operated by ICCS/E3MLab is an econometric model for transport activity projections; it takes GEM-E3 projections (GDP, activity by sector, demographics and bilateral trade by product, and by country) as drivers, to produce transport activity projections to be fed into PRIMES-TREMOVE. The econometric exercise also includes fuel prices coming from PROMETHEUS, as well as transport network infrastructure (length of motorways and railways), as drivers.

The PRIMES-TAPEM model provides the transport activity projections for the Reference Scenario.

PRIMES Energy system model

PRIMES Energy system model, operated by ICCS/E3MLab, covers in detail energy demand, energy supply, energy markets, CO_2 emissions from energy combustion and CO_2 emissions from industrial processes, and it represents policy measures, technologies, means for emission reductions in all sectors, and evaluates cost of emission reduction. PRIMES uses as inputs macroeconomic and multi-sectorial projections from GEM-E3 and projections of world energy prices from PROMETHEUS. PRIMES conveys projections to GAINS, GEM-E3 and CAPRI.

Within this Reference Scenario process the PRIMES model provides the energy system projection for demand and supply side sectors including full energy balance, investment costs, prices and related CO_2 emissions per country.

Further it calculates total GHG emissions using inputs of other models on non-CO_2 GHG emissions (GAINS).

PRIMES-TREMOVE Transport model

PRIMES-TREMOVE Transport model, operated by ICCS/E3MLab, is a satellite model (integrated into the

main PRIMES model, but it can run independently) for detailed projections and policy analysis (policy measures, emission reduction and costs) for the transportation sector. The model takes inputs from core PRIMES model and PRIMES-TAPEM and provides outputs to GAINS, PRIMES Biomass and GEM-E3.

The model provides detailed projections for the evolution of the entire transport sector in terms of transport activity by mode and transport mean, energy consumption, emissions, fleet development, new technologies and alternative fuels.

PRIMES-Biomass Supply

PRIMES-Biomass Supply, operated by ICCS/ E3MLab, is a satellite model covering biomass and waste production and processing for meeting demand for bio-energy commodities; the model takes as inputs demand for bio-energy projected by PRIMES and provides model outputs to CAPRI and GLOBIOM – harmonisation between these models has been undertaken within the EUCLIMIT project and continuous data cross checks have been performed for the work on the Reference Scenario.

The model provides the supply and transformation projections of biomass/waste resources for the given biomass demand, as well as the projections of the bio-energy commodity prices.

PRIMES-Gas Supply

The PRIMES gas supply module provides projections for gas imports by country of origin, by transport mean (LNG, pipeline) and route as well as the evolution of gas prices until 2050 in 5-year time steps. The gas model studies the relationships between gas resources, gas infrastructure and the degree of competition in gas markets over the Eurasian area and evaluates their impacts on gas imports and prices paid by consumers in each EU Member State. The gas model is a dynamic market competition model, which covers the entire Eurasian/MENA areas and the global LNG market and represents in detail the present and future gas infrastructure of each Member State and of important gas producers in the Eurasian and MENA areas. Demand is exogenous to the gas module and is derived from the PRIMES energy system model.

CAPRI

CAPRI, operated by EuroCARE GmbH Bonn, is a multi-country agricultural sector model, supporting decision making related to the Common Agricultural Policy and environmental policy; the model takes inputs from GEM-E3, PRIMES and PRIMES Biomass model, provides outputs to GAINS, and exchanges information with GLOBIOM on livestock, crops, and forestry as well as LULUCF effects.

The CAPRI model provides the agricultural outlook for the Reference Scenario, in particular on livestock and fertilisers use, further it provides the impacts on the agricultural sector from changed biofuel demand.

Cross checks are undertaken ex-ante and ex-post to ensure consistency with GLOBIOM on overlapping variables, in particular for the crop sector.

GAINS

The GAINS model, operated by IIASA, covers projections of air pollution and non-CO_2 GHG, including costs of emission reductions and projections of atmospheric emissions. GAINS allows exploring trade-offs and synergies between GHG emission reductions and air pollution. The model also evaluates and projects atmospheric dispersion, air quality impacts, health impacts, impacts on ecosystems, and climate impacts. Moreover, it assesses costs of abatement strategies. The model takes inputs from PRIMES, PRIMES-TREMOVE, and CAPRI, and produces outputs for use by other models, e.g. PRIMES.

For the Reference Scenario, GAINS provides non-CO_2 GHG and air pollutant emissions.

GLOBIOM/G4M

GLOBIOM/G4M model, operated by IIASA, provides projections for EU LULUCF CO_2 emissions/removals. It consists of a global economic agricultural and forest sector model (GLOBIOM) linked with a detailed forest model (G4M). For the EU, GLOBIOM/G4M receives important inputs from GEM-E3, PRIMES-biomass and CAPRI models while POLES provides bioenergy demand projections for the global analysis. For the EU agricultural sector, GLOBIOM is aligned with the CAPRI model to ensure consistency in Reference scenario projections.

Within the Reference Scenario process GLOBIOM/G4M provides the outlook for the EU LULUCF sector which includes the changes in land use and related CO_2 emissions. GLOBIOM models the CO_2 emissions from soil and biomass emitted by cropland and grassland management practices whereas G4M estimates the emissions from forest (forest management, afforestation and deforestation).

1.2.3 Main methodological improvements and updates compared to EU Reference Scenario 2013

Calibration in PRIMES: the specific case of 2015

For the preparation of the Reference Scenario the Eurostat data (February 2015) was taken into account; this includes information until the year 2013 and updates for all the past years. The years 2005 and 2010 were therefore updated and calibration was undertaken to reflect the new data. Limited information in the form of monthly statistics for selected fuels became available while the Reference Scenario projection process was ongoing for the years 2014 and partially for the initial months of 2015.

Therefore, while the years 2005 and 2010 reflect full calibration to the existing data from Eurostat, the year 2015 was treated as a semi-calibration year. Due to the closeness of the year 2015 it could not be based on pure economic modelling. The year 2015 was constructed through econometric analysis of the past years, in order to estimate a plausible trajectory for fuel demand by sector, taking into account heating degree days and economic development. For the supply side the model is further constrained by known investments in power and heat generation sector which are fully taken into account as exogenous into the model.

Although by the time of publication of this report more statistics for the year 2015 are available, these could not be taken into account in the preparation of the work, as the calibration work had been concluded earlier in the process. Therefore, in some cases, unavoidable divergences between the 2015 data and the semi-calibration undertaken for the Reference Scenario will emerge.

Transport activity projections (PRIMES-TAPEM)

The EU Reference Scenario 2016 implements a more sophisticated approach for deriving the transport activity projections by Member State until 2050 compared to the EU Reference Scenario 2013. It employs a combined econometric and engineering approach for deriving transport activity by transport mode. A considerable enhancement in the transport sector is that the EU Reference Scenario 2016 follows the territoriality principle for the heavy goods vehicles activity (both for the past and the future years), which reflects transportation activity of vehicles circulating on the territory of the country rather than the "nationality" of the haulier.

The activity projections have been validated using typical indicators such as e.g. activity per capita. Regarding the split of passenger rail activity into conventional and high-speed rail, an engineering approach has been followed using as input the expected development of the high-speed railways network within each Member State along the revised TEN-T guidelines for the core and comprehensive network complemented by information received through the replies to the Member State policy questionnaires.

For modelling purposes, due to the lack of official data, some assumptions had to be made for calculating air and maritime transport performance and allocating it by Member State. These assumptions are used for modelling purposes and shall be considered as model estimates and not as official data[8].

Further, the PRIMES-TREMOVE was updated to include the detailed TRACCS database which provides

[8] The transport volumes (number of passengers and tonnes) and distance matrices have been used for this purpose. By assumption within EU28, 50% of the calculated transport performance is allocated to the origin country and 50% to the destination country. The same “50%-50%” principle allocation applies to the EFTA countries and the candidate countries. For the international extra-EU activity, where the corresponding partner is outside EU-28 and is not an EFTA or candidate country, 100% of transport performance is allocated to the declaring EU MS country.

the most up-to date information regarding the split of the vehicle fleet for each Member State. The new projections include all these elements and provide improved calibration and projection to future years.

However, energy and transport statistical concepts have developed differently in the past according to their individual purposes. Energy demand in transport reflects sales of fuels at the point of refuelling, which can differ from the region of consumption. These differences should be borne in mind when comparing energy and transport figures. This applies in particular to transport activity ratios, such as energy intensity in freight or passenger transport, which are measured in tonnes of oil equivalent per million tonne-km and in tonnes of oil equivalent per million passenger-km, respectively.

PRIMES residential and buildings model

The database of the residential and services buildings module has been updated. The new database is the end product of evaluation and consolidation of the results from several data sources including large EU Projects (e.g. ENTRANZE, ECOFYS, iNSPiRe, etc.), industrial associations (e.g. BPIE) and other sources such as research results from the JRC. The data collected from different sources, which does not necessarily cover all countries, was harmonized and checked in order to obtain a fully coherent database. Further data from the household surveys of Eurostat (SECH-Survey Energy Household Consumption) was used for countries where it was available.

Compared to the previous Reference Scenario, an important element was changed: instead of being held constant at 2005 levels, the number of heating degree days are assumed to reduce slightly over time whereas cooling degree days are assumed to be increasing. The changes in heating degree days reflect the trend observed in the time series from 1980. Regarding cooling degree days, extrapolation of past trends post 2013 was performed by E3MLab using time series analysis techniques, applied on US cooling degree days data by census region. Projection of US data into the future was used by country in the EU as an analogy.

The power sector module of PRIMES

E3MLab has developed a significantly enhanced version of the power sector module of PRIMES. The aim of the development was mainly twofold:

1. Represent in higher detail the existing fleet of power plants in Europe and so capture in a better way the projection of decommissioning, refurbishment and new constructions;
2. Improve the model capability in simulating unit commitment in the presence of high contribution by variable renewables and so capture in a better way the system requirements for operation of fast-ramping power resources (flexibility) and the possible sharing of such resources within the EU internal market based on cross-border trade and market coupling.

The new developments make the model considerably better placed to study policy issues for the internal energy market, the integration of renewables and the simulation of investment behaviour. Recent experience from the market suggests that investment in power plants relies less than before on theoretical long-term optimality of generation costs. System-depending operational restrictions deriving from penetration of variable RES imply forced operational cycling of plants. Ignoring them in economic appraisal of investment would be a serious drawback. In addition, the refurbishment options are highly influenced by more stringent regulation regarding the air pollution emissions for fossil fuel plants and by more stringent security regulation for nuclear plants.

Boilers, CHP and the industrial model of PRIMES

In the EU Reference Scenario 2016, a change in the industrial sectors and the treatment of industrial boilers and CHP was undertaken. While previously the output of industrial boilers and CHP was modelled simultaneously with the power sector, now they are modelled independently allowing better reflection of the characteristics of the specific industrial sectors. The new model version now splits the modelling into sub-models covering: (i) boilers and cogeneration for each industrial sector, (ii) district heating including heat extraction from cogeneration and (iii) the rest of the power market. The data for industrial boilers and cogeneration model, as well as the data for the industrial sectors (excluding their consumption for boiler and CHP) have

been newly collected and are fully updated.

Industrial sectors modelled in PRIMES

The industrial energy model has been considerably expanded and revised. The new version covers 30 industrial activities and represents process flow by activity type in more detail. The EU Reference Scenario 2016 projections are based on fully updated and revised engineering information on process flows, the corresponding technical-economic data and the calibration from 2000 to 2015. The model combines cost minimization with non-linear functions which delimit the restructuring possibilities and capture heterogeneity of structures by industry type.

The new model treats capital vintages in a fully dynamic manner, includes endogenous scrapping and retrofitting and a new detailed representation of heat recovery and other horizontal energy efficiency possibilities. The new model has an expanded technology representation by process and activity type, and includes several classes of improved and advanced industrial technologies. The costing information has also been fully revised, based on new collection of information from literature and industrial surveys. The new industrial module is better linked with the power/steam model regarding steam (CHP and boilers) generation. In both models the CHP and boilers plants are identified for each sector of industrial activity, and therefore the projection of fuel mix and restructuring possibilities is more realistic than in previous model versions. It also allows a finer grained split of ETS and ESD emissions.

GAINS non-CO_2 emissions updates

The GAINS model applies a consistent emission calculation methodology across all countries, usually drawing on country-specific information for individual sectors. The consistent methodology used in GAINS and the exclusion of a few minor emission sources that are specific to only one or a few member states, may result in differences in historical emission estimates between GAINS and the national inventories. For the GAINS projections to be used for policy purposes, historical estimates are aligned to national inventories at an aggregate level. GAINS estimates of national emissions of CH_4 and N_2O in 2005 are therefore adjusted to national emissions reported to the UNFCCC in November 2015 by introducing country- and gas -specific calibration residuals. These reflect the deviation from national estimates in year 2005 and are kept constant for all future years. No calibration was conducted for F-gas emissions because of a large variation between countries in terms of quality and completeness of the reported F-gas emissions. At an EU28 level, the GAINS estimates of total non-CO_2 GHGs agree very well with reported emissions both in 2005 and in 2010 (difference 0.4% and 0.3%, respectively), however at country and gas level discrepancies may be more prominent (see separate methodology report for country details[9]).

Improvements of GAINS since the Reference Scenario 2013 were strongly guided by adjustments in emission reporting and the need to maintain compatibility of the approach with national inventories. Starting in 2015 (national GHG inventories of the year 2013), countries use the new IPCC (2006)[10] guidelines to estimate national emissions, which has a particularly large impact on nitrous oxide emissions from soils and methane emissions from solid waste disposal. Moreover, the improved understanding of indirect effects on climate according to IPCC's fourth assessment report[11] led to a strong increase of the perceived climate impact of methane with a Global Warming Potential (GWP) increasing from 21 to 25, i.e. by 20%. This also changed the GWP of several of the fluorinated gases significantly, while having only little impact on nitrous oxide (a GWP decrease of 3%, from 310 to 298). While CH_4 and F-gases are most strongly impacted by the change in GWP, N_2O emissions decrease due to a

[9] Höglund-Isaksson, L., W. Winiwarter, P. Purohit, A. Gomez-Sanabria, 2016. Non-CO2 greenhouse gas emissions in the EU-28 from 2005 to 2050: Final GAINS Reference Scenario 2016 – GAINS model methodology, International Institute for Applied Systems Analysis, Laxenburg, Austria.

[10] IPCC: 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Intergovernmental Panel on Climate Change, Japan, 2006

[11] IPCC: Climate Change 2007 - The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, 2007, Cambridge University Press, United Kingdom, 2007.

changed understanding of the impacts of indirect emissions from soils in IPCC (2006)[12]. While the previous guidelines used throughout the Kyoto period (IPCC, 1997)[13] assumed a considerable amount of N_2O to be derived from processes in groundwater as a consequence of fertilizer application on soils, this process is considered much less important in the updated version. With soil-related processes being the key contributor to emissions, this methodological change alone causes a reduction of total N_2O emissions of about 20% for the whole time series. Changes that needed to be implemented as a consequence of the above, allowed implementing other updates based on a review of literature. Adjustments beyond the Reference Scenario 2013 are the inclusion of new sectors and new abatement technologies. While the details of the changes introduced are covered in a separate[14] report, the major impacts are described by gas and by source sector in the following sections.

Non-CO_2 emissions: processes in industry

N_2O: A new sector "caprolactam production" (not included in the ETS) was introduced to allow for a clear separation of ETS and ESD sectors. Caprolactam production has become the major industrial source of nitrous oxide emissions in some countries, where emissions from nitric acid production have been reduced successfully over the last years, while those from caprolactam production remained constant, and thus needs to be specifically considered. Emission abatement technologies are taken from nitric acid production, due to similarities in the processes.

Non-CO_2 emissions: agriculture

In order to accommodate the impact of farm size on abatement measures and costs, the GAINS model has been extended to provide a split of animal categories dairy cows, non-dairy cattle, pigs, poultry, sheep and goats by five farm size classes: less than 15 livestock units (LSU), 15 to 50 LSU, 50 to 100 LSU, 100 to 500 LSU, and above 500 LSU based on data from Eurostat (2015). The data shows a consistent and very robust trend of increasing shares of animals in large size classes, while the shares of the small size classes decrease. Projections for the future development of farm-size classes in each individual country have been made by applying a multi-nominal logistic function weighing in the development observed in historical years from 1990 onwards. The development of farm-size classes has implications for the development of the fractions of animals on liquid and solid manure management and on the future applicability of control technology options, such as anaerobic digestion.

CH_4 – manure management: Treatment of pig or cattle manure in an anaerobic digester not only reduces CH_4 emissions from this source, but at the same time allows for the production of bioenergy. The implementation of anaerobic digestion has been updated using new information on the amount of energy generated from biogas production from EurObserv'ER (2014)[15]. As co-digestion with manure only makes up a small fraction of overall biogas produced, adjustments were made to account for this in historical data. The future growth in energy generation from digestion of manure-based substrates follows growth in biogas production as estimated by the PRIMES model. When implementing the adoption of AD technology, the available potential is first assumed exhausted on farms with more than 500 LSU before adoption on farms with 100 to 500 LSU. As mentioned, the share of large farms is expected to increase over time in all EU countries.

N_2O – soils: Updating to IPCC (2006) not only requires the use of new emission factors, but also the introduction of new subsector splits. GAINS still combines direct and indirect emissions into just one factor, but in agreement with IPCC the impact of leached nitrogen on N_2O emissions is now considered to be much smaller. Soil emissions are differentiated by the source of nitrogen (manure, mineral nitrogen & crop residues, and nitrogen from grazing sheep and from other animals are separated), with specific accounting for rice plantations. Following IPCC (2006), nitrogen on rice has much lower emission rates, while nitrogen from

[12] *Op. cit.* footnote 10

[13] Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories, Intergovernmental Panel on Climate Change (IPCC), UK Meteorological Office, Bracknell, United Kingdom, 1997

[14] *Op. cit.* footnote 9

[15] EurObserv'ER, 2014. Biogas Barometer, EurObserv'ER November 2013. http://www.energies-renouvelables.org/observer/stat_baro/observ/baro224_Biogas_en.pdf

grazing cattle is specifically high in N_2O emissions. The Reference Scenario assumes no emission abatement to be in place, except for efficiency improvements. CAPRI reports, as an average for EU28, that nitrogen use efficiency (rate between nitrogen outputs in products divided by nitrogen fertilizer inputs) is expected to increase by roughly 6% until 2030. To reflect this efficiency improvement, GAINS assumes options to save fertilizer by appropriate housekeeping measures ("fertilizer saving") to be fully implemented in the Reference Scenario.

Non-CO_2 emissions: waste

CH_4 – solid waste: Methane from solid waste is released when biodegradable matter decomposes under anaerobic conditions in landfills or during storage and handling of biodegradable waste in different waste treatment processes. To account for the decomposition time of biodegradable waste in landfills, GAINS models future emissions as driven by the gross (pre-treatment) amounts of waste generated ten years before for fast-degrading waste like food and garden waste, and twenty years before for slow-degrading waste like paper and wood. The effects on emissions of various waste policies are modelled through flows of waste to different treatment paths. The gross amounts of solid waste generated are driven by GDP and urbanization rate for municipal solid waste and by value added in the relevant manufacturing industries.

As part of a switch to the IPCC 2006 guidelines in the 2015 submission of national inventories to the UNFCCC, almost all EU Member States use a First-Order-Decay (FOD) method for estimating methane emissions from solid waste disposal. The FOD method takes account of methane emissions from landfill waste deposited up to fifty years back in time. For a few countries, this methodological shift meant almost a doubling of methane emissions reported from landfills in historical years, while for others it did not have a significant effect. As the difference stems from taking a longer historical time perspective into account when estimating emissions from landfills, the approach has been to apply the standard GAINS methodology accounting for emissions from waste deposited twenty years back in time. Differences (if any) between GAINS and landfill emissions as reported by countries to the UNFCCC are included in a separate emission category reflecting emissions from "Historical solid waste disposal". The residual is estimated for 2005, 2010 and emissions reported for 2013 were used to estimate the emission residual for year 2015. Considering the progressing decomposition of biodegradable waste in landfills and the fact that the Landfill Directive is expected to significantly reduce the amount of decomposable biodegradable waste in the landfills in the future, the emissions currently released and reported from the decomposition of historical disposal of solid waste are assumed to be phased out linearly until 2035. In 2005, methane emissions from solid waste are estimated to have constituted a third of EU methane emissions or a fifth of the overall release of non-CO_2 GHGs. By 2030, methane emissions from this source are expected to have declined by more than 70 percent due to fulfilment of the Landfill Directive in all Member States, more stringent national waste policies in some Member States, and the progressing decomposition of historically landfilled waste.

CAPRI updates

The CAPRI database was updated to include the most recently available information. In particular Eurostat statistics were updated in December 2015. For some animal herds (e.g. sheep) Eurostat series are less recent than UNFCCC data. If these cases were critical, UNFCCC data have been used to extrapolate missing Eurostat data. Two aspects required particular attention. The first was the lack of virtually all agricultural market balances (available from Eurostat in previous years). The solution found was to take trade and demand data from (a) Eurostat or (b) FAO, and to combine these with production data from Eurostat. The second aspect is that the CAPRI database update also included the sub-national database which required additional efforts to adjust to changes in definitions like that of NUTS2 regions. Furthermore, exogenous inputs for the projections have been updated. The most important element, apart from those models interacting in this study, is external projections from the European Commission's DG Agriculture. This refers to projections for areas, market balances and prices based

on the Aglink model[16]. The 2015 outlook was prepared in parallel to this Reference run and therefore could not be used as input for CAPRI. But for the important dairy sector access was available to data underpinning more recent (2015) DG Agriculture projections[17].

GLOBIOM/G4M updates

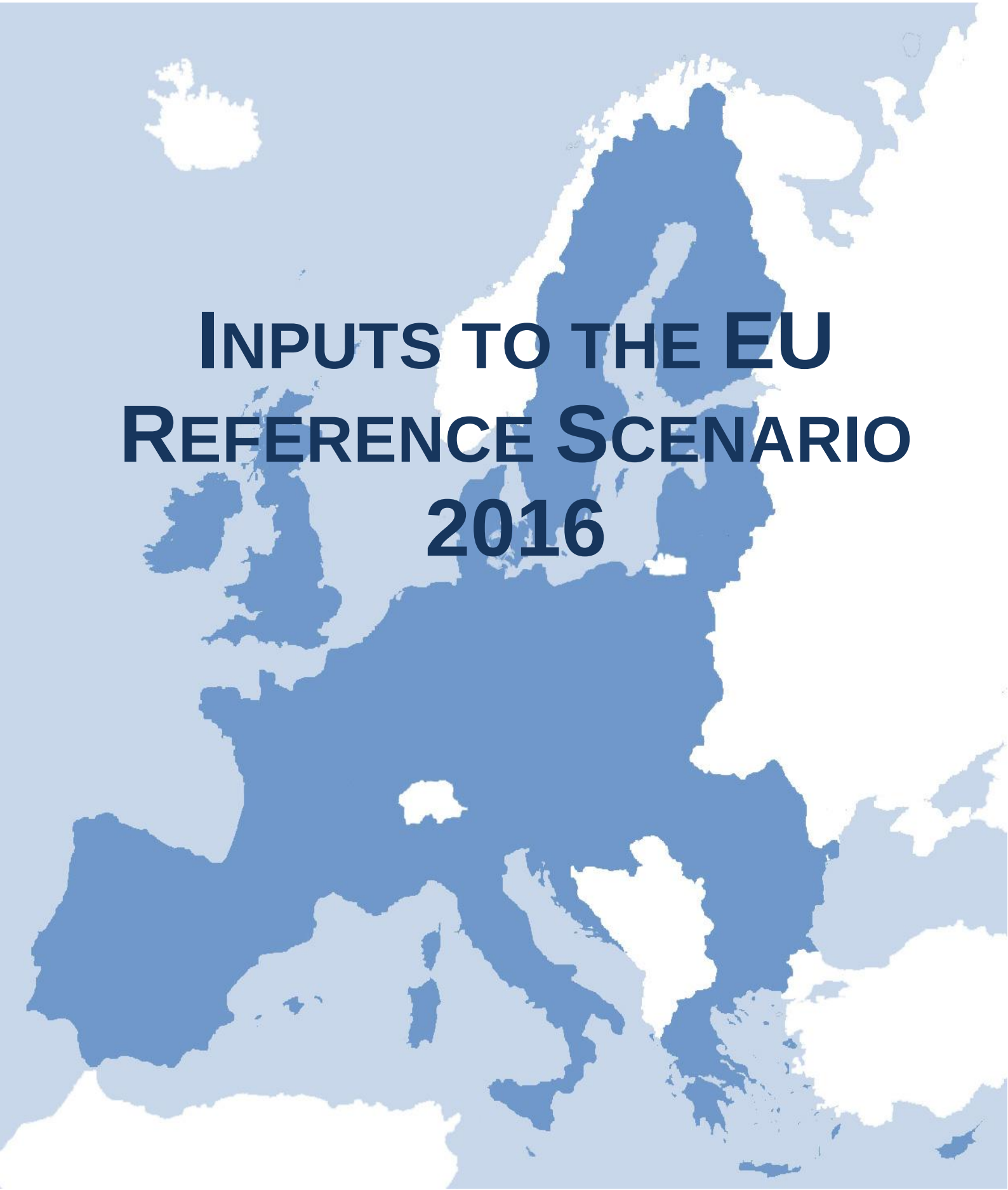
The input data used in the GLOBIOM/G4M model were updated for the Reference Scenario in collaboration with JRC, the CAPRI team and national experts. Forest harvest removals were calibrated to most recent FAOSTAT (2015)[18] data or individual submissions by Member States. Forest net annual increment and forest available for wood supply have been updated to MCPFE (2015) data[19] or submitted data from Member States.

The afforestation and deforestation rates in G4M have been calibrated, in collaboration with JRC, on UNFCCC and Kyoto Protocol (KP) submissions for 2015. Historical harvest removals from 1960 onwards taken from FAOSTAT data have been used in the calculation of the harvested wood sink.

UNFCCC 2015 data was used for the ex-post correction of model results to ensure consistency with UNFCCC submissions. A trend on the expansion of settlements was included in the projections based on historical UNFCCC 2015 time series (2003-13). GLOBIOM/G4M area balances were consolidated with the reported UNFCCC 2015 data to improve consistency (i.e. natural grasslands were split out from the "other natural vegetation" aggregate and included under grassland management together with pastures). Emissions sources covered have been extended to include biomass emissions from cropland and grassland.

A new approach was used for simulation of forest management decisions in G4M as new data were implemented. In particular, a map of 2000-10 wood production in EU[20] has been used for the initialization of wood production in model cells with rotation time close to the one maximizing sustainable wood production. Further change of the rotation time in response to wood demand is allowed only if the forest management is economically feasible (i.e. the net present value of forestry does not decline by more than 5%).

[16] European Commission (2014) Prospects for EU agricultural markets and income 2014-2024. Directorate-General for Agriculture and Rural Development. Brussels.
[17] European Commission (2015). EU Agricultural Outlook: Prospects for EU agricultural markets and income 2015-2025. Directorate-General for Agriculture and Rural Development. December 2015.
[18] The data was downloaded in October 2015
[19] MCPFE (2015). Forest Europe, 2015: State of Europe's Forests 2015. Madrid, Ministerial Conference on the Protection of Forests in Europe: 314.
[20] Verkerk PJ, Levers C, Kuemmerle T, Lindner M, Valbuena R, Verburg PH, Zudin S (2015) Mapping wood production in European forests. Forest Ecology and Management 357: 228-238. http://dx.doi.org/10.1016/j.foreco.2015.08.007



INPUTS TO THE EU REFERENCE SCENARIO 2016

2 Framework conditions and other inputs to the EU Reference Scenario 2016

2.1 Policies included in the EU Reference Scenario 2016 (EU and MS)

The Reference Scenario includes policies and measures adopted at EU level and in the Member States by December 2014. In addition, amendments to three Directives only agreed in the beginning of 2015 were also considered. This concerns the ILUC amendment to the RES and FQD Directives and the Market Stability Reserve Decision amending the ETS Directive.

The policies and measures reflected in the Reference Scenario are listed in annex 4.1, accompanied by an explanation on how they are taken into account in the models. The section below presents how some of the key policies are modelled.

2.2 Overview of how key policies are modelled

2.2.1 Overview of the EU ETS and projections on carbon prices

The EU ETS is modelled in its current scope (third trading period from 2013 onwards), including also aviation, further industrial process emissions and certain industrial non-CO_2 GHGs. It includes the Market Stability Reserve (MSR) adopted in 2015.

Non-CO_2 GHGs are integrated based on results of GAINS non-CO_2 modelling (see section on non-CO_2 emission results) and PRIMES then ensures consistent modelling of the complete ETS. The annual volume of available EU ETS allowances (quoted as allowances hereafter) following the Directive's current provisions on the emissions cap, is assumed to decrease by 1.74% p.a. from 2013 throughout the projection period, except for aviation for which the cap remains stable from 2013 onwards at 95% of average 2004-06 emission levels. The modelling reflects availability of allowances on the market, taking into account back-loading, the small remaining permissible amount of exchangeable international credits, and from 2019 onwards governed by the MSR decision, which is represented in the modelling. Aviation is modelled in the scope covered by Eurostat, and therefore PRIMES, based on fuels sold in the EU, which corresponds to domestic and outgoing international flights.

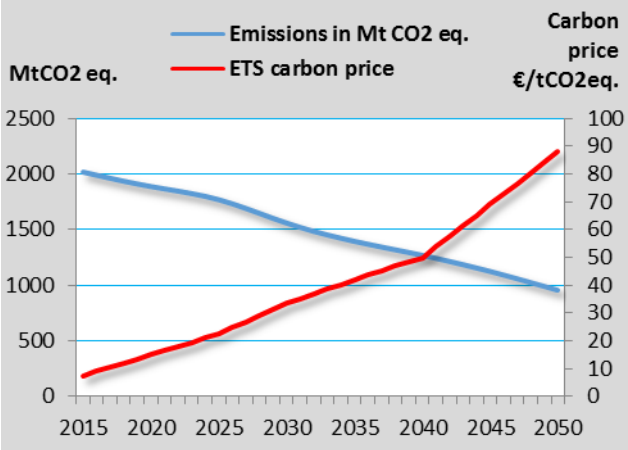
The different allowance allocation rules (auctioning, free allowances based on benchmarks) for the different sectors foreseen in the legislation, and including the provisions for sectors at risk of carbon leakage, are reflected in the modelling.

The PRIMES model simulates emission reductions in ETS sectors as a response to current and future ETS prices, taking into account risk-averse behaviour of market agents which leads to banking of allowances, perfect foresight of the carbon price progression in the period 2025-50 and the fact that no borrowing from the future is permitted. ETS prices are endogenously derived with model iterations until the cumulative ETS cap is met and the provisions of the MSR are respected. If the surplus of allowances is above 833 Mt CO_2 then 12% of allowances are put in reserve; if the surplus falls below 400 Mt CO_2 then an additional 100 Mt are reintroduced into the market. Other aspects are considered in the iterations: the stabilisation of the ETS market (achievement of balance between supply and demand) is reflected in limiting the difference between emissions and allowances in 2030 and all allowances withdrawn according to the surplus related rule are reinserted during the projection period.

The early phase III of the ETS has seen a significant surplus of allowances, amounting to 2070 Mt in 2014. Due to ETS back-loading and from 2019 the start of the MSR and the continuously decreasing number of available allowances, this surplus is decreasing constantly. The modelling suggests that the surplus would reach equilibrium levels shortly before 2025 and that the ETS price will follow only a slowly increasing trend until 2025 and stronger increases thereafter. The increasing ETS price induces a switch in power generation towards the use of low and zero carbon fuels or technologies (e.g. RES and CCS). Moreover, the increase in the unit cost of energy, reflecting the increasing ETS price, supports energy efficiency and fuel switching in the ETS sectors. Finally,

the increasing ETS price indirectly contributes to energy efficiency in demand side sectors as well, since the expenditures for ETS allowances are passed through to consumer prices, notably in electricity prices.

FIGURE 2: ETS EMISSIONS AND ETS CARBON PRICES



The ETS emissions target for 2020 is achieved. Alongside the ETS price there are also a wide variety of additional policies being implemented, particularly RES support policies but also Ecodesign and the EED, which influence the ETS sector allowance demand. In addition the economic crisis substantially reduced the industrial production as well as power demand and thus GHG emissions.

In the longer term, and in particular from 2040 onwards, the level of the ETS price increases significantly. This is the consequence of a decreasing supply of allowances in line with the yearly linear reduction factor that reduces the cap substantially over time and a combination of energy supply factors. These include: the delayed technology developments of CCS, public acceptance problems for nuclear energy and CO_2 storage, the updated offshore wind cost assumptions and phasing out of RES support as well as the trends in world fuel prices, where a decoupling of oil and gas prices takes place, with gas prices remaining in the longer term at relatively stable levels. The gradually increasing ETS prices lead to a progressive use of previously banked allowances and to feeding in of allowances back from the MSR into the carbon market, moderating the extent of price increases.

2.2.2 Energy efficiency

The Reference Scenario reflects the policies that have been adopted in recent years regarding energy efficiency in the EU and in MS, including Ecodesign and labelling, the Energy Efficiency Directive (EED) and the Energy Performance of Buildings Directive (EPBD). In the following, these measures are briefly discussed and a general overview of their effects on the energy system is provided, as well as their reflection in the PRIMES model.

The PRIMES model can simulate different energy efficiency policies with different modelling techniques. The model-specific instruments used affect the context and conditions under which individuals - in the modelling represented by stylized agents per sector - make their decisions on energy consumption and the related equipment.

The way of modelling such policies and instruments is the modification of model parameters in order to mirror technology performance or the effects of building codes that are determined jointly in the process of calibrating the interdependent model output to the observations from the most recent statistical year. Another technique is the assumption of improved equipment and appliances under certain scenario conditions over time which become available for future choices by consumers within the model projection.

Furthermore, there are specific modelling instruments for capturing the effects of measures that promote or impose efficiency performance standards (best available technology for industry, Ecodesign). Such modelling instruments relate to individual technologies or groups of technologies and modify the perception of associated costs by the modelled agents or influence the portfolio of technologies that will be available for consumer choice.

Another type of measures are those which improve consumer information through education, labelling, correct metering and billing, energy audits and technology support schemes aiming at inciting consumers to select more efficient technologies. Such measures are dealt with through the modelling instruments discussed in this section or are directly reflected in the

modelling mechanisms, where economic agents are per-se informed correctly about the prevailing and to some extent future prices. This depends on the sector as there is limited foresight in final demand sectors with shorter equipment lifetimes compared to power generation.

The penetration of ESCOs as explicitly incited by the EED leads to an environment with reduced risks for the consumers engaging in energy efficiency investments, which can include both changes in the building structure and changes in the energy equipment. As in the case for, e.g. labelling policies, the potential benefits of the penetration of ESCOs is represented in the modelling by reduced discount rates for certain sectors, mirroring the changes in the decision making conditions and constraints of e.g. households and services. In addition, these measures also induce lower technical and financial risk, hence reducing the perceived costs of new technologies and saving investments (see also point above on perception of costs).

Another key modelling tool are efficiency values reflecting a variety of broad and sometimes un-specified instruments that bring about efficiency improvements. In the most concrete form these values represent the price of hypothetical White Certificates, reflecting the marginal costs of reaching energy savings obligations, e.g. for energy distributors and retail sellers regarding energy efficiency at final customers' sites. In the Reference Scenario these values represent the implementation of the EED energy savings obligations in domestic and service sectors, specific building renovation policy efforts or a large range of other pertinent measures, such as energy audits, energy management systems, good energy advice to consumers on the various benefits of energy efficiency investment and better practices, targeted energy efficiency education, significant voluntary agreements, etc. For the modelling of the energy savings obligation or alternative measures it has been assumed that the possible exemptions for ETS installations and transport are used.

The EED includes specific public procurement provisions and induces multiplier effects, as the public sector assumes an exemplary role, i.e. private consumers are imitating the public sector energy efficiency actions.

Energy efficiency improvements also occur on the energy supply side, through the promotion of investments in CHP and in distributed steam and heat networks. These investments are combined with incentives on the consumer side to shift towards heating through district heating, both in the residential and the tertiary sectors.

Improvements in the network tariff system and the regulations regarding the design and operation of gas and electricity infrastructure are also required in the context of the EED; moreover, the EED requires MS and regulators to encourage and promote participation of demand side response in wholesale and retail markets. In this context, the EU Reference Scenario 2016 assumes that intelligent metering is gradually introduced in the electricity system. This enables consumers to more actively manage their energy use. It allows for demand responses so as to decrease peak and over-charging situations, which generally imply higher losses in the power grids. Thus, efficiency is also improved as a result of the intelligent operation of systems.

Finally, some policies and measures that do not target energy efficiency directly lead to significant additional energy efficiency benefits. Among these policies are the ETS Directive, the Effort Sharing Decision (ESD), and the CO_2 standards for cars and vans[21].

Policies on promoting RES also indirectly lead to energy efficiency gains; in statistical terms many RES, such as hydro, wind and solar PV, have an efficiency factor of 1; thus, the penetration of RES in all sectors, in particular in power generation, induces energy savings in primary energy terms.

Other measures that foster energy efficiency relate to taxation, in particular excise duties (including those

[21] For details on these policies see sections above and below.

reflecting emissions); they are directly modelled in PRIMES by Member State and type of fuel, allowing for the full reflection of the effects of energy taxation and other financial instruments on end user prices and energy consumption. By assumption, current tax rates per Member State are kept constant in real terms throughout the projection period.

2.2.3 RES policies

The Reference Scenario starts from the assumption that the EU energy system evolves so that the legally binding targets on RES (20% share of gross final energy consumption from RES by 2020 and 10% specifically in the transport sector) are achieved. In parallel, the framework for the penetration of RES significantly improves in the projection, as the Reference Scenario incorporates known direct RES aids (e.g. feed-in tariffs) and other RES enabling policies, such as priority access, grid development and streamlined authorisation procedures.

In the interaction process with Member States, it has been made clear that national RES 2020 targets are generally expected to be achieved at the Member State level, including only very limited recourse to co-operation mechanisms for those few countries that have considered making use of them. The Reference Scenario takes into account the most recent available data on RES development by Member State and the Member States projections on the trajectories of the RES shares by sector (RES-H&C for heating and cooling, RES-T for transport and RES-E for electricity) as expressed in the respective National Renewable Energy Action Plans (NREAPs).

The PRIMES model includes detailed modelling of Member States' policies representing a variety of economic support schemes, including feed-in-tariffs. A survey complementing the replies from Member States to the questionnaires sent at the beginning of the Reference Scenario process has been conducted to correctly represent current incentive schemes by Member State, including their budget limitations.

The RES investments resulting from the overall policy and economic context as well as incentives have been projected assuming that investors evaluate project specific Internal Rates of Return including the financial incentives and decide upon investing accordingly. The projected RES investments implied directly for the financial incentives are considered as given by the market model which decides upon the remaining potentially necessary investments (among all power generation technologies) based on pure economic considerations with a view to meeting the RES obligations.

Special fuel and electricity price elements (fees) are accounted for in the model to recover fully all the costs associated with RES deployment, which are calculated through the incentives and the contracting obligations over time. The model further keeps track of the RES technology vintages as projected. The outstanding fee is raised throughout the economic lifetime of the thus built power capacity, therefore also beyond 2020.

RES – T Share calculation following the ILUC amendment of the RES Directive

Numerator *= 2*Advanced biofuels as defined by Annex IX (including animal fats and cooking oil) + Other first generation compliant biofuels (maximum 7%) + 5 *RES electricity in road transport + 2.5*RES electricity in rail + RES electricity in other modes + Other RES in transport + Hydrogen of RES origin in all modes*

Denominator *= Petrol and diesel in all modes + All liquid biofuels (compliant and non-compliant) in road and rail transport + All gaseous biofuels in road and rail transport + 2.5 * RES electricity in rail + All electricity used in transport (excluding RES electricity in rail but including non-RES electricity in rail) + Electricity used for the production of renewable liquid and gaseous fuels of non-biological origin*

Note*:*

For RES-T, the share calculation following the ILUC amendment of the RES Directive is reported in the EU Reference scenario 2016 results. However, the 7% cap for first generation compliant biofuels was not retroactively applied to 2005 and 2010.

For biofuels, national blending obligations are modelled and assumed to be met in all countries where these are present. The Reference Scenario includes the ILUC amendment for the RES and FQD Directives. All biofuels are considered as being compliant with the EU sustainability criteria as of 2020, whereas for 2015 the compliancy rate reported in the RES share calculator 2013[22] is used. As far as the share of Article 21(2)[23] in compliant biofuels is concerned, this is assumed to further increase throughout the projection period starting from 2015, compared to the historical values for 2013.

For Member States which are not initially projected to achieve their RES target through direct incentive policies, an additional instrument is included in the modelling, the so-called RES-value. The value represents yet unknown policies which would be implemented by 2020 to provide the necessary incentives to reach the RES targets. These could include further legislative facilitations, easier site availability or grid access, or even direct financial incentives. The costs related to investments induced through the RES-value are fully reflected in the model and recovered through electricity prices. A separate RES-value for transport is also applied, where necessary, to achieve the 10% obligation for RES-T in 2020.

Beyond 2020, no additional RES targets are set and therefore no additional specific RES policy support is modelled, as a general rule.

Although direct incentives are phased out in power generation, the investments in RES continue beyond 2020 due to three main factors: (1) continued learning-by-doing, which makes some RES technologies economically competitive, (2) the increasing ETS carbon price, and (3) extensions in the grid and improvement in market-based balancing of RES as well as maintaining priority dispatch, although the possibility for RES curtailment is also modelled. The latter implies that RES curtailment is possible if the system requires it, however the continuation of RES priority dispatch in the Reference Scenario implies that this option is barely used under such conditions. In addition, some incentives for innovative technologies such as tidal, geothermal, solar thermal, and remote off-shore wind are phased out more gradually than for mature technologies.

In transport, national blending obligations are assumed to be maintained at constant level post-2020, where these exist.

2.2.4 Other policies impacting sectors covered by the Effort Sharing Decision

The ESD defines legally binding national GHG emission targets in 2020 compared with 2005 for sectors not covered by the EU ETS excluding LULUCF, ranging between -20% and +20%, which shall lead to an EU-wide emission reduction of 10%. To achieve the targets, it also defines for each country a linear emission path between 2013 and 2020 which has to be satisfied each year but is subject to a number of important flexibility mechanisms, e.g. a carry-forward of emission allocations, transfers between Member States and use of international credits. With regard to the national target trajectories, flexibility both over time and between Member States via the use of transfers has been assumed to reflect the use of economically effective options to meet the targets while respecting clear Member State indications on flexibility limitations.

Energy efficiency policies, as well as RES policies in the heating and transport sectors (see above) are key policies to achieve the ESD targets.

Transport

For the CO_2 standards for cars and vans, it is assumed, based on current reduction trends, that the 2020/21 CO_2 targets for the fleet of new vehicles set out in the Regulations are achieved and remain constant afterwards (for cars 95gCO_2/km by 2021, for vans 147gCO_2/km by 2020).

More specifically, the energy consumption calculated in the model takes into account the gap between the laboratory tests and the real world performance of cars. The model uses the COPERT methodology to calculate energy consumption by vehicle type, type of trip and time, as a function of the average speed. The

[22] Eurostat SHARES Tool Calculator (Version 2013.50204)

[23] As defined in Directive 2009/28/EC on the promotion of the use of energy from renewable sources, now amended by Directive (EU) 2015/1513

model does not assume one single value for specific fuel consumption of vehicles. The model considers discrete specific fuel consumption formulas for all trip types (i.e. more than 30) and for all vehicle technologies. The congestion effect, which is partly responsible for the discrepancy, is also captured through changes in the average speed of vehicles. Assuming, for example, that a vehicle is mostly used in urban areas, this results in lower average speed, which increases its specific fuel consumption. Furthermore, different types of technologies (battery electric, internal combustion, plug-in hybrid) have different characteristics which can influence their performance depending on the trip type. This implies that the model calculates different divergence factors taking into consideration vehicle type and trip type.

Continued emission reductions take place also post 2020 through the diffusion process of new vehicles complying with these standards.

Complementary, the Directive on alternative fuels infrastructure supports the development of electro-mobility and the uptake of other alternative fuels (e.g. liquefied natural gas in road freight and shipping) in the Reference Scenario, as long as incentives for the uptake of alternative powertrains/vessels are in place at Member State level.

Renewables energy policies in the transport sector are covered in the section on RES policies above.

Agriculture

Much of the legislation affecting agriculture has impacts on projected activity. The latest 2013 CAP reform[24] include various changes to the system of direct payments; they are included in CAPRI. Among the three "greening" components (ecological focus areas, crop diversity and grassland protection) it appears that the latter is the most relevant one and it is explicitly included in the CAPRI projections. Also the removal of quotas on milk and sugar has been incorporated. Implicitly, CAPRI reflects the effects of modifications in the CAP also through its use of Aglink/DG Agri projections[25] as external inputs. The milk quota expiry and perhaps the grassland protection are the two most important CAP drivers of agricultural markets and animal numbers and output levels. The nitrates and water framework Directives' impacts have been translated into increasing efficiency of fertiliser use over time, with consequences for the amount of fertilizer applied. Both animal sector information as well as fertiliser quantities are provided to GAINS from outputs of the CAPRI model. Also, assumptions taken on the development of farm sizes and their effects on shares of liquid vs solid manure systems in GAINS have been mentioned in section 1.2.3.

F-gases

The new EU F-gas Regulation (EC 517/2014) replaced the existing EU F-gas Regulation (EC 842/2006) and came into force on 1st January 2015. The new Regulation prescribes a phase out of the amount of HFCs that can be sold in the EU to one fifth of today's sales. In the Reference Scenario this is expected to cut EU F-gas emissions by 60 percent between 2015 and 2030. To assess the impact of the new Regulation (on top of previous F-gas legislation), account has been taken of the useful lifetime of the refrigeration and air-conditioning units, market penetration of low-GWP HFC alternatives, etc. In GAINS, a number of low GWP alternatives to HFCs are considered, i.e., hydrocarbons (i.e. HC-290, HC-600a), ammonia (NH_3), carbon dioxide (CO_2), and tetrafluoropropenes (i.e. HFO-1234yf, HFO-1234ze). Though a range of hydrocarbons have refrigerant applications, iso-butane (HC-600a) is the most frequently used in domestic fridges and freezers, while propane (HC-290) is common in stationary air-conditioning, commercial refrigeration and freezer applications. In the Reference Scenario, HFC emissions at EU28 level are reduced by 65 percent (nearly two-thirds) in 2030 compared to 2015.

Waste

Adopted waste policies include: the Landfill Directive (LD), which requires significant diversion of biodegradable waste away from landfills and recovery and control of landfill gas; the EU Waste Management

[24] See: http://ec.europa.eu/agriculture/cap-post-2013/index_en.htm

[25] Overview in European Commission (2014). Prospects for EU agricultural markets and income 2014-2024. Directorate-General for Agriculture and Rural Development. Brussels: European Commission.

Framework Directive, which requires respect for the waste treatment hierarchy giving priority to recycling and energy recovery before landfilling; and finally, a number of national waste policies which go beyond the EU-wide Directives by having a complete ban on landfilling of biodegradable waste. In GAINS, the respective treatment paths are reflected. By 2020 all EU Member States are assumed to meet or exceed the LD target of reducing landfill of biodegradable waste by 65 percent below the 1995 level.

2.2.5 Assumptions on implementation of the internal energy market policies

The Reference Scenario modelling includes flow based allocation of interconnection capacities, assuming a market model purely relating trade to market forces throughout the EU internal energy market with perfectly operating market coupling across all participating countries. The EU target model is assumed to be successfully implemented post 2020. This implies that the Net Transport Capacity (NTC) levels will be higher than currently (closer to their physical capabilities) and that there is higher coordination between TSOs reducing the balancing costs.

Consequently, the balancing of RES occurs in a very cooperative and cost-efficient manner avoiding excessive investments in peak devices that would be resulting if national perspectives in balancing were persisting. Through the improvements in the grid and the Ten Years Network Development Plan (TYNDP) of ENTSO-E (see next section) the grid is better suited for taking up higher shares of RES. Therefore the market improvements and the EU-wide market coupling allows for rather low balancing costs for RES, thus easing their market penetration.

2.2.6 Updates in infrastructure developments considered in the Reference Scenario

The PRIMES model and its sub-models take into account the official infrastructure development plans from ENTSOE, ENTSOG and the TEN-T networks for transport.

Electric grid

All interconnectors between Member States with their technical characteristics and capacities are represented in PRIMES; the import–export module further includes also non-EU countries such as Switzerland and Norway, as well as the South East European area, due to their strong connection with the EU electricity market. Interconnections to and from these countries are fully included.

Regarding grid development and the interconnectors between countries all the developments of the ENTSOE Ten Year Development Plan (TYNDP) are fully accounted for in the import-export module of PRIMES. The timeline of the TYNDP is also followed. After the end of the TYNDP, expansions are based on the known capacity expansion developments and the developments of RES. Within countries the grid expansions are assumed to be a function of capacity expansion particularly for RES.

ENTSOE development plan regarding grid reinforcement within each country were also taken into account. The reinforcements aim at relaxing some of the tight Net Transfer Capacity constraints, which prevail today. This integrates more RES production into the grid. The assumption was made that these reinforcements will remove the congestions currently prevailing within some countries. The combination of these elements implies that the ENTSOE development plan not only reinforces interconnection of countries, but also allows for wide market coupling in parallel with inter-TSO coordinated dispatching.

Gas networks

The PRIMES-Gas module represents in detail the present and future gas infrastructure of each Member State and of gas producing and consuming countries of the Eurasian area, including Russia, Ukraine, Belarus, the Caspian countries, Middle East (including Israel), Persian Gulf (including Qatar which is the largest LNG supplier worldwide) and North African countries (Algeria, Libya and Egypt). The model also represents the supply possibilities of LNG worldwide and the demand for LNG. The infrastructure types include: gas production, pipelines (represented as a network), gas storage facilities, LNG regasification terminals and gas liquefaction. Operation of infrastructure and related gas flows are constrained by a physical system involving pipelines, LNG terminals, gas storage facilities, liquefaction plants and gas producing wells.

The PRIMES-Gas module takes into account a comprehensive list of PCI gas infrastructure projects, including major gas infrastructure projects with neighbourhood countries, interconnections between EU Member States, expansion of existing pipeline capacities, new bidirectional pipelines, LNG import terminals and storage facilities in each of the EU 28 Member States. This list is largely based on the ENTSOG ten year development plan, questionnaire answers in the Member State consultation procedure, other studies and further review undertaken by E3Mlab.

Transport infrastructure

The developments in transport infrastructure mainly affect transport activity projections. In the EU Reference Scenario 2016 the core TEN-T network is assumed to be completed by 2030 and the comprehensive TEN-T network by 2050. Foreseen developments for rail and motorways are included, also reflecting information received through the replies to the MS policy questionnaires.

Regarding high speed rail, the plans foreseen in the revised TEN-T guidelines have been included, complemented by information received through the replies to the MS policy questionnaires. In addition, the replies to the MS policy questionnaires (including existing plans) have also been used for rail electrification.

2.3 Macroeconomic and demographic assumptions

The macroeconomic outlook used in the Reference Scenario provides the framework projections on how the EU will perform in the coming decades. The outlook is important as it provides projections on the future structure of sectors and activity of the EU economy, used as inputs in the PRIMES energy model.

The macroeconomic scenario builds on recent demographic and economic projections for the EU countries provided by Eurostat and the joint work of the Economic Policy Committee and the European Commission. More specifically, the "2015 Ageing Report"[26] has been the starting point of this exercise providing medium and long term population and GDP growth trends while the short term GDP growth projections were taken from DG ECFIN.[27]

The GEM-E3 model is used to simulate developments of each GDP component (like investment, consumption and trade) and of the sectorial production for each EU Member State that are fully consistent with the aggregate input macro projections. As GEM-E3 is a global computable general equilibrium model, it ensures that macroeconomic and sectorial projections of the EU economy are consistent with a global economy context. By representing the global economy as a closed system, the model ensures that demand equals supply at world level. Details on the methodology, data and assumptions can be found in Annex 4.2.

2.3.1 EU population projections

EU population is projected to increase over coming decades up to 2050, although with declining growth rates.

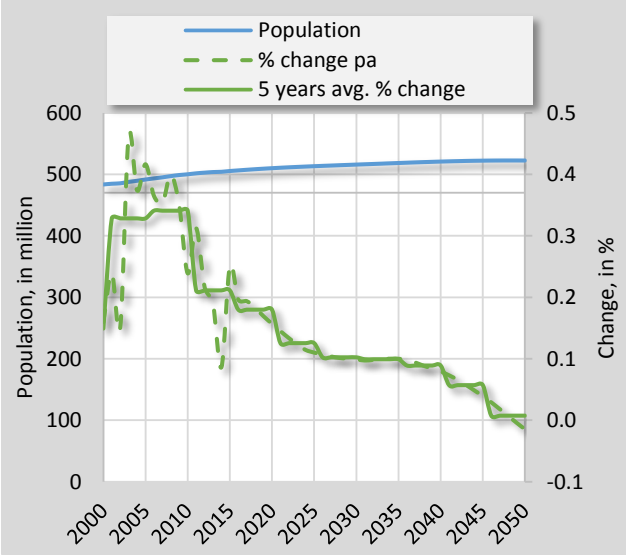
Fertility rates rise in the EU from 1.6 in 2013 to 1.7 in 2050, converging to the fertility rates of Northern European countries[28]. Life expectancy also rises by more than 6 years until 2050. Migration trends continue to 2050 recording an inward net migration to the EU which is however projected to decline overtime. Following fertility, life expectancy and migration dynamics age structure in the EU is projected to change strongly in the following decades. Elderly people, aged 65 or more, would account for 24% of the total population by 2030 and 28% by 2050 as opposed to 18% today.

[26] European Commission (2014),The 2015 Ageing Report: Underlying Assumptions and Projection Methodologies. European Economy 8/2014. Directorate-General for Economic and Financial Affairs (DG ECFIN)
http://ec.europa.eu/economy_finance/publications/european_economy/ageing_report/index_en.htm

[27] European Commission (2014). European Economic Forecast. Autumn 2014. European Economy 7/2014. Directorate General for Economic and Financial Affairs (DG ECFIN). Annual macro-economic data available at:
http://ec.europa.eu/economy_finance/db_indicators/ameco/zipped_en.htm

[28] see footnote 26

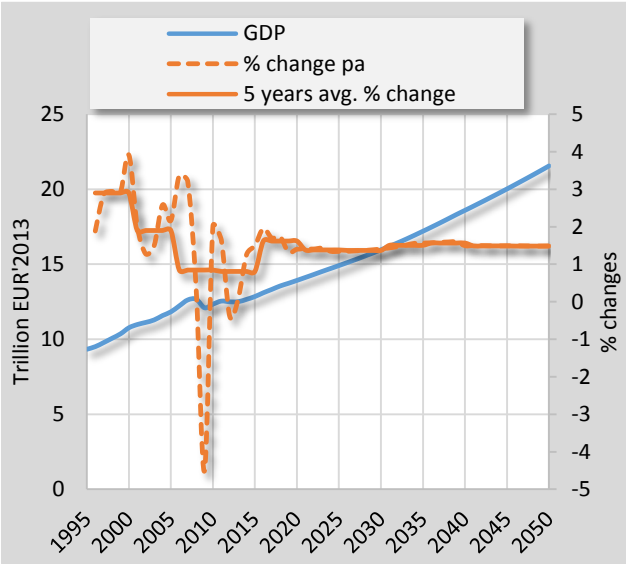
FIGURE 3 EU POPULATION PROJECTIONS



2.3.2 EU economic projections

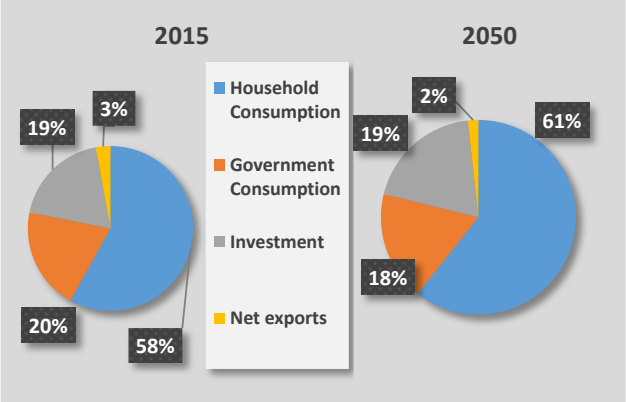
Projections on EU GDP show relatively low growth rates in the short to medium term averaging at a rate of 1.2% per annum over the period 2010-20 (down from the 1.9% per annum during 1995-2010). In the longer term EU GDP growth is projected to increase at an average rate of 1.5% per annum. The annual average potential GDP growth rate in the EU is projected to remain quite stable over the long-term and much lower than in previous decades.

FIGURE 4: EU GDP IN REAL TERMS



GDP growth in the EU remains weak reflecting the legacies of the crisis, demographic effects and the fall in total factor productivity that has started before the crisis. At the beginning of the projection period growth in the EU Member States is projected to be affected by deleveraging pressures, incomplete adjustment of macroeconomic imbalances and slow pace of structural and institutional reforms taking place. Over the longer term the impacts of the financial crisis are projected to fade away, structural reforms start to yield results, labour markets improve and more supportive policies and financing conditions are projected to be put in place sustaining the growth in the EU Member States. The recovery of the European economy is also projected to be facilitated by lower energy prices and a shift of the EU economy into a neutral fiscal stance[29].

FIGURE 5: COMPONENTS OF GDP IN THE EU



The macroeconomic components of EU GDP are projected to record only marginal changes by 2050 in their shares. The composition of the EU GDP continues current trends with high and increasing shares of private consumption followed by investments and government consumption. Private consumption continues to account for the largest part of GDP in the EU up to 2050.

Government consumption is projected to marginally lower its share in GDP reflecting adjustments after the financial crisis and contraction of government spending. Investments are projected to account for 19% of

[29] European Commission (2014). European Economic Forecast. Autumn 2014. Directorate-General for Economic and Financial Affairs. European Economy 7/2014.

GDP in 2050. Trade surplus with non-EU regions continues to account for a small share of EU GDP, which is close to present levels.

2.3.3 EU sectorial projections[30]

In the EU, the services sector is projected to generate 78% of gross value added by 2050, increasing its share from 2010 when it accounted for 74% of total.

FIGURE 6: SECTORIAL GROSS VALUE ADDED IN THE EU 28

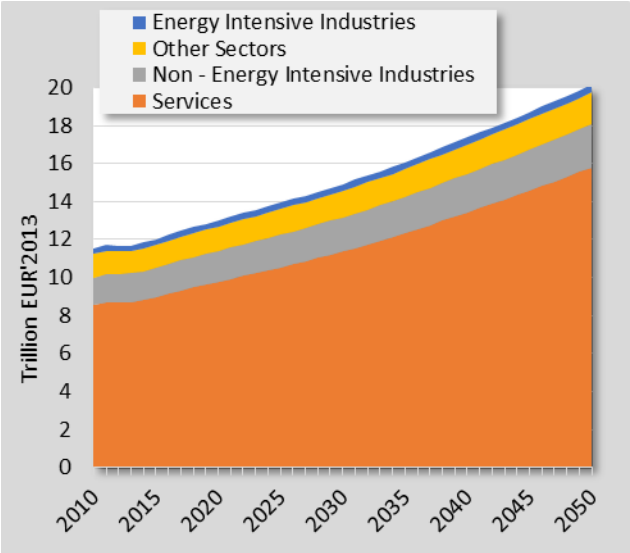
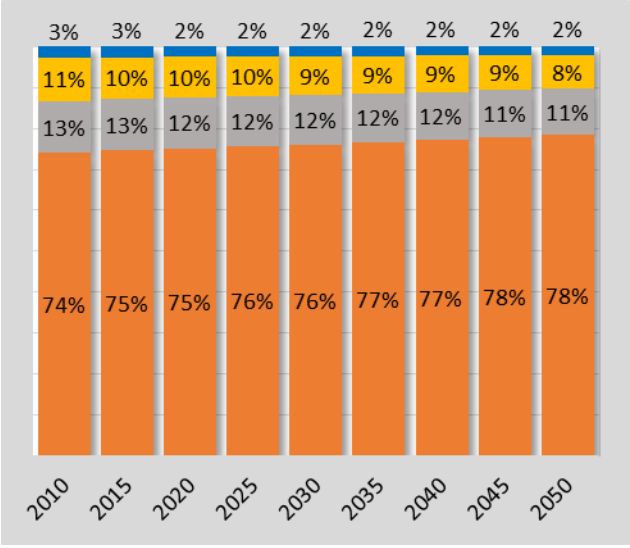


FIGURE 7: SECTORIAL SHARES IN GROSS VALUE ADDED IN THE EU 28



Sectors that have been hit by the financial crisis, like the construction sector and the industrial sector, are projected to resume activity. The recovery is driven by better financing conditions, changes in real disposable income, the projected recovery in investments and lower energy prices that decrease the unit cost of production and improve competitiveness. Sectors linked to the construction sector (like cement) also record improvements in sectorial activity to 2050. Energy intensive industries maintain their shares in gross value added close to present levels, moving up the value chain. Growth is projected to be relatively slow in agriculture and the energy sector (in terms of activity volume).

With regard to different industrial sectors EU countries are projected to maintain activity in iron and steel and non-ferrous metals sectors thanks to the existence of tight links with the EU equipment goods industry. The chemicals sector[31] records a slow recovery affected by strong competition from non-EU countries like China, India and USA, but activity increases in line with industry average. Within this sector, the EU production of fertilizers and inorganic chemicals is projected to stabilize and slightly decline in the long term as a result of increasing international competition and low internal market demand. The equipment goods industry (engineering) is projected to remain a dynamic sector in the EU industry, growing at steady pace, but faced with higher competition from emerging markets. The textile industry is projected to decline as affected by international competition.

2.4 World fossil fuel prices

2.4.1 Approach

The Reference Scenario takes as exogenous assumptions the evolution of global fossil fuel prices, which have been developed independently with PROMETHEUS (global partial equilibrium energy system model). The PROMETHEUS model endogenously derives consistent price trajectories for oil, natural gas and coal based on the evolution of global energy demand, resources and reserves, extraction costs and bilateral trade between regions.

[30] For details on EU sectorial projections, please see Appendix 1

[31] KPMG (2010). The future of the European Chemical industry. KPMG International.

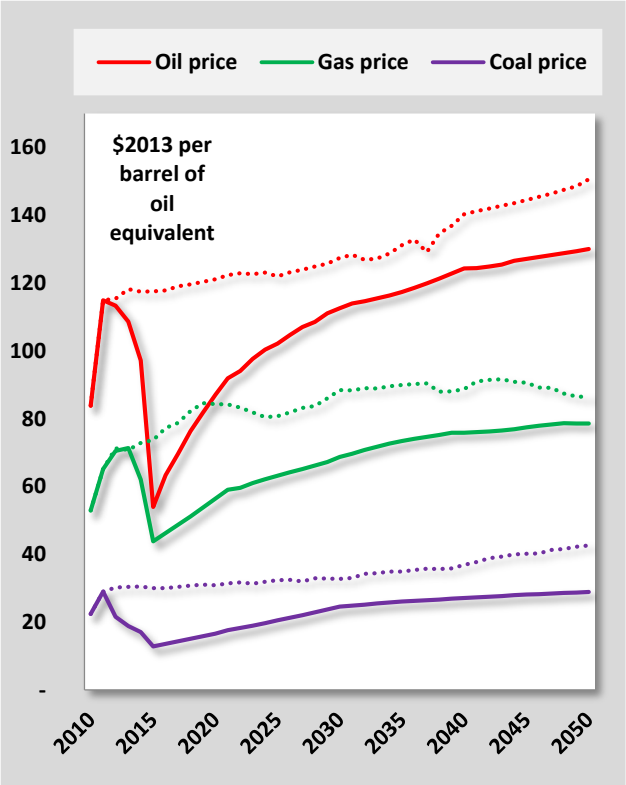
The evolution of world fossil fuel prices depends heavily on the stringency of climate policy assumptions, which aim at limiting the consumption of fossil fuels. In the context of the Reference Scenario, the following assumptions are made. For the period to 2020, adopted EU policies and Copenhagen-Cancun pledges and their updates are respected through the introduction of carbon values combined with dedicated policies and measures (e.g. RES subsidies and feed-in tariffs, energy efficiency regulations, transport policies and carbon standards etc.). Policies promoting renewables are implicitly modelled in all regions where they exist, using RES values that lead to higher RES deployment, as they lower RES costs for energy consumers. The projections also incorporate explicit assumptions regarding technology costs, energy taxes and subsidies (especially in developing regions), energy efficiency improvements, uptake of low and zero carbon technologies and geopolitical considerations (e.g. the role of OPEC).

Fossil fuel prices are also influenced by the production costs of different supply options (including unconventional resources), productive capacities and the constraints in production rates and recovery factors of various types of resources. Assumptions on global hydrocarbon resources have been entirely updated to include unconventional gas (shale gas, tight sands and coal-bed methane) and oil resources (tight oil, Canadian oil tar sands and extra heavy oil)[32].

2.4.2 Projections for world fossil fuel prices

Figure 8 shows the development of world fossil fuel prices[33] as projected by PROMETHEUS and used for the EU Reference Scenario 2016 (dotted lines represent the EU Reference Scenario 2013 projections).

FIGURE 8: FOSSIL FUEL IMPORT PRICES



Note: Dotted lines represent the previous Reference Scenario

Oil price projections

The Brent price declined by more than 50% from the level of 115 $/barrel in July 2014 to less than 60$ in the summer of 2015. This trend continued and spot Brent price hit record lows by the end of 2015, while in January 2016 it dropped even below 30$/ barrel, before bouncing back to about 50$ at the end of the first half of 2016. The main reasons for this development are related to the low demand increase at the global level (due to weak GDP growth, accelerated energy efficiency improvements and substitution of oil by gas and renewables in many world regions) combined with increased production especially concerning US tight oil. Furthermore, OPEC has failed to reach agreement to reduce its production. Despite tensions in major oil producers (particularly turmoil in Libya and Iraq) production and volumes of oil export

[32] Coal and uranium are assumed to have relatively abundant resources, which do not pose a constraint in global supply prospects until 2050.

[33] PROMETHEUS assumes that the global oil price is the price of Brent, the gas price is the weighted average of gas as imported to the EU (taking into account long-term oil-indexed gas contracts, UK NBP spot price, LNG prices and German border price) and the coal price refers to the average price of imported coal in the EU-28 (CIF ARA-6000). Prices are presented as smoothed trend lines (annual average); in reality prices have very high variability and fluctuate in shorter time steps (daily or hourly).

surpluses have been maintained. Finally, the quantitative easing policy of the US Federal Reserve Board, ended in mid-2014, increased the value of the dollar compared to other international currencies, and notably the Euro.

It is not clear how long oil production from non-OPEC countries, mainly USA tight oil production, will take to respond to the low prices prevailing in world markets. The Reference Scenario assumes a gradual adjustment process with reduced investments in upstream non-OPEC productive capacities. Quota discipline is assumed to gradually improve among OPEC members. Hence, the global oil price[34] is projected to follow an increasing trajectory reaching 87$2013[35] in 2020. Still, world oil prices stand significantly lower relative to the previous Reference Scenario exercise (-26% in 2020).

World oil prices are projected to increase constantly after 2020. In the decade 2020-30, the international oil price increases at relatively high growth rates (2.3% per annum) due to persistent demand growth in non-OECD countries, which is fuelled by high growth of economic activity and rapid motorisation in major emerging economies (including China and India) mainly related to increased ownership of private passenger cars (as the global passenger car stock nearly doubles between 2012 and 2030). In accordance with the IEA World Energy Outlook 2015 analysis, the projections point towards a tighter global oil market that emerges in the decade 2020-2030 as oil production outside the Organisation of the Petroleum Exporting Countries (non-OPEC) stabilises. Thus, the growing role of OPEC leads to increasing oil prices in global markets. Furthermore, declining Reserves to Production ratio at the global level in combination with the gradual transition towards oil resources with higher extraction costs, as global low-cost deposits are gradually exhausted, result in resumption of upward price trends.

Growth in world oil prices decelerates significantly to 0.7% p.a. in the period 2030-50 driven mainly by lower growth rates of global oil consumption (due to e.g. energy efficiency, deployment of biofuels, penetration of hybrid vehicles in road transport, gradual substitution of oil by gas in stationary energy uses) and by technological progress in extraction techniques of tight oil (hydraulic fracturing and horizontal drilling). In 2050, the price of Brent reaches 130 $2013/barrel. This is 13.5% lower relative to the previous Reference Scenario - mainly as a result of overall higher assumptions for global oil resource base. It must be noted that the Reference Scenario does not take into account the uncertain and usually temporary effects of geopolitical crises in the medium and long term.

The PROMETHEUS projection for international oil prices is consistent with the New Policies Scenario of WEO 2015. For the medium and long-term, PROMETHEUS projections are directly comparable to IEA estimates, while for the short term PROMETHEUS assumes somewhat more rapid price rebound as investments in productive capacities decline and global markets rebalance to higher price levels than today.

Gas price projections

During 2013-15, the average gas import price to the EU has declined by 27%[36] in constant Euro terms (and 39% in constant US Dollars) following the evolution of world oil prices (41% and 50% respectively) and the easing of conditions in global LNG market mainly due to the shale gas developments in North America. Moreover, the recent decline in average EU gas import prices is a result of the increasing competitiveness of the European gas market. While indexation to oil prices remains the most widely used pricing method in the Southern and Eastern parts of the EU, across North-West Europe, gas import contracts are increasingly referenced to European hub prices (gas-to-gas competition). This development allowed market fundamentals with declining domestic demand and robust gas supply from various sources (both pipeline and LNG) to be reflected in lower gas import prices to the EU.

In the short term, low gas import prices are projected

[34] See footnote 25.

[35] Fossil fuel price are expressed in constant dollars of 2013.

[36] The reduction refers to annual average prices.

to be maintained, with prices in 2020 remaining well below recent peaks and even 2014 prices.

The world oil price landscape affects European gas import contracts that are indexed to oil prices, while the pressure on global LNG market is relaxed due to the expected rise in nuclear energy use in Japan[37] (implying lower requirements for gas imports) and the emergence of shale gas in USA with potential LNG exports. Moreover, the transition away from long-term oil-indexed gas contracts and towards indices linked to the prices prevailing in gas trading hubs leads to fewer restrictions in gas supply contracts and higher flexibility in international gas spot markets. In the period after 2020, the average EU gas import price increases constantly reaching 69 $2013/ boe[38] in 2030 and 79 $2013 in 2050, i.e. it stands 11% higher than recent peaks of 2008 and 2012. This increase is driven by high growth in natural gas consumption in developing economies, mainly in China, India and the MENA[39] region, and the constantly increasing international oil prices (that influence oil-indexed EU gas import contracts).

Additional unconventional gas resources, mainly shale gas, are assumed to become massively available at the global level after 2020, expanding the gas supply base. On the other hand, these resources are characterised by higher production costs compared to conventional low-cost reserves that will gradually deplete. This is reflected in increasing prices for imported gas to the EU. The Reference Scenario projection is such that by 2050 gas prices remain at a level that is high enough to guarantee the economic viability of most unconventional gas production projects at the global level.

Coal price projections

In the period 2011-14, international coal prices have declined by 43% in constant $ of 2013, as Australia, Colombia, Indonesia and South Africa have contributed to significantly increasing supply at the global level, while growth of global demand was weaker compared to the decade 2000-10. Coal consumption declined by 18% between 2008 and 2014 in the USA, mainly due to the shale gas developments and the subsequent decrease in Henry Hub gas price, while coal demand in China (by far the largest coal consumer in the world) has been subdued because of slower growth in its electricity demand and increased hydropower output as well as new installed RES capacities (mainly wind onshore).

By 2020, the PROMETHEUS projection implies a relative stabilisation of coal prices (as imported to the EU) at their 2014 levels, i.e. about 16.5 $2013 per barrel of oil equivalent. This stabilisation is a result of the deceleration in the growth of global coal demand driven by climate policies and emission pledges in major carbon emitting economies with the introduction of carbon values that curb the consumption of solid fuels in combination with low trajectories for world oil and gas prices.

On the other hand, in the period 2020-50, EU coal import prices increase steadily from 16.5 $2013/boe in 2020 to 29 $2013/boe in 2050, driven by rapid growth of coal demand in developing economies with very modest GHG abatement policies after 2020 (especially in China and India that already import large quantities of coal to satisfy their expanding domestic consumption), increasing world oil prices and the restructuring of the global coal mining sector with closure of inefficient coal extraction facilities in several countries.

Moreover, coal prices are also strongly influenced by movements of natural gas prices as the two fuels compete for investments to satisfy the rapidly growing global power generation requirements. That is, as world gas prices increase in the period 2020-50, coal increasingly substitutes for gas in electricity production and global coal demand increases thus exerting an upward effect on international coal prices.

[37] Currently nuclear electricity production in Japan is very close to zero (period 2014/2015). National policies (incorporated in the global energy outlook assumptions) imply that the share of nuclear will increase to about 15% in 2020, which is still lower than the 26% share in 2010 before the Fukushima accident.

[38] Barrel of Oil Equivalent

[39] Middle East and North Africa

Despite their higher increase in percentage terms over the period 2020-50 compared to both world oil and gas prices, coal prices stand significantly lower compared to the EU Reference Scenario 2013 projections, even by 2050. This is a combined effect arising from the overall development of the global energy system. Global coal demand is lower relative to EU Reference Scenario 2013 throughout the projection period (-5% in 2030 and -8.5% in 2050), while coal consumption in China, which is projected to be the major coal importing economy by 2050, stands also significantly lower (-22% in 2050). This projection implies easing of stresses in global coal markets.

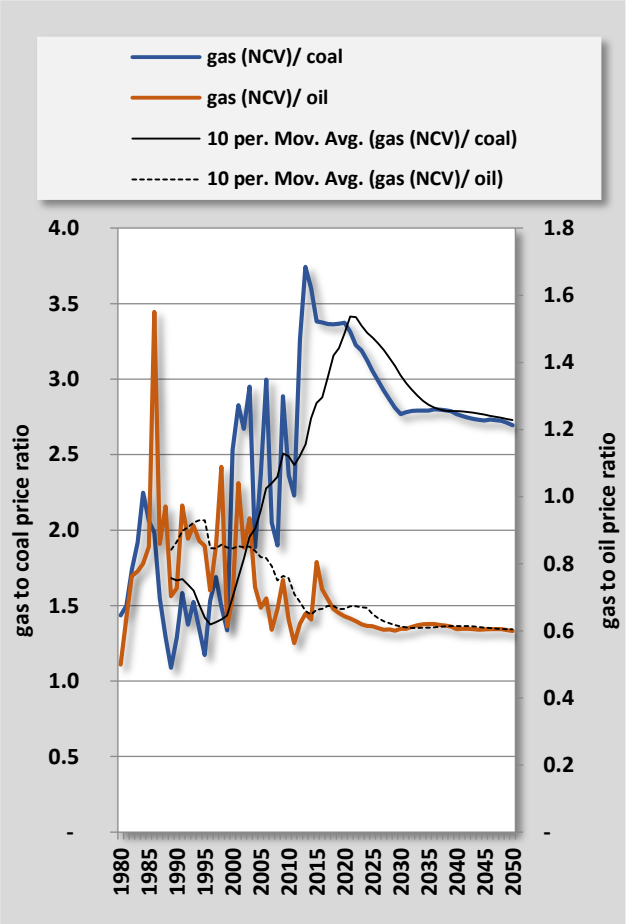
During the period 2030-50, world oil prices stand 12-14% lower compared to the previous Reference scenarios leading to reduced transport costs for coal trade between countries and regions. The Reference Scenario assumes higher coal supply prospects derived from detailed global coal supply reports, which show increasing coal mining and export capacities for major coal exporters (Australia, Indonesia, South Africa, USA), despite some delays.

Ratios of EU fossil fuel import prices

Figure 9 presents the evolution of gas to oil and gas to coal price ratio (as imported to the EU) in the Reference Scenario. The price ratios are calculated by normalising the prices in constant $2013 per barrel of oil equivalent.

The ratio of EU gas import price to the world oil price has recently increased significantly from 0.56 in 2011 to 0.8 in 2015. This led to reduced gas consumption in the EU. Reference Scenario projections result in a rapid decline of the ratio to 0.64 by 2020. The gas to oil price ratio stabilises at the value of 0.60 in the period 2030 to 2050; this would correspond to one of the lowest values of gas to oil price ratio registered in the period after 1980 pointing to a relative decoupling of gas and oil prices.

FIGURE 9: RATIO OF GAS TO COAL AND GAS TO OIL PRICES



In the period 2012 to 2014, the ratio of gas to coal import price in the EU has increased above 3 giving a clear signal for a shift away from natural gas in electricity production. Consequently, the natural gas input to thermal power plants has declined by about 37% in the EU between 2010 and 2014[40].

The Reference Scenario projections lead to a decline of the gas to coal import price ratio from 3.74 in 2014 to 3.4 in 2020. In the decade 2020-30, a rapid decline of the gas to coal price ratio, from 3.4 in 2020 to 2.8 in 2030, is projected. In the period after 2030, the ratio is projected to decline very slowly and reaches 2.7 in 2050.

[40] On the other hand, during recent years the gas Henry Hub price which is used as the benchmark gas price in the USA stands significantly lower compared to the average gas import price to the EU due to emergence of domestic shale gas production. Therefore, natural gas is the preferable option for new power generation investments in the USA.

2.5 Energy technology progress

2.5.1 Approach and classification of technologies

The EU Reference Scenario 2016, as the previous Reference Scenarios, deals explicitly with the penetration of new technologies notably in power generation and transport and specifically with progress in renewable technologies including further technology learning.

The penetration of new technologies is dependent on their techno-economic characteristics alongside other drivers such as relative prices and costs, policies to promote energy efficiency, renewables and new technologies and broader market trends regarding economic efficiency and better use of resources. This leads to different penetration levels of the technologies and different energy mixes.

The interdependent developments also bring about energy efficiency improvements on both the demand and supply side. They further result in energy technology changes, which in the modelling are represented by an uptake of specific energy technologies from a broad portfolio of different technologies.

The modelling of technologies in PRIMES is characterised by the following features:

- Technology vintages are tracked in the entire model
- Technology learning curves are generally scenario specific in the majority of the models.
- Cost-supply-potential curves (non-linear) for renewable resources, power plant sites, energy savings, etc. are used in demand and supply models to mimic the increasing difficulty of exploiting a resource close to potential, the increasing marginal costs of energy efficiency, the increasing cost of RES development in remote areas, etc.
- Progress reducing cost gap between different scales, influencing the emergence of decentralized power plants
- Risk premium and perceived costs used to influence uptake of not yet mature technologies obstructed by low access to financing or the reluctance of customers to buy technologies which are not yet well known and for which, for example, maintenance services are uncertain.

TABLE 1: CLASSIFICATION OF ENERGY TECHNOLOGIES IN PRIMES MODULES

Houses and Buildings (several technologies by energy use)

- Space heating, cooling, water heating, cooking
- Electric appliances, lighting
- Thermal integrity of buildings (efficiency curves by category - no explicit techniques)

Industry by sector and sub-sector (26 sub-sectors) - several technologies split by:

- Specific industrial processes
- Thermal processing - furnaces etc.
- Electric processing
- Steam
- Low enthalpy heat
- Motor drives, air compression/ventilation, chillers, etc.
- Horizontal energy management and heat recovery

Transport sector (various technologies by transport mode)

- Cars (conventional, hybrid, plug-in hybrid, battery electric, fuel cells - several categories incl. the EURO standards separately)

By fuel type and technology efficiency curves:

- Heavy Goods Vehicles, Busses, Coaches
- Conventional and high speed rail
- Airplanes
- Ships

Power sector (>150 cases)

- *Utility and Industrial scales separately*
  - Coal - lignite (several)
  - Steam turbine (gas, oil)
  - GT and IC
  - CCGT (several)
  - CCS (several)
  - Nuclear (several)
  - CHP technologies (several)
  - Large Hydro and pumping
- *Renewables*
  - Solar PV
  - Wind onshore, offshore
  - Solar thermal
  - Biomass (several)
  - Waste (several)
  - Biogas (several)
  - Geothermal
  - Tidal - waves
  - Small hydro
- *Highly decentralised*
  - Rooftop solar
  - Small scale wind
  - Micro CHP
  - Fuel cells

Grids

- High voltage, medium voltage, low voltage, DC/AC interconnectors, smart metering (curves)
- District heating
- Steam distribution
- Gas pipelines, LNG, storage, etc.
- Hydrogen transport and distribution
- Refuelling - recharging infrastructure

Power storage

- Hydro pumping
- Hydrogen (RES to hydrogen/gas)
- Air compression
- Batteries (low, medium scale)

Biomass supply

35 technologies converting feedstock to bio-energy

Oil Refineries

15 typical processes

Hydrogen production

14 production processes

The technology portfolio in the Reference Scenario includes the following categories (see Table 1):

- End-use energy efficiency for stationary demand: residential, tertiary and industry (thermal integrity of buildings, lighting, electric appliances, motor drives, heat pumps, thermal and electric processing, etc.).
- Renewable energy in centralized and decentralized power generation, in direct heating and cooling applications, as well as for blending with petrol or diesel oil.
- Supercritical coal plants, advanced gas combined cycle plants and CHP.
- CO_2 carbon capture and storage (CCS).
- Nuclear energy including 3rd and 4th generation.
- Advanced transmission and distribution grids and smart metering.
- Plug-in hybrid and battery electric vehicles, both for passenger and freight road transportation (light commercial vehicles).
- Improvements in conventional engines in transport.

For not-yet mature technologies, the projected evolution of their technical and economic characteristics presupposes substantial research and demonstration effort to enable economies of scale.

2.5.2 Power generation

In the following an overview of the main assumptions about key power generation technologies is provided; changes compared to the EU Reference Scenario 2013 are mentioned when these are noteworthy.

Solar photovoltaic (PVs): techno-economic improvements in the solar PV industry, having surpassed previous expectations of costs, have been re-estimated using updated data. The development of PVs therefore starts from lower costs than previously expected and continues to exploit learning potential in the future. However, costs hit a floor which is justified by the incompressible costs of the modules and components such as inverters, frames and installation costs.

Wind onshore: costs of wind turbines are influenced by metal prices, but after 2008-10 a steadily decreasing trend is visible. The remaining potential for learning is estimated to be small, but costs can decrease due to the size of turbines and their height.

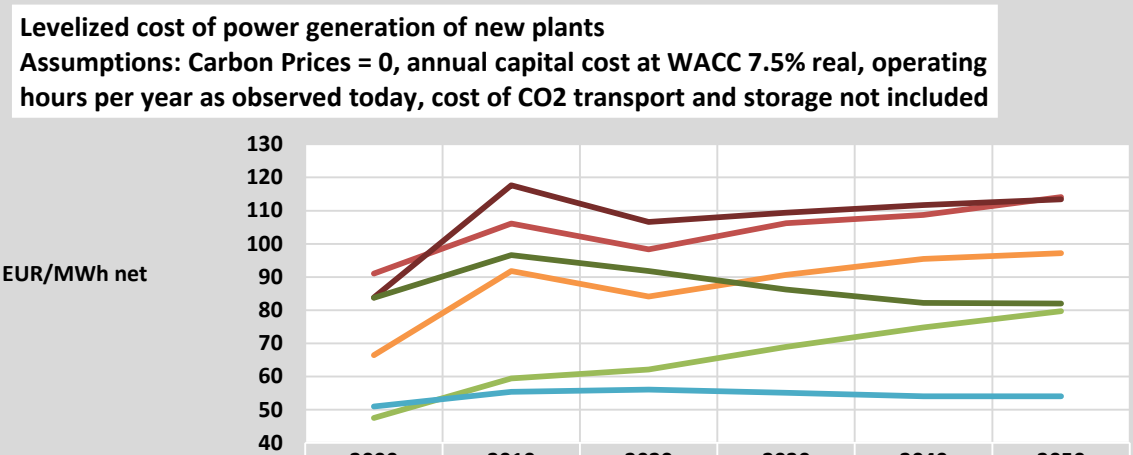
Remote offshore wind: There remains large uncertainty about the costs for offshore wind and there have been cost increases due to previously unforeseen difficulties and logistics. Surveys have identified significant potential of cost decrease due to economies of scale and possibilities of improvement in logistics; these cost decreases are likely to occur towards 2030.

Biomass electricity: capital costs are high for biomass electricity plants due to the poor combustion and environmental restrictions in place. There are poor learning potentials and for the calculation of LCOEs the costs are dependent on future feedstock prices which may offset technological learning possibilities. Bio-gas and waste are considered more attractive technologies. Co-firing of biomass is represented in the model and has low costs when the share of co-firing is small.

Nuclear: based on a large number of case studies from world-wide projects, there has been a substantial upwards revision of capital costs for third generation nuclear in the EU Reference Scenario 2016, compared to previous exercises. The Fukushima accident and the additional security requirements have notably contributed to an increase of the costs for nuclear. The latest Power Purchase Agreement (PPA) contracts which have been awarded for nuclear power plants have prices in the order of 100€/MWh or higher. Therefore compared to the previous Reference Scenario costs of nuclear investments have been increased by over a third and the costs for nuclear refurbishments have also been revised upwards.

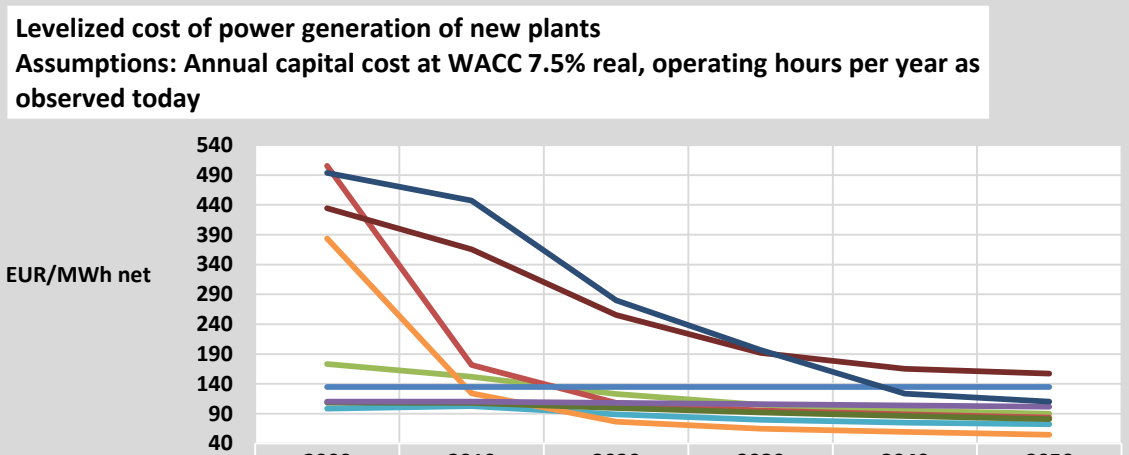
CCS: the construction of power plants equipped with carbon capture technologies has been developing at a very slow pace, and been dependent on public support (e.g. EEPR and NER300) as a necessary however not sufficient condition. The storage and transport costs are treated on a country by country basis in PRIMES with country specific cost-potential curves with learning embedded. Current political restrictions are modelled as high risk premiums for storage. The cost of CCS power plants construction has been revised accordingly, making the technology more expensive, in particular the storage cost-supply curves as well as the technology itself.

FIGURE 10: INDICATIVE LEVELIZED COSTS FOR NON-RES TECHNOLOGIES



	2000	2010	2020	2030	2040	2050
Pulverized Coal	48	59	62	69	75	80
Supercritical Lignite	51	55	56	55	54	54
Combined Cycle Gas Turbine	66	92	84	91	95	97
Pulverised Coal CCS post combustion	91	106	98	106	109	114
Gas combined cycle CCS pre combustion	84	118	107	109	112	113
Nuclear third generation	84	97	92	86	82	82

FIGURE 11: INDICATIVE LEVELIZED COSTS FOR RES TECHNOLOGIES



	2000	2010	2020	2030	2040	2050
Wind Offshore	173	152	123	105	95	90
Wind onshore	99	103	89	80	75	72
Solar PV - South of Europe	383	124	77	65	59	55
Solar PV - North/Central Europe	505	172	108	95	89	84
Solar Thermal	434	365	255	192	165	157
Geothermal	109	108	99	92	86	81
Large Hydro	135	135	135	135	135	135
Small Hydro	110	110	108	106	104	101

2.5.3 Demand side technologies

For stationary energy uses, technologies are distinguished by technology vintages - ordinary, improved, advanced and best technologies - which have increasing capital costs and efficiency. The features of the ordinary technology change over time according to minimum Ecodesign Regulations where these are available. Perceived costs and technology specific risk premium decrease over time for the advanced and best technologies closing the cost differences to the ordinary category. Efficiency policies and Ecodesign drive earlier achievement of maturity and performance for advanced and best technologies as barriers are removed and manufacturers get higher market certainty.

Demand side technologies have been updated where it was found necessary following latest literature review. This includes the most up to date studies for the preparation of Ecodesign Regulations and the amendment of CO_2 from light duty vehicles Regulation. The trajectory of battery costs has been updated based on recent developments and estimates from the literature. Battery costs are more optimistic than in the EU Reference Scenario 2013, reaching 320-360 $/kWh for battery electric and plug-in hybrid vehicles by 2030 and 270-295 $/kWh by 2050[41].

2.5.4 Learning curves

The techno-economic characteristics of existing and new energy technologies used in the demand and the supply sectors of the energy system evolve over time and improve according to exogenously specified trends including learning rates. Learning curves apply for specific technologies, thus reflecting decreasing costs and increasing performances as a function of cumulative production. The steepness of the learning curve differs by technology, depending also on their current stage of maturity.

For power generation technologies the Reference Scenario takes the view that all power technologies known today are projected to improve in terms of unit cost and efficiency, without however assuming breakthroughs in technology development.

At any given time, several technologies are competing with different performance and costs as presented for example in Table 1. Following the logic developed in the previous Reference Scenarios, consumers and suppliers are generally hesitant to adopt new technologies before they become sufficiently mature. They behave as if they perceive a higher cost (compared to engineering cost evaluations for the operation of such equipment) when deciding upon adoption of new technologies.

TABLE 2: EXAMPLES OF COSTS AND EFFICIENCIES OF DEMAND SIDE TECHNOLOGIES

Appliance/Equipment		Unit	Base case	Improved	Advanced	Best
Domestic Dishwashers	*Consumption*	*kWh/hour*	1.05	-5%	-10%	-20%
	Costs	*EUR'10/appl*	349	29%	80%	130%
Domestic Lighting	*Consumption*	*kWh/hour*	0.03	-26%	-80%	-82%
	Costs	*EUR'10/appl*	4	34%	130%	165%
Domestic AC (Electricity)	*Efficiency*	*COP*	2.50	21%	47%	52%
	Costs	*EUR'10/kW*	415.7	20%	61%	85%
Domestic boiler -Dwelling size (natural gas)	*Efficiency*	*(Useful/Final)*	0.68	9%	23%	30%
	Costs	*EUR'10*	3342	15%	49%	71%
Water heating boiler (natural gas)	*Efficiency*	*(Useful/Final)*	0.64	21%	42%	47%
	Costs	*EUR'10*	700	40%	101%	131%

[41] The Reference Scenario, by design, assumes the continuation of the current trends and policies without the implementation of additional measures. Hence, due to the absence of further policies, car manufacturers and industry are not expected to devote additional effort in marketing advanced vehicle technologies. The relatively low production of advanced vehicles, in the Reference scenario, is not expected to yield economies of scale which could potentially imply high reduction in battery costs as suggested by other sources. Such assumptions change in a decarbonisation scenario context.

Public policies at EU and national level, through information campaigns, industrial policy, R&D support, taxation and other means, aim at pushing more rapid adoption of new technologies by removing or compensating uncertainties associated with their use. In this way, the technologies themselves reach maturity more rapidly as a result of "learning-by-doing" effects and economies of scale. Supportive policies for the adoption of new technologies thus lead to modifications of their overall perception.

Taking into account the technology portfolio available, energy efficiency gains in the scenarios are driven by microeconomic decisions, reflecting the market agents' aim of minimizing costs and maximizing economic benefits operating in the context of public policies that promote energy efficiency. Similarly, renewables and CHP development are driven by private economic considerations also taking into account supportive policies which are assumed to continue in the Reference Scenario and gradually decrease in the longer term (see policy assumptions).

On the macro-economic level, GDP growth is associated with continuous improvement of the technological basis leading to improved energy intensity. This is also supported by the effects from structural change in the economy.

Last but not least, the deployment of some of the new technologies depends on the development of new infrastructure and regulations. These are partly driven by government. This is the case, for example, for interconnectors and grid expansion, CCS regarding the transportation and storage of captured CO_2 and for the electrification of transportation which depends on TSOs and DSOs undertaking grid and control systems investments.

2.6 Other important assumptions

2.6.1 Discount Rates

The PRIMES model is based on individual decision making of agents demanding or supplying energy and on price-driven interactions in markets. The modelling approach is not taking the perspective of a social planner and does not follow an overall least cost optimization of the entire energy system in the long-term. Therefore, social discount rates play no role in determining model solutions.

On the other hand, private discount rates pertaining to individual agents play an important role in their decision-making. Agents' economic decisions are usually based on the concept of cost of capital, which is, depending on the sector, either the weighted average cost of capital (for larger firms) or a subjective discount rate (for individuals or smaller firms). In both cases, the rate used to discount future costs and revenues involves a risk premium which reflects business practices, various risk factors or even the perceived cost of lending. The discount rate for individuals also reflects an element of risk averseness.

The discount rates vary across sectors. In the PRIMES Reference Scenario 2016 modelling, the discount rates range from 7.5% (in real terms) applicable to public transport companies or regulated investments as for example grid development investments (in the form of weighted average cost of capital) up to 12% applicable to individuals (households). Additional risk premium rates are applied for some new technologies at their early stages of development impacting on perceived costs of technologies.

The decision-making discount rates used by sectors are summarised in the following tables.

TABLE 3: DISCOUNT RATES IN ENERGY SUPPLY SECTORS

Assumptions for EU Reference Scenario 2016	*Discount rates*
Regulated monopolies and grids	7.5%
Companies in competitive energy supply markets	8.5%
RES investment under feed-in-tariff	7.5%
Investment under contract for differences	7.5%
RES investment under feed-in premium, RES obligation, quota systems with certificates	8.5%
RES investment in competitive markets	8.5%
Risk premium specific to immature or less accepted technologies	1%-3 %
Risk premium specific to investment surrounded by high regulatory or political uncertainty	None
Country-specific risk premiums	None

TABLE 4: DISCOUNT RATES OF FIRMS IN ENERGY DEMAND SECTORS

Assumptions for EU Reference Scenario 2016	*Discount rate*
Energy intensive industries	7.5%
Non energy intensive industries	9%
Services sectors	11%
Public transport (conventional)	7.5%
Public transport (advanced technologies, e.g. high speed rail)	8.5%
Business transport sectors (aviation, heavy goods vehicles, maritime)	9.5%
Country risks	None

TABLE 5: DISCOUNT RATES OF INDIVIDUALS IN ENERGY DEMAND SECTORS

Assumptions for EU Reference Scenario 2016		
	Standard discount rate	*Modified discount rates due to EE policies*[42]
Private cars and powered two wheelers	11%	
Households for renovation of houses and for heating equipment	14.75%	12%
Households for choice of appliances	13.5%	9.5%

The use of discount rates is also necessary for annualising capital or investment expenditures (CAPEX) for cost reporting. The methodology used in the 2016 PRIMES modelling has been updated and a flat discount rate of 10% for annualising CAPEX of end-consumers is used.

Details on the methodology related to the discount rates can be found in Annex 4.4 of this report.

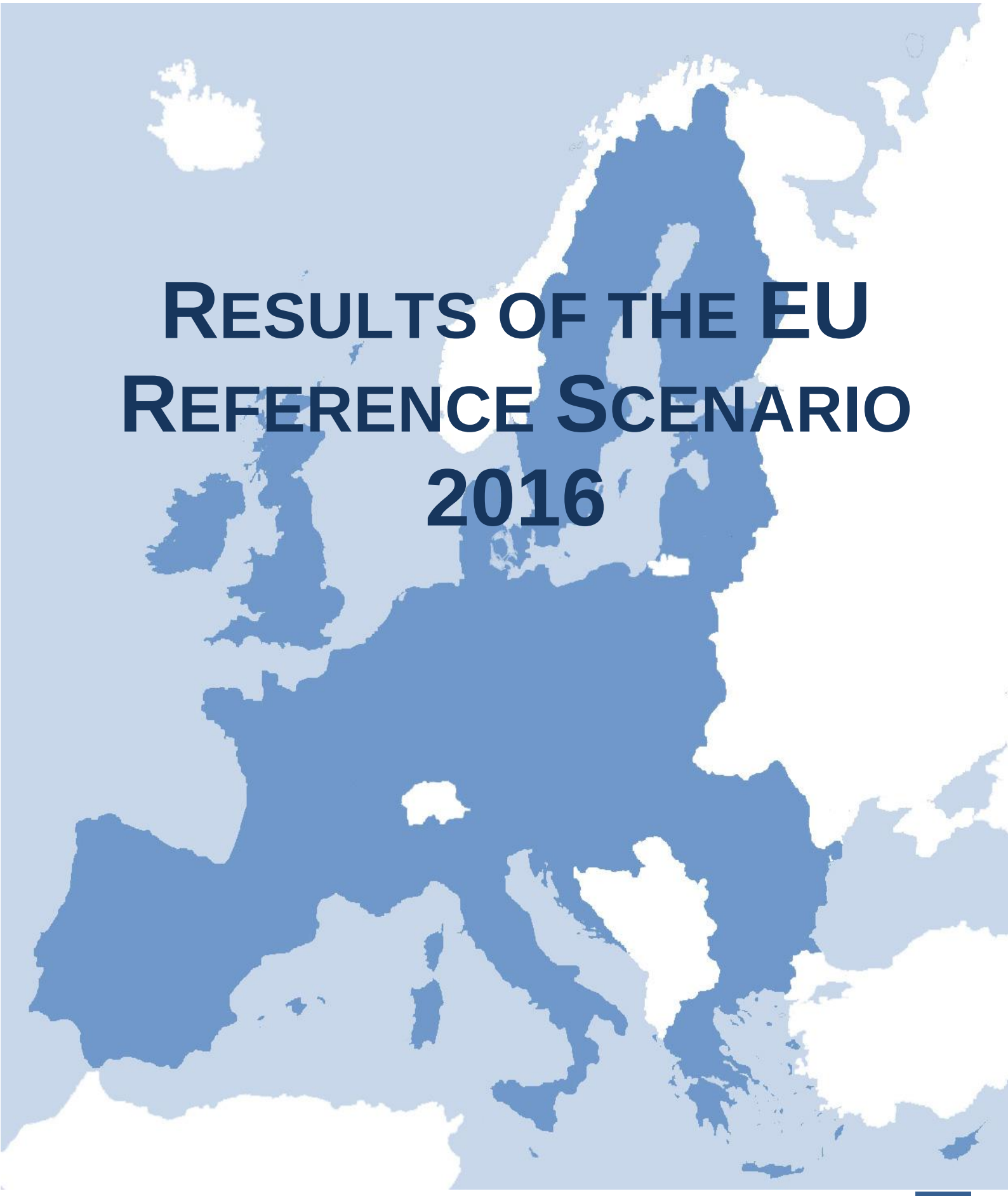
The GAINS Reference Scenario modelling also uses private discount rates, using a flat discount rate of 10% for decision-making and cost reporting.

2.6.2 Exchange rates

All monetary values are expressed in constant prices of 2013.

The exchange rate of Dollar/Euro changes over time. Following a period of particularly high levels in the period 2007-13, it has declined significantly from 1.30$/€ in 2014 to 1.12 $/€ in 2015 (all values are yearly averages). The Reference Scenario assumes a modest increase of the exchange rate from 1.12 $/€ in 2015 to 1.20 $/€ by 2025, at which level it is assumed to remain constant for the rest of the projection period.

[42] As explained in section 2.2.2. and in Annex 4.4., it is assumed that the standard discount rates values are influenced downwards by policies addressing barriers and imperfections considered among the causes explaining the initially high discount rate values.



RESULTS OF THE EU REFERENCE SCENARIO 2016

3 Results for the EU Reference Scenario 2016

The Reference Scenario reflects current trends and developments in the EU energy system and in GHG emissions. It reflects the consequences of adopted policies presented in Annex 4.1. In this section, the main results are presented, notably on energy demand, power generation and emissions developments for the EU28.

The horizon of the projection is 2050 and results are available in five-year time steps, for each Member State and for the EU28.[43]

Considering the timeframes of the policies included in the Reference Scenario, the results are presented distinguishing between three time periods: up to 2020 (the short term), 2020-30 (the medium term) and 2030-50 (the long term). Up to 2020 the main driver of developments is the achievement of the targets of the 2020 Climate and Energy Package. This period is characterised by increased penetration of RES and by strong energy efficiency improvements. For the year 2015, econometric techniques have been employed using the available Eurostat data (full Eurostat energy balances until 2013 and some monthly statistics for 2014 and partially for the initial months of 2015 were available when the modelling was undertaken).

In the decade 2020-30, the Reference Scenario does not incorporate the 2030 Energy and Climate policy framework. However, market dynamics, the on-going enabling policies (such as streamlined authorisation procedures) and technology cost reductions allow for further penetration, albeit at lower growth rates, of RES. Moreover, energy efficiency measures implemented up to 2020 continue to deliver improvements in this period, as the lifetime of new appliances, renovated buildings, vehicles etc. extends beyond the lifetime of the policies. As with renewables, the improvement rates slow-down in the absence of specific new policy measures.

Progress towards the EU 2020 targets

The Reference Scenario models that binding RES 20% targets for the EU and Member States will be met; considerations about the use of cooperation mechanisms by countries are also taken into account. The shares of RES in electricity generation, heating and cooling and transport are also provided. These represent independent projections which are informed by the NREAPs but do not necessarily follow them. The penetration of RES in electricity generation is largely driven until 2020 by renewable support schemes such as feed-in tariffs for countries where these are available. The PRIMES model explicitly takes into account the support schemes with their tariffs and constraints (e.g. capacity). For heating and cooling the same applies within the model. For RES in transport blending obligations and support for biofuels are taken into account as well as plans for the penetration of alternative fuels (e.g. electrification plans and financial and non-financial incentives for the uptake of such vehicles); the RES-T target is assumed to be met in all countries.

Similarly, the Reference Scenario models that the binding -10% Effort Sharing GHG target for the overall EU will be met, albeit some Member States are projected not to achieve their targets domestically. Together with the modelling of the ETS this ensures that the 2020 GHG target is met.

With regard to the energy efficiency target, the Reference Scenario projects that the 20% target will be missed by a small margin. Still, it shows more energy savings than summing the indicative national targets would imply.

More generally, all policies already adopted can have long-lasting implications, such as for instance the influence of the CO_2 for cars and vans Regulations on the EU vehicle fleet characteristics.

The ETS Directive continues to influence the energy system, as the number of EU-ETS emissions allowances continues decreasing linearly at 1.74% p.a. as specified in the ETS Directive. This drives strong emission reductions in particular in the power generation sector up to 2050.

[43] Summary results for EU28 and for each country are presented in the Appendix.

3.1 Energy consumption

The Reference Scenario is characterized by accelerating energy efficiency improvements until 2020, followed by improvements at lower pace throughout the remaining projection period – as demonstrated by the declining energy intensity of GDP. Gross inland consumption (GIC) and GDP growth continue to decouple. The downward trend on energy consumption started before the onset of the economic crisis, with EU energy consumption having peaked in 2006. The trend continues, enhanced by legislation until 2020, and then the rate of growth decreases, no longer driven by policies but by market trends and technology improvements.

Energy intensity of GDP varies by country (see Figure 12), depending on the structure of primary energy production, industrial structure (and renovation thereof) and fuels used for electricity generation. The energy intensity of all countries is improving throughout the projection period and over time, a slow convergence can be observed as energy intensity declines and GDP increases faster in countries with initially high energy intensity.

FIGURE 12: GIC IN RELATION TO GDP

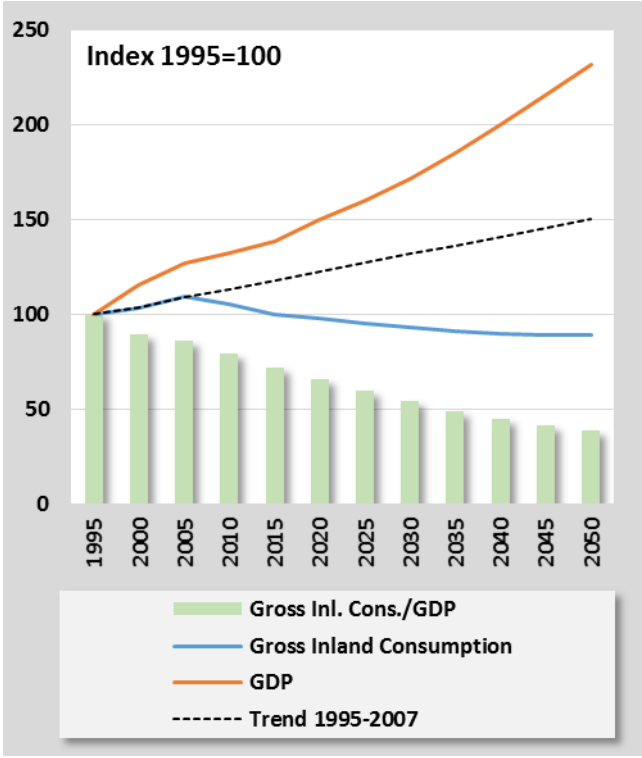


FIGURE 13: GROSS INLAND CONSUMPTION OVER GDP (TOE/MEURO'13) BY MEMBER STATE IN 2020 AND 2030

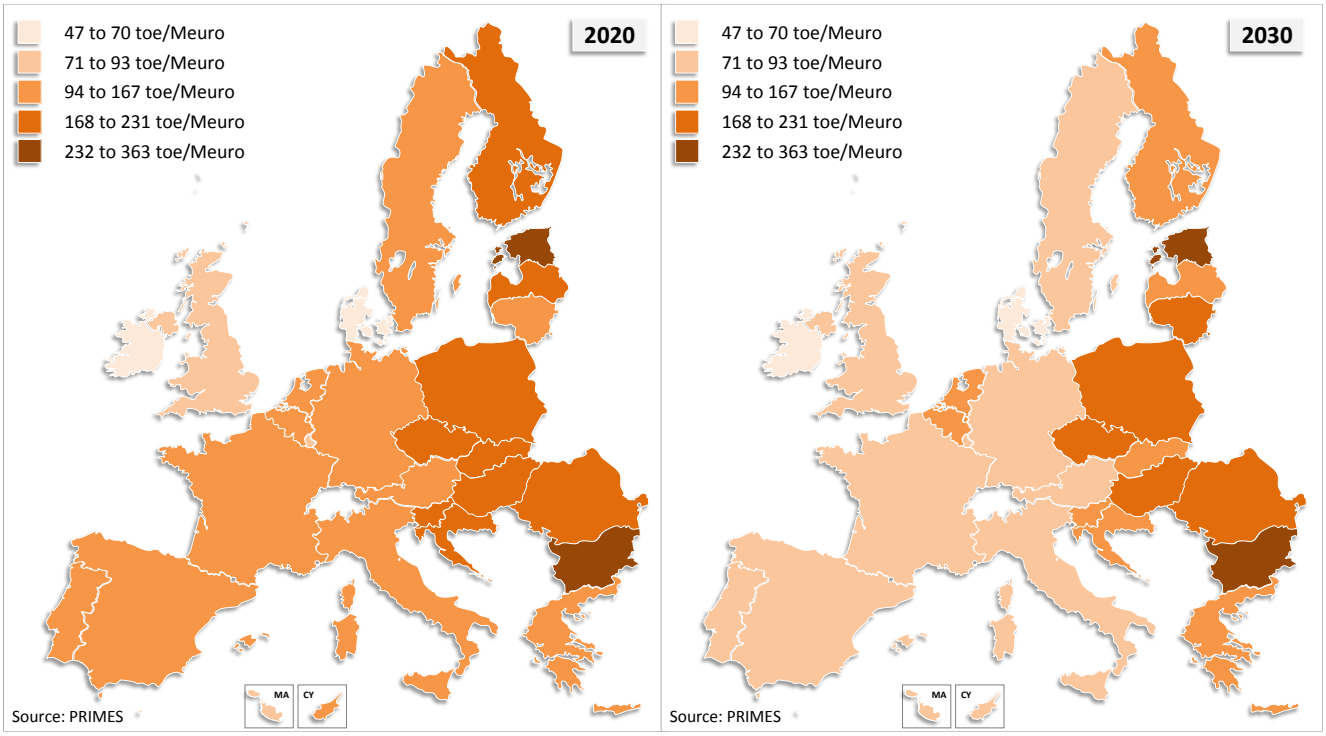
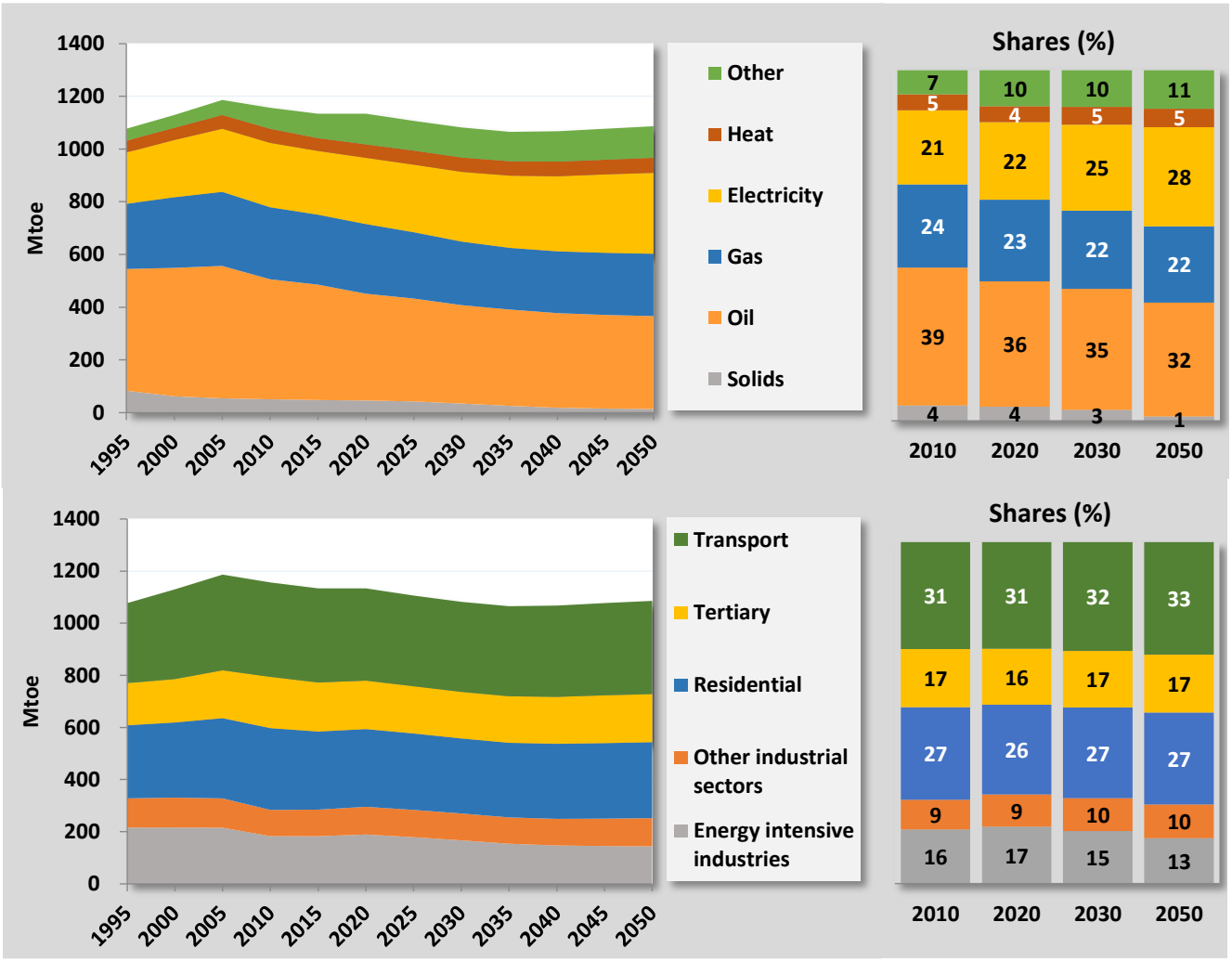


FIGURE 14: FINAL ENERGY CONSUMPTION BY FUEL AND BY SECTOR



The main drivers of the decreasing trend of total primary energy requirements are the developments in final energy demand.

These reflect the implemented energy efficiency policies that include, among others, the Energy Efficiency Directive (EED), Energy Performance of Buildings Directive (EPBD), the Ecodesign Directive and a host of implementing Regulations for specific products, CO_2 emissions standards for light duty vehicles etc.

The assumed implementation of these policies is also delivering energy efficiency improvements in the time period beyond 2020, albeit with a lower strength.

The shift in industry towards higher value added and less energy intensive products also promotes the decreasing energy consumption.

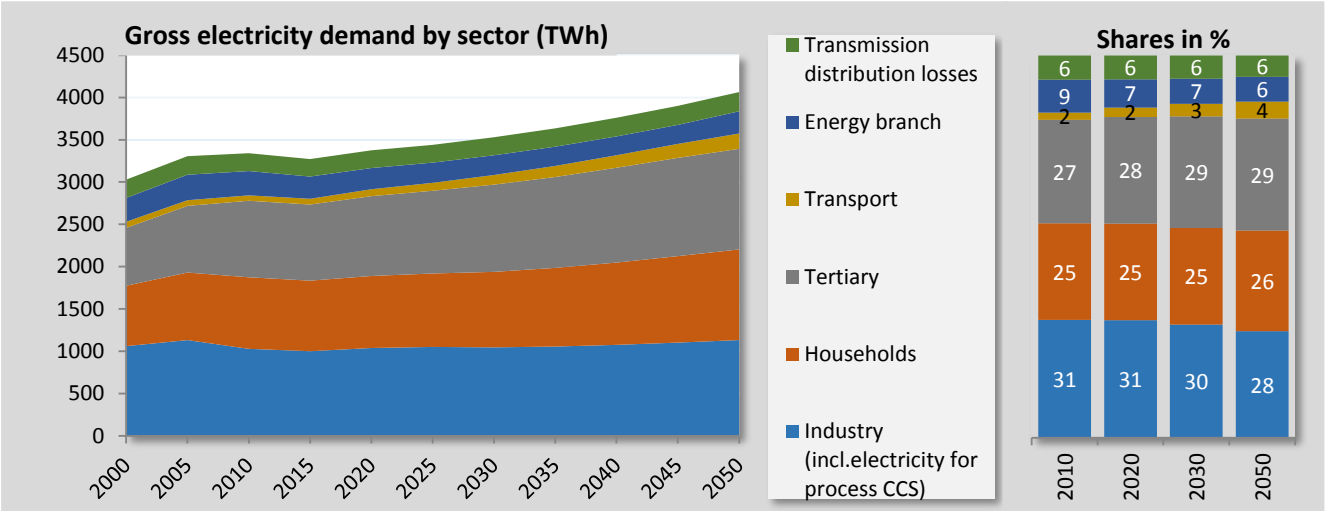
Beyond 2030, in the absence of additional policies on efficiency, final energy consumption stabilises. It is thus clear that the developments of the energy system in the decades 2010-20 and 2020-30 will have already set the ground for an economy with lower energy intensity. Finally, the ETS continues to indirectly support energy efficiency and higher RES penetration in the ETS sectors throughout the projection period.

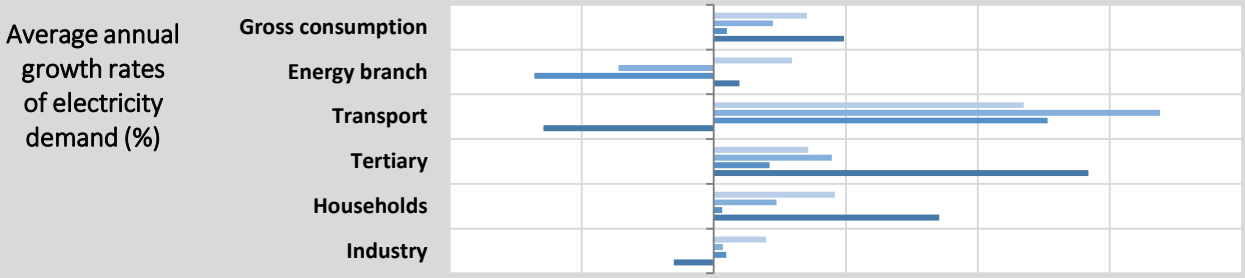
The share of transport in final energy demand continues to be the largest among all sectors until the end of the projection period.

The share of energy intensive industries slightly decrease over time, while the share of rest of industry slightly increases. The share of energy consumption in houses and buildings decreases in 2020 compared to 2015, due to the energy efficiency policies.

Electrification is a persisting trend in final energy demand: see in Figure 14 the increase of share of electricity in final demand and the significant increase of demand for electricity in households and services, as shown in Figure 15.

FIGURE 15: TRENDS IN ELECTRICITY DEMAND BY SECTOR





	Industry	Households	Tertiary	Transport	Energy branch	Gross consumption
'30-'50	0.40	0.92	0.71	2.35	0.59	0.71
'20-'30	0.07	0.47	0.89	3.38	-0.72	0.45
'10-'20	0.10	0.06	0.42	2.53	-1.36	0.10
'00-'10	-0.30	1.71	2.84	-1.29	0.19	0.99

The increase of electricity share in demand is due to two effects: a shift towards electricity for heating and cooling (due to higher demand for air conditioning and the introduction of electric heat pumps) and a continued increase of electric appliances in the residential and the tertiary sector (mainly IT, leisure and communication appliances). It is also to a lesser extent the result of further electrification of rail as well as of the long term penetration of electric vehicles, leading to higher uptake of electricity in the transport sector. In the period until 2020, when energy efficiency policies are being implemented, the growth rate of electricity demand is less than 0.3% per year up to 2020; thereafter, without specific energy efficiency policies, the electricity demand growth rate remains between 0.6% and 0.8% per five year time period and approx. 0.7% on average between 2020 and 2050.

In the following sections, details on the trends in final energy consumption by sector are presented.

3.1.1 Industrial sector

The year 2010 was characterised by an economic downturn which led to a reduction in final energy demand in the industrial sectors; consumption of 2015 also remains low, as industrial activity has not yet recovered.

The activity of the industrial sector is projected to recover and follow a slowly increasing pace in the future, with the non-energy intensive sectors growing faster and the industrial sectors moving towards higher value added and lower energy intensity products. This implies that energy consumption of the sector will grow at a slower rate relative to the activity of the sector.

In the short term increases in industrial activity drive an upward trend in energy demand in the projection; however as can be observed the overall trend in energy intensity has been downwards for many years

due to market forces that drive the renovation of equipment. This persisting trend means that energy intensity of the industrial sectors continues to slightly decline; the additional energy demand is due to the more than proportionate increase in production activity.

FIGURE 16: INDUSTRIAL ENERGY DEMAND VERSUS ACTIVITY[44]

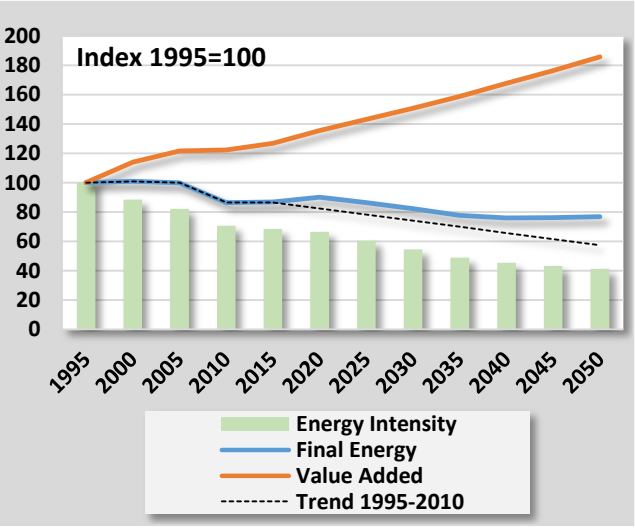
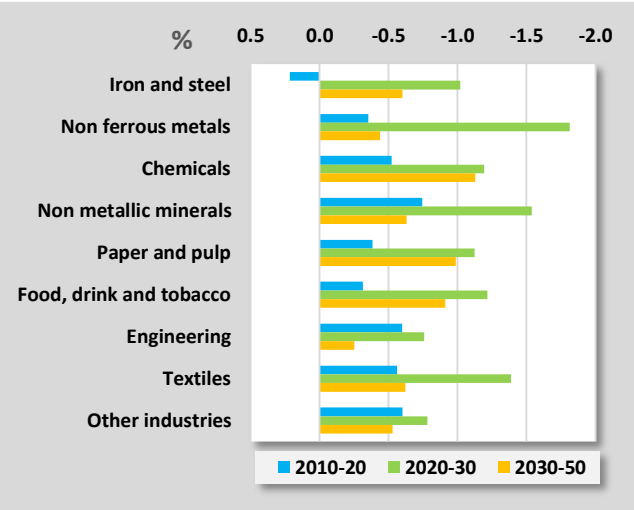


FIGURE 17: AVERAGE ANNUAL CHANGE OF ENERGY CONSUMPTION IN THE INDUSTRY SECTOR



In the medium term energy demand decreases and stabilises in the long term, even though activity in terms of value added progresses. This is due to two main drivers: (i) the energy efficiency embedded in the new capital vintages which replace old equipment and (ii) structural changes in the activity which is assumed to shift towards higher value added and less energy-intensive production processes (Figure 18).

The projection keeps track of vintages of productive equipment in industry. The recovery of activity growth in the short term implies that industries mainly use existing equipment, including the less efficient ones, as low activity growth in recent years has discouraged investment and has left part of capacities unused. This explains the shown slowdown of energy efficiency improvement in industry in the short term. However, persistence of economic recovery leads to investment in new productive equipment, which in the projections are implemented in the medium term, mainly between 2020 and 2030. To mitigate impacts of increasing costs of energy on industrial competitiveness, the projection finds as optimum that significant energy efficiency technologies are embedded in new industrial capital vintages in the period 2020-30. This explains the acceleration of efficiency improvement in industry during the same period. The strong investment, which includes strong energy efficiency, necessarily implies a cycle with lower investment in the longer term. Thus, energy efficiency improvement due to embedded technology also slows down. Anyway, the absence of additional policies does not provide incentives for maintaining after 2030 the pace of efficiency improvement achieved in the previous period.

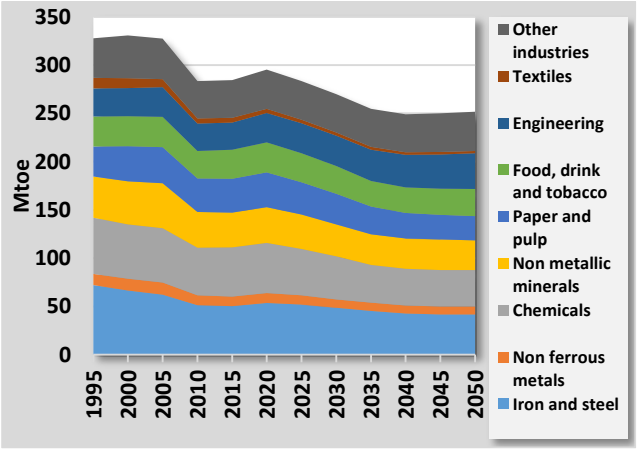
The macro-economic projection underlying the Reference Scenario implies that significant part of the energy intensive industrial productions will remain in the EU territory, due to the advantages of maintaining industrial integration and to technology progress offsetting effects of energy costs on competitiveness. The projection finds economic to exhaust the potential of using recycled or scrap materials thus avoiding unnecessary primary production of metals, glass and others, which is highly energy consuming. However, the yet untapped potential is not very high in the European Union. Therefore, the projected energy efficiency improvement primarily comes from embedding energy efficient technologies in new capital vintages and secondarily from changing the mix of industrial outputs towards less energy intensive production. Although this is true for certain sectors, such as iron and steel, non-ferrous metals, glass etc. it is not true when looking at industry as a whole. The macroeconomic projection

[44] The trend 1995-2010 is the trend in final energy consumption for the entire industrial sector.

foresees significantly stronger growth of activity in industrial sectors of low energy intensity, such as the engineering sectors, than in energy intensive ones.

Moreover, by assumption, the Reference Scenario does not assume implemented the most recent initiatives promoting a circular economy[45], which would otherwise be expected to have noticeable effects on overall efficiency.

FIGURE 18: FINAL ENERGY CONSUMPTION IN INDUSTRY



Final energy consumption of the industrial sector shifts towards less carbon intensive fuels, driven by increasing ETS carbon prices after 2020 and by a shift towards products of higher quality with higher value added which often require cleaner fuels. As is visible in Figure 19 there is a decline in solid and petroleum fuels, an increase in RES (mainly biomass and waste fuels), as well as an increase in the share of electricity. The share of gas remains approximately constant over time. Industrial boilers and CHP become more efficient over time, implying that their energy demand reduces slightly while the share of industrial CHP slightly increases in the future, substituting boilers.

The reduction of coal and oil is driven by the mandatory emission reductions that industrial activities should achieve in the context of the Integrated Pollution Prevention and Control (IPPC) and the Large Combustion Plant (LCP) Directives, as well as national renewable support policies in the short term and the increasing ETS prices (concerning the ETS industries), mainly in the long-term.

Switch to biomass and waste is also driven by the upward trajectory of fossil fuel prices and is compatible with the need for resource-efficiency, as it is mainly biomass pellets, industrial waste and waste gas for some industries such as chemicals.

Finally, the provisions on cogeneration in the EED promote the penetration of highly efficient cogeneration and the use of waste heat for steam generation in industrial sites. Also industrial boilers and CHP follow similar trends regarding fuel split.

FIGURE 19: FINAL ENERGY CONSUMPTION IN INDUSTRY BY ENERGY FORM

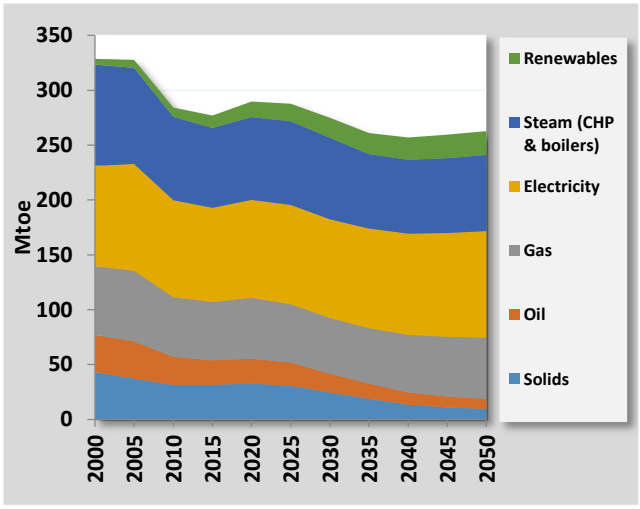
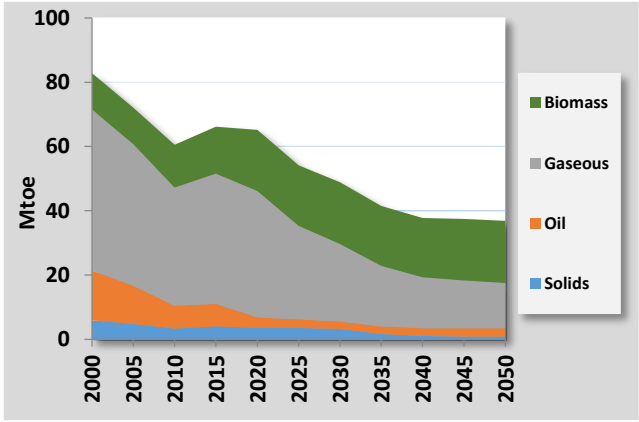


FIGURE 20: FUELS FOR INDUSTRIAL CHP AND BOILERS



The developments across countries within the various industrial sectors are very similar. However varying structures in industry may lead to aggregate results differing. This is the case for example if a country has integrated iron and steel production with blast furnaces

[45] See for instance the European Commission's Circular Economy Package, adopted on December 2, 2015, and therefore after the cut-off date for the policies to be reflected in the Reference Scenario. (More information available at: http://ec.europa.eu/environment/circular-economy/index_en.htm).

compared to a country having only secondary steelmaking. The same applies to countries having pulp versus only paper production or recycling.

3.1.2 Residential sector

Energy demand remains below 2015 levels throughout the projection period. Energy demand decouples from income growth more than would be suggested by extrapolation of past and current trends as the efficiency policies drive high energy intensity improvements in the medium term; in the long term however the rate of improvements decreases due to the absence of additional policies.

FIGURE 21: RESIDENTIAL ENERGY DEMAND BY USE

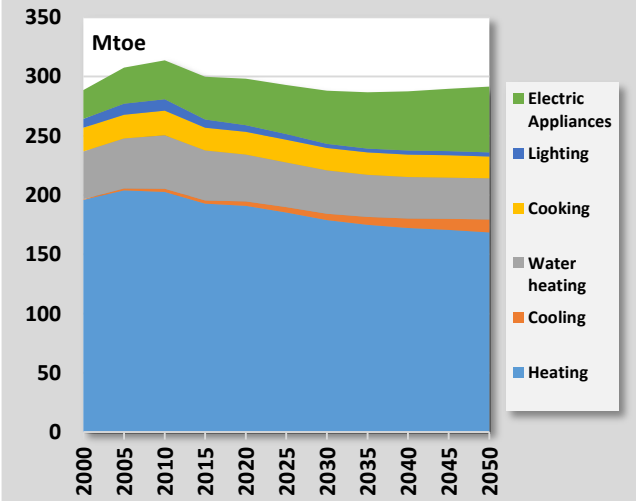
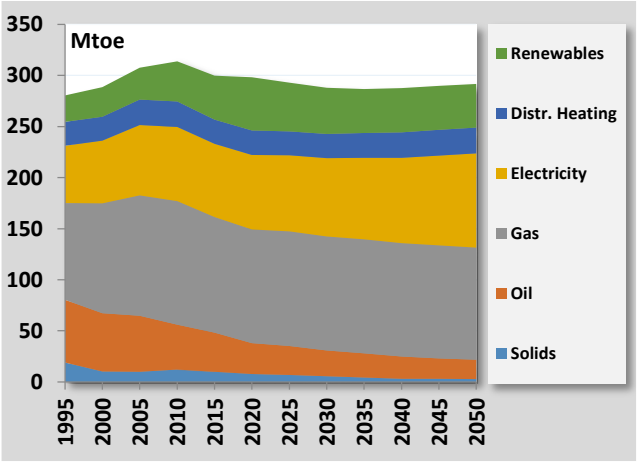


FIGURE 22: RESIDENTIAL ENERGY DEMAND BY FUEL



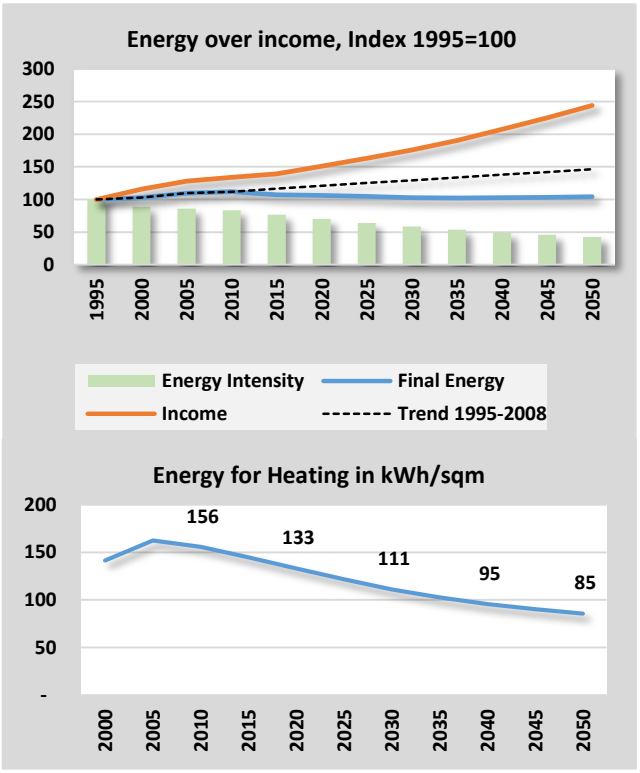
In general, energy efficiency in the residential sector (as well as in the tertiary sector) can be improved by:

- Using more efficient energy equipment (e.g. lighting, electric appliances, heating and cooling appliances),
- Upgrading energy characteristics of buildings (e.g. thermal integrity of buildings), or
- Inducing changes in energy consuming behaviour.

In the Reference Scenario, there is a general improvement in the efficiency of energy using equipment across the EU which is related to the effects of the implementation of relevant policies.

The strong reduction in the short and medium term is attributable to the provisions under the Energy Efficiency Directive, including the savings obligation on distribution companies and retail sellers, the provision on the exemplary role of public authorities as well as all the other provisions stimulating more energy efficient behaviour and the improvement of equipment and appliances driven by the Ecodesign Regulations.

FIGURE 23: INDICATORS FOR RESIDENTIAL ENERGY DEMAND



Also public campaigns help, together with measures improving transparency, for allowing more energy efficient choices (Labelling Directives). Energy used for heating maintains the highest share of energy consumption, but the share decreases from 65% in 2010 to 58% in 2050 due to improvements in efficiency driven by renovation of buildings.

Energy efficiency obligations on buildings and strict building codes drive investment choices improving the thermal integrity of houses and efficiency of heating appliances.

Energy demand for electric appliances continues to increase. However, a decoupling between appliance stock and energy consumption is projected, due to the impressive technological progress facilitated by Ecodesign regulations, as energy consumption from appliances does not increase as fast as the uptake of the stock of appliances would otherwise suggest.

Regarding the fuel mix, the consumption of solids and oil decline following also past trends and policies to improve air quality, complying with the EU Air Quality Directive. Gas is projected to approximately maintain its market share, whereas electricity increases its share due to the uptake of appliances and a slow penetration of electricity in heating uses. The share of RES increases mainly to 2020.

Although the overall EU trends are generally similar across Member States, there is some differentiation among them due to the different starting points: the majority of EU13 Member States have lower average energy consumption than EU15 Member States, pointing to lower comfort levels. This is due to lower heating levels e.g. not all the living surface is heated, but also to lower average indoor temperatures. In such Member States, an increase in comfort level is assumed together with the projected energy efficiency developments. This can lead in some cases to rebound effects: e.g. if a partially heated home is renovated it will most likely become a fully heated home with central heating.

Although the dwelling will have a better efficiency overall, the increase in the heated space may compensate for the higher efficiency, effectively achieving no efficiency gains or even increasing energy consumption. The same may apply to electric appliances where although the appliances (per unit) become more efficient, an initial low penetration of appliances will lead to overall higher electricity consumption from appliances.

3.1.3 Tertiary sector

Projections of final energy demand in the tertiary sector (services and energy use of agriculture) follow similar trends as for the residential sector: demand is projected to decouple from activity growth. In the short to medium term, despite high growth in services, demand for energy decreases driven by energy efficiency policies. In the long term, due to the lack of additional policies, energy consumption slightly increases.

FIGURE 24: ENERGY DEMAND VERSUS VALUE ADDED

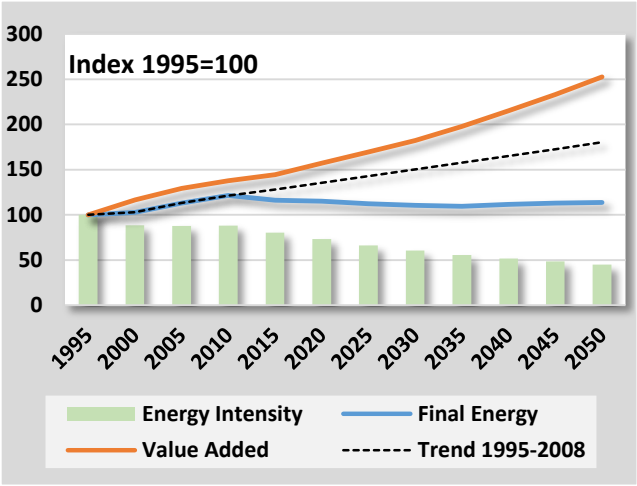
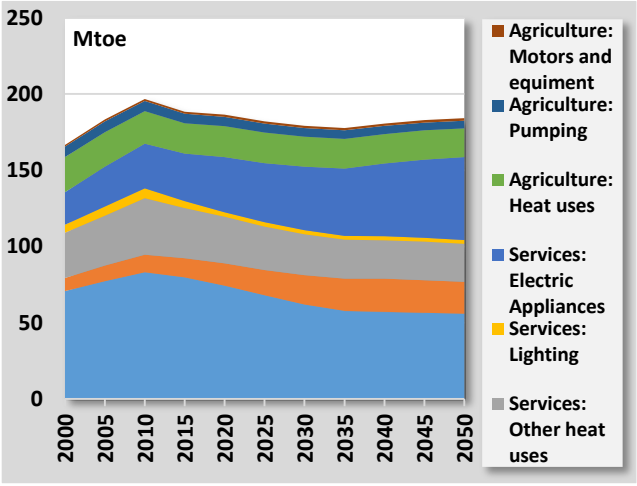


FIGURE 25: FINAL ENERGY DEMAND IN THE TERTIARY SECTOR BY USE

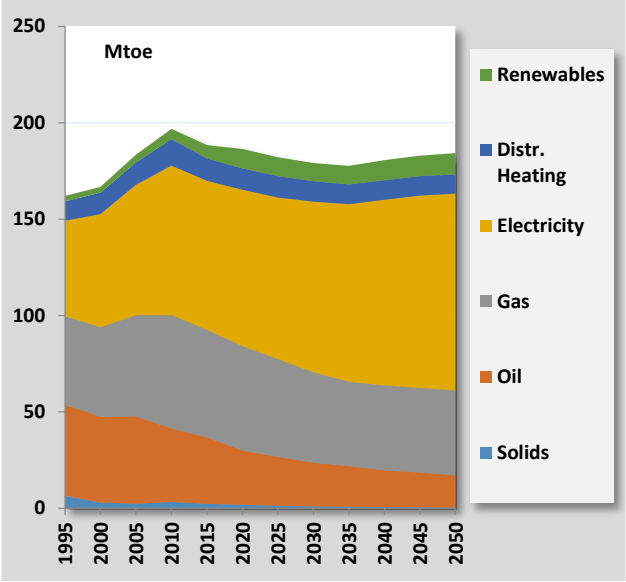


Energy efficiency gains brought about by Ecodesign policies, energy efficiency policies stemming notably from obligations under the EED and policies on the energy performance of buildings, are very significant. They over-compensate the effects of increasing sectorial activity up to 2030, driving final energy demand below 2010 peak levels throughout the entire projection period. Marked efficiency progress is observed both for heating and for specific electricity consumption, in

particular in the medium term (2020-30), driving energy consumption downwards in the period 2010-30, contrasting past increasing trends (Figure 25). Beyond 2030, where no additional energy efficiency policies are implemented, energy consumption resumes an increasing, albeit slow, pace of growth.

Electricity gains share in the fuel mix driven by the increase of specific electricity uses and by the application of heat pumps, whereas the share of oil declines; in the long term the share of gas decreases. The share of RES increases in the run-up to 2020, but thereafter the pace of increase reduces considerably.

FIGURE 26: FINAL ENERGY DEMAND IN THE TERTIARY SECTOR BY FUEL



The trend among EU Member States is fairly similar, but, where the initial consumption is low an increase in comfort, e.g. increasing square meter per employee, is taken into account, as for the residential sector.

3.1.4 Transport sector

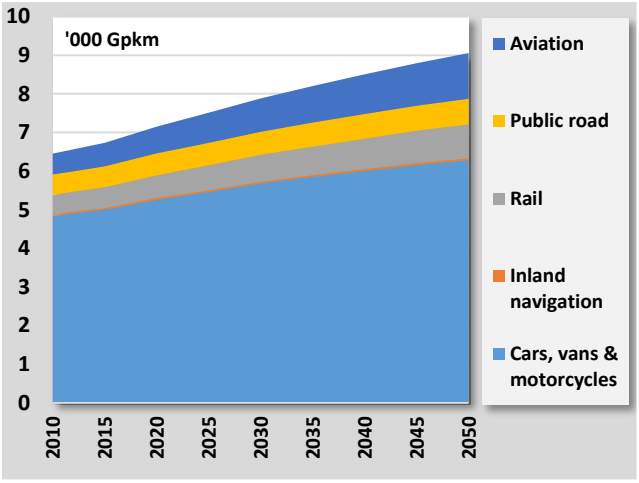
Transport activity

In the EU Reference Scenario 2016, the activity of the transport sector shows significant growth; the highest increase takes place during the period 2010 to 2030, driven by developments in economic activity. These developments concern both the passenger and freight transport sectors; the latter, in particular, is growing at higher rates than passenger transport[46], following more closely the GDP developments.

Passenger transport activity continues to grow post-2030, albeit at lower rates. The slower growth of the overall passenger activity is a result of an almost stagnant population after 2040 and saturation effects that limit the growth of passenger cars transport activity.

The picture is similar in the case of freight transport activity, resulting from the shift of economic activities towards services and limits to distant sourcing and off-shoring, with growth only being marginally higher than that of passenger transport activity during the 2030-50 period.

FIGURE 27: PASSENGER TRANSPORT ACTIVITY BY MODE



Note: The figure reports the aviation activity related to the domestic and international intra-EU flights to maintain comparability with usual reported statistics

As far as passenger transport is concerned, road transport and in particular passenger cars are expected to maintain their dominant role throughout the projection period, despite growing at lower pace relative to other modes (0.8% and 0.5% p.a. for 2010-30 and 2030-50, respectively, compared to growth rates of 1.0% and 0.7% for total transport activity). The modal share of passenger cars is expected to gradually decrease over time (from about 73% in 2010 to 70% in 2030 and 67% in 2050). Figure 27 presents the evolution of passenger activity by mode.

The growth slowdown for passenger cars activity could be explained by the car ownership which is close to saturation levels in many EU15 Member States (e.g. Germany, Italy, France, Austria, and Luxembourg).

[46] Passenger transport activity does not include international extra-EU aviation, to maintain comparability with usual reported statistics.

Other factors contributing to this outcome are the high congestion levels, the increase in fossil fuel prices in the long term, the higher use of collective transport modes (e.g. high speed rail) and the ageing of the EU population. Public road transport activity grows at a comparable, but marginally lower, rate relative to passenger cars, while powered two-wheelers activity grows faster over the period 2010-50 (1.0% p.a. for powered two-wheelers versus 0.6% p.a. for passenger cars).

The EU Reference Scenario 2016 distinguishes aviation activity into flights within the EU and international extra-EU destinations. Flights within the EU include domestic transport activity (within the boundaries of one single EU Member State) and international intra-EU (both origin and destination of the flight is within the EU28). The international extra-EU air transport activity includes all remaining flights. Total air transport activity (i.e. both intra-EU and extra-EU) is projected to be the highest growing of all passenger transport modes, going up by 125% between 2010 and 2050 (2.0% p.a.).

The high growth of total aviation activity is expected to take place during the period 2010-30 (2.4% p.a. on average) and is driven, in particular, by the international extra-EU flights to the emerging economies in Asia. International extra-EU trips hold the largest share in total aviation activity, representing a marginally increasing share of approx. 70% of total activity throughout the projection period. Aviation activity in EU15 would increase at lower rates compared to EU13 due to weaker growth of GDP per capita and the available capacity at the airports. Post-2030 total aviation activity grows at lower pace (1.7% p.a. on average for 2030-50) and presents saturation effects especially beyond 2040, in the context of almost stagnant population.

Passenger rail activity is projected to increase by 76% during 2010-50 (1.4% p.a.) and increases its modal share from 7.7% to 9.7% during the same period[47]. Such developments are driven in particular by the effective implementation and completion of the TEN-T core network by 2030 and of the TEN-T comprehensive network by 2050. High-speed rail sees a significant increase in terms of volume (2.5% p.a. during 2010-50) and share as a result of the infrastructure build-up and the upgrade of existing railway lines. About 32% of passenger rail traffic, expressed in passenger-kilometres, would be carried by high-speed rail by 2050, compared to 21% in 2010.

Passenger rail competes with both road and air transport. In EU15 a significant share of additional demand would be covered by rail (in most cases high-speed rail where investments are foreseen). The high congestion levels and the increase of fossil fuel prices in the long term improve the competitiveness of railways and shifts part of the passenger road traffic to rail, supported by the completion of the core and comprehensive TEN-T network. In addition, high-speed rail presents an alternative transport service option for longer distance trips and attracts demand from short-distance air travel.

Inland navigation, which refers to inland waterways and national maritime, holds a small share of total passenger transport activity. The growth of inland navigation transport activity at EU level would be moderate (0.6% p.a. between 2010 and 2050), according to the projections.

The recent economic crisis led to a significant reduction of freight transport activity over the period 2008-2009, which resulted in lower levels by 2010 compared to 2005. Total freight activity shows some slight recovery between 2010 and 2015. Its growth, though, is stronger during 2015-20, driven in particular by higher growth in GDP relative to 2010-15. The projections show an increase in the total freight transport activity by about 58% (1.2% p.a.) between 2010 and 2050, which is comparable to the growth of freight activity in the Reference Scenario 2013.

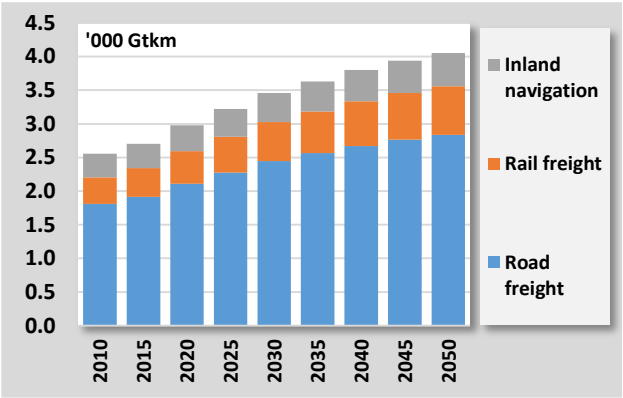
Freight traffic shows strong correlation with GDP growth until 2030. The completion of the TEN-T core network by 2030 and of the comprehensive network by 2050 is expected to provide more adequate transport infrastructure coverage and support a concentration of trans-national traffic and long-distance flows. It is also expected to provide support for logistic functions and improve multi-modal integration (road, rail, and inland navigation), through the innovative information management systems which are part of the network, and

[47] Passenger rail activity covers here conventional and high-speed rail, plus light rail and tram/metro in urban areas.

reduce the time lost caused by road congestion. Nonetheless, beyond 2030 weaker growth prospects together with shifts in GDP composition towards services and information activities and limits to distant sourcing and off-shoring contribute to a certain weakening in freight transport activity.

Road freight traffic is projected to increase by about 57% between 2010 and 2050 (1.1% p.a.), but growth is unevenly distributed between the EU15 and EU13. The highest growth in road freight transport activity would take place in the EU13 (95% for 2010-50, equivalent to 1.7% p.a.) where a strong correlation with GDP growth can be observed. Overall, road freight in the EU28 sees a marginal reduction in its modal share (Figure 28).

FIGURE 28: FREIGHT TRANSPORT ACTIVITY BY MODE



Note: The figure reports freight transport activity excluding international shipping.

As regards rail freight, it features the highest growth among the inland freight transport modes (84%, equivalent to 1.5% p.a.) and increases its modal share from 15% in 2010 to 18% in 2050. The significant increase in rail freight transport activity is mainly driven by the completion of the TEN-T core and comprehensive network which are expected to improve the competitiveness of the mode.

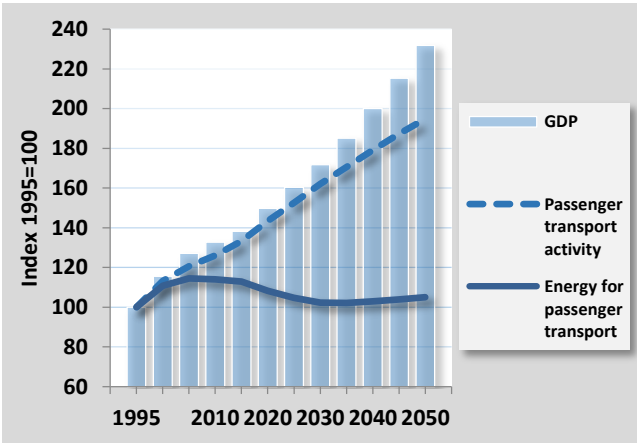
Inland navigation traffic also benefits from the recovery in GDP growth and the completion of the TEN-T core and comprehensive network, including support for the logistic functions and improved multi-modal integration. This is projected to grow by 39% between 2010 and 2050 (0.8% p.a.). However, the relatively stronger growth in road and rail traffic leads to a decrease in its modal share, from about 14% in 2010 to 12% in 2050.

International maritime activity is projected to experience significant growth, following closely the developments in economic activity and the increasing demand for traded goods. International maritime activity (including both intra-EU and extra-EU) is expected to grow by more than 70% between 2010 and 2050 (1.4% p.a.).

Final energy demand: Analysis by transport mode

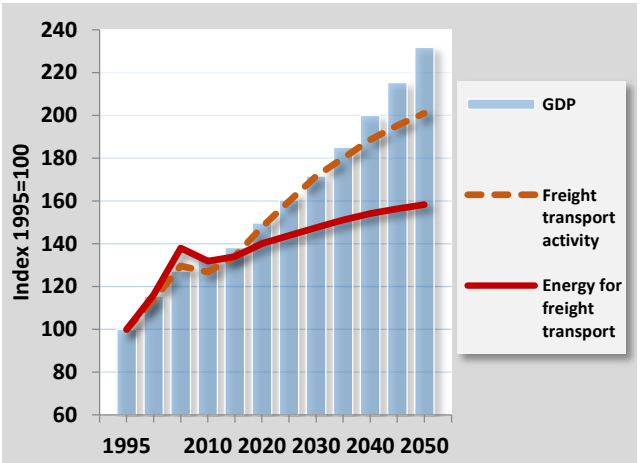
Historically, the growth of final energy demand in the transport sector has shown strong correlation with the evolution of transport activity. A decoupling between energy consumption and transport activity has been recorded in statistics of the past decade. This discontinuing trend is in particular apparent in the case of passenger transport activity, already by 2005 (Figure 29).

FIGURE 29: TRENDS IN PASSENGER TRANSPORT ACTIVITY AND ENERGY CONSUMPTION



Note: The figure reports passenger transport activity including domestic, international intra-EU and extra-EU flights for aviation.

FIGURE 30: TRENDS IN FREIGHT TRANSPORT ACTIVITY AND ENERGY CONSUMPTION

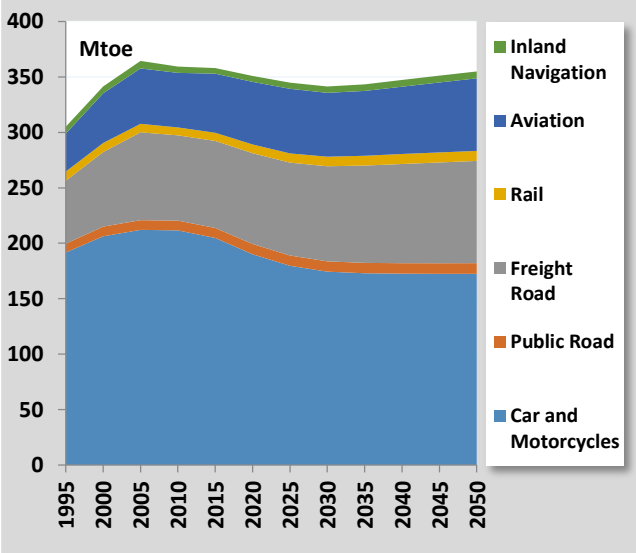


Note: The figure reports the freight transport activity excluding international shipping and the final energy demand for freight (excluding maritime bunkers).

The decoupling between energy consumption and activity is projected to continue and intensify in the future. With regard to short term projections by 2020, total final energy demand will decrease compared to 2010 levels as a result of reduced demand from passenger transport. Final energy demand from freight transport, on the contrary, increases during the same period (Figure 30), mainly driven by the recovery of the activity of the sector after the crisis.

From 2020 onwards, a stronger decoupling between final energy demand and transport activity takes place. Despite the projected upward trends in transport activity beyond 2010, final energy demand stabilizes by 2050 to levels marginally lower than those observed in 2010. In particular, total final energy demand for transport presents a decreasing trend over the period 2010-30 (-0.3% p.a.), driven by the efficiency improvements of certain transport modes already observed during the period 2010-20.

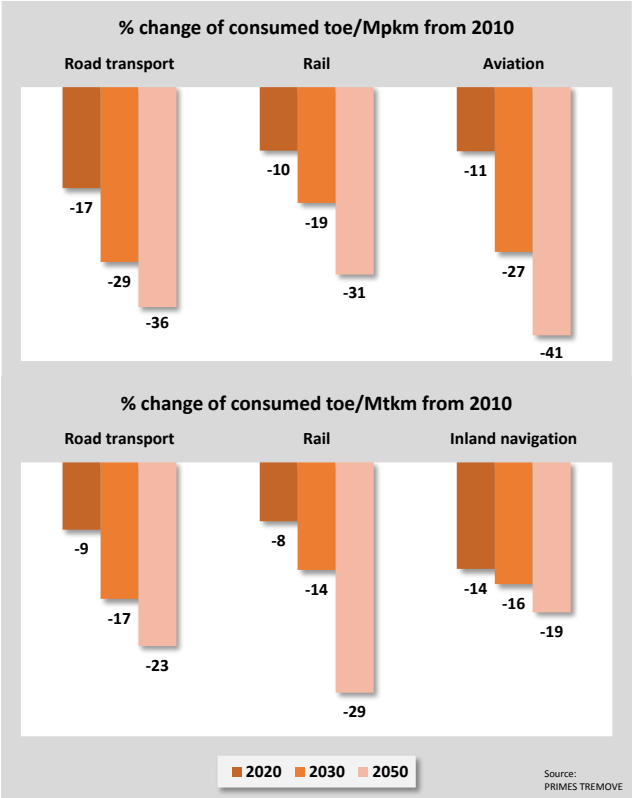
FIGURE 31: FINAL ENERGY DEMAND IN TRANSPORT



Final energy demand from cars and powered two-wheelers is responsible for more than half (59% in 2010) of total final energy demand in transport (Figure 31). This share is projected to significantly decrease over the medium term and almost stabilize towards 2050 (51% and 49% in 2030 and 2050, respectively). The energy efficiency improvements for light duty vehicles, driven by the CO_2 standards set for 2020/2021, contribute to the reduction of total final energy demand for transport until 2030, but they are not enough to maintain this trend until the end of the projection period.

Other passenger transport modes also contribute to the decoupling between activity and final energy demand; albeit at a lower degree. Road freight and aviation are projected to increase their contribution to the total final energy demand in share terms, continuing the historic trend from 1995. Energy demand continues to increase in both sectors, contrasting the picture of private passenger road transport modes. Other transport sectors like railways, public road and inland navigation are projected to maintain a limited share in total final energy demand throughout the years.

FIGURE 32: TRANSPORT EFFICIENCY IMPROVEMENTS BY MODE



Note: For aviation, the figure reports the improvements in energy efficiency taking into account domestic, international intra-EU flights and extra-EU flights. Regarding the efficiency improvements in freight transport, the figure does not consider the improvements in international shipping.

The main driver of the decoupling between activity and final energy demand is the improvement in fuel efficiency and the uptake of more efficient technologies driven by policies, and fuel substitution (Figure 32). In particular in road passenger transport, energy efficiency of vehicles improves by 17% in 2020 and 29% in 2030 relative to 2010 (Figure 32), leading to a decline in energy demand in passenger road transport by 2030. Such development is driven by the implementation of regulations on CO_2 emission standards for Light Duty Vehicles (LDVs), covering passenger cars and

light commercial vehicles. As a result, vehicle manufacturers need to introduce more fuel efficient LDVs into the market. Beyond 2030, energy demand of passenger road transport stabilizes due to the absence of further tightening of the existing policies. Efficiency gains only occur due to the gradual renewal of the vehicle fleet, the emergence of advanced vehicle technologies, the increasing fuel prices in the long term and some autonomous progress.

Efficiency improvements in aviation amount to 11% in 2020 and 27% by 2030 relative to the 2010 levels (Figure 32). Such developments are driven by high efficiency gains due to the introduction of more energy efficient aircrafts and the renewal of the fleet[48]. Hence, even though aviation experiences strong growth in its activity, final energy demand increases by 17% by 2030.

Passenger rail experiences relatively lower rates of improvement in efficiency by 2030 (19% relative to 2010) compared to road and aviation. The slower pace of improvements in the average specific fuel consumption of rail is attributed to the long lifetime of the rolling stock which delays its renewal rate and therefore the improvements in efficiency. The improvements would be mainly attributed to fuel substitution; in particular switching from diesel to electricity in areas where electrification is an economically viable option and in line with the provisions of specific initiatives by Member States.

Efficiency improvements also take place in freight transportation, and moderate the effect of the increasing activity (which is growing stronger than for passenger transport) on energy demand (Figure 32). Fuel costs represent a considerable part of operational costs of HGVs and their minimization is among the main objectives of HGV manufacturers and fleet operators. Improvements in technology, related among others to vehicle design, aim to reduce vehicle specific fuel consumption. Efficiency improvements of HGV become more apparent in the medium and long term as the renewal rate of the fleet is relatively slow.

LCVs on the other hand, show high efficiency gains already by 2020 as a result of the CO_2 emission regulations, which contribute to the overall reduction of final energy demand in road transport. LCVs account for only a small fraction of the total freight transport activity; nonetheless their contribution in total energy demand is more significant. Overall, the average specific fuel consumption in road freight transport is projected to decrease by 9% in 2020, 17% in 2030 and 23% in 2050 relative to 2010.

Freight rail, similarly to the developments in the passenger rail sector, follows moderate improvements on the average specific fuel consumption in the medium term (up to 2030). However, the efficiency gains are accelerated beyond 2030 and are somewhat higher than for road freight. This development is due to higher electrification rate of railways and lack of specific policies for CO_2 emissions reduction or energy efficiency of newly registered HGVs. Regarding the improvements in specific fuel consumption for freight inland navigation, they amount to 19% in 2050, relative to 2010.

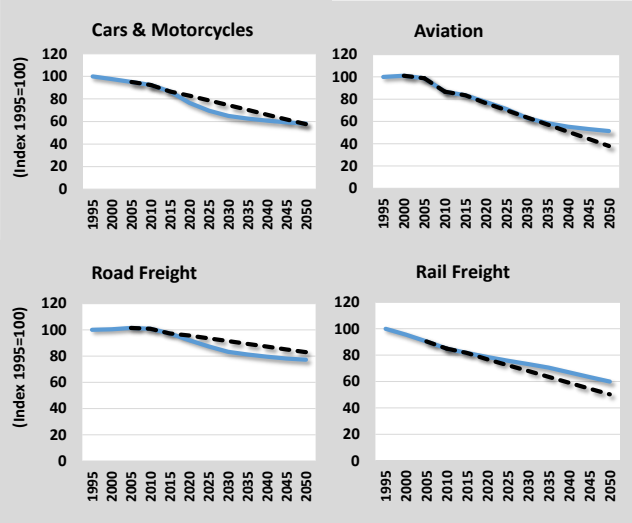
The efficiency improvements induced in the segment of passenger cars are already apparent in the period 2010-15 as the manufacturers have been progressively marketing vehicles with low-carbon performance. Car manufacturers are projected to increase their effort during the period from 2015 to 2020, which is reflected as higher improvements in specific fuel consumption compared to the recent trend (Figure 33). This effort is expected to discontinue from 2030 onwards, due to the absence of further tightening of the regulations.

The induced efficiency improvements in passenger private road transport are expected to reduce the relevant share in final energy demand for passenger transportation (from 77% in 2010 to 71% and 68% in 2030 and 2050, respectively). On the contrary, aviation sees its energy share to increase considerably from 18% in

[48] The International Air Transport Association (IATA) has set ambitious targets to curb fuel consumption and mitigate GHG emissions from aviation in its Carbon Neutral Growth initiative, according to which the aviation industry has committed to an average improvement in fuel efficiency of 1.5% per year by 2020 and a cap on aviation CO_2 emissions from 2020 (carbon-neutral growth). By 2050 the CO_2 emissions from aviation should be reduced by 50% relative to 2005 levels. Source: http://www.iata.org/pressroom/facts_figures/fact_sheets/pages/environment.aspx.

2010 to 26% in 2050 (Figure 34), as a result of increasing demand for jet fuels.

FIGURE 33: EVOLUTION OF ENERGY INTENSITY BY TRANSPORT MODE



Note: The dotted lines represent the 2005-15 trend.

FIGURE 34: SHARES OF PASSENGER TRANSPORT MODES IN FINAL ENERGY DEMAND

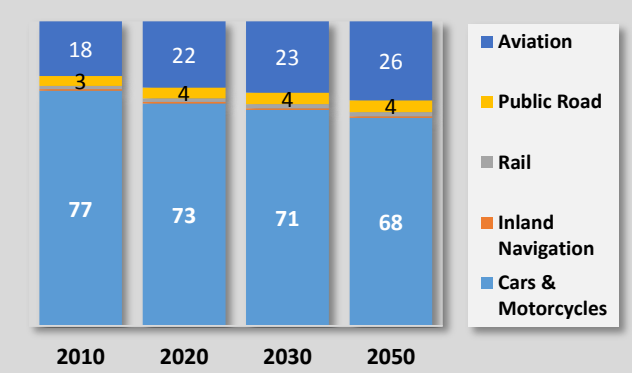
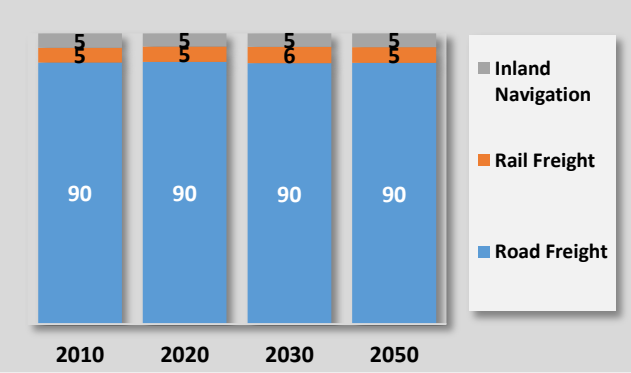


FIGURE 35: SHARES OF FREIGHT TRANSPORT MODES IN FINAL ENERGY DEMAND



The contribution from each transport mode in total final energy demand for freight transport is projected to remain stable from 2010 onwards. Heavy goods vehicles (HGVs), which throughout the projection period account for approximately 90% (Figure 35) of total energy consumed for freight business purposes, undergo improvements in specific fuel consumption driven mostly by the increasing fossil fuel prices.

Fuels used for international shipping, by convention, are not accounted under final energy demand in the Eurostat energy balances. According to the latter, energy demand for bunkers was reported to be roughly 50 Mtoe in 2010. Such quantities represent 37% of energy used by domestic freight transport and international bunkers combined. Model estimates show a growth in the bunker fuels consumption, up to 70 Mtoe in 2050 (a growth of approximately 0.9 p.a.), driven by the high growth in the international maritime transport activity.

Final energy demand: Analysis by fuel

Diesel is projected to maintain its share in total final energy demand in transport by 2030 (i.e. represents over half of total energy consumption), slowly decreasing its share only during 2030-50 (Figure 36). Such development is supported by favourable taxation of diesel by some Member States, with the share of diesel in the private road passenger fuel mix slightly increasing over the next 10-15 years.

In addition, diesel continues to be the primary fuel for heavy duty vehicles (HGVs, buses and coaches). In volume terms, total consumption of diesel in 2015 is slightly higher than its 2010 levels, showing a declining trend afterwards; during 2015-50 diesel demand decreases by 7%.

Total consumption of gasoline declines considerably until 2030, continuing the declining trend from 1995, and stabilizes from thereon to 2050, as no more stringent requirements for emissions standards are assumed in the Reference Scenario post 2020/2021.

Furthermore, certain Member States have adopted taxation favouring gasoline powered vehicles in an attempt to strengthen the share of gasoline in their transport mix.

The evolution of the biofuel penetration in the energy mix of the EU28 is mainly driven by the legally binding target of 10% renewable energy in the transport sector (RES-T target) and by the FQD reduction target, both

as amended by the ILUC Directive[49]. Projections also take into consideration specific MS mandatory blending regulations or incentives. Beyond 2020, with no further tightening of the RES-T target, biofuel quantities in EU28 remain relatively stable.

LNG enters the market, especially over the mid and long term horizon, for road freight and inland navigation transportation. The share of LNG in total consumption of heavy duty trucks would go up to 2.8% and 8.2% in 2030 and 2050, respectively.

The picture is similar in the case of inland navigation (the equivalent shares are 3.7% and 7.1%). The effective penetration of LNG in the Reference Scenario is driven by the implementation of the Directive on the deployment of alternative fuels infrastructure and the guidelines for the revised TEN-T, which are important drivers for the higher penetration of alternative fuels in the transport mix.

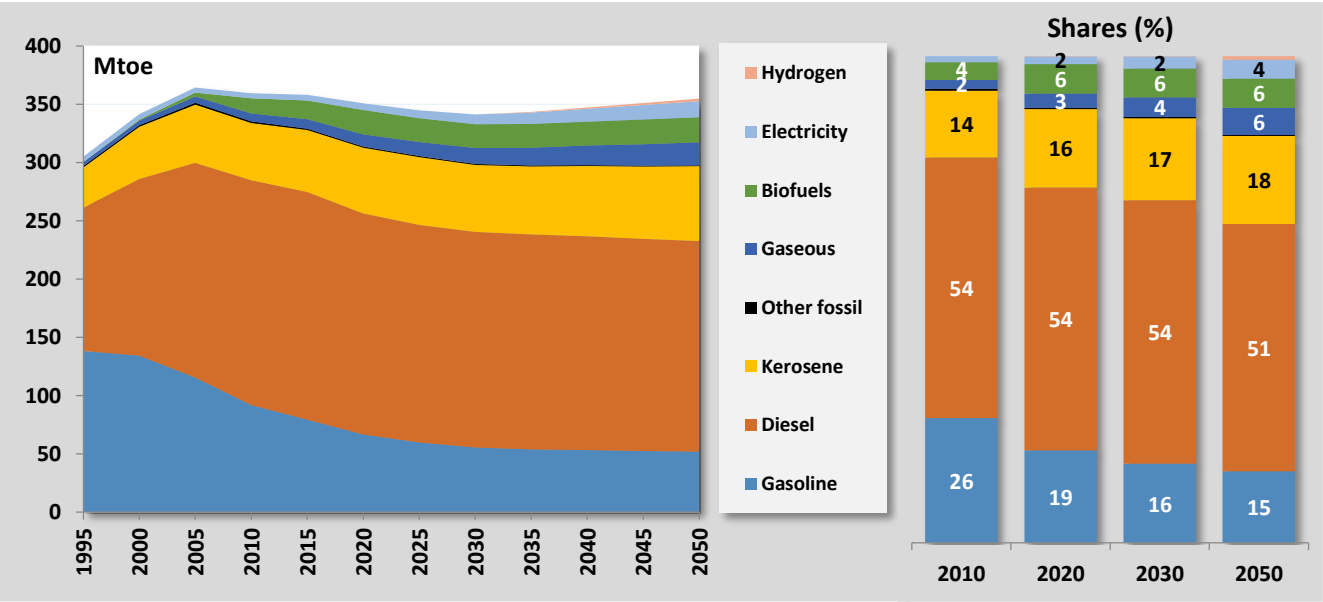
Consumption of jet fuels in aviation increases steadily by 2050 due to the increase in transport activity and despite improvements in efficiency; fossil fuels continue to dominate, and only after 2035 biofuels (bio-kerosene) slowly start penetrating the aviation fuel mix - driven by higher, compared to the medium term, ETS prices.

Electricity consumption in transport sees a steady increase throughout the projection period. Such development is driven mostly by the penetration of electric vehicles in road transport and partly by the substitution of diesel powered rolling stock with electric ones in rail transport. In particular, total electricity consumption in transport reaches almost 14 Mtoe towards the end of the projection period and provides a share of about 4% in total final energy demand in transport by 2050.

Regarding international shipping, petroleum products continue to be by far the dominant energy source used for powering vessels; unlike other transport modes, alternative powertrains for bunkers are limited to LNG powered ones in the Reference Scenario.

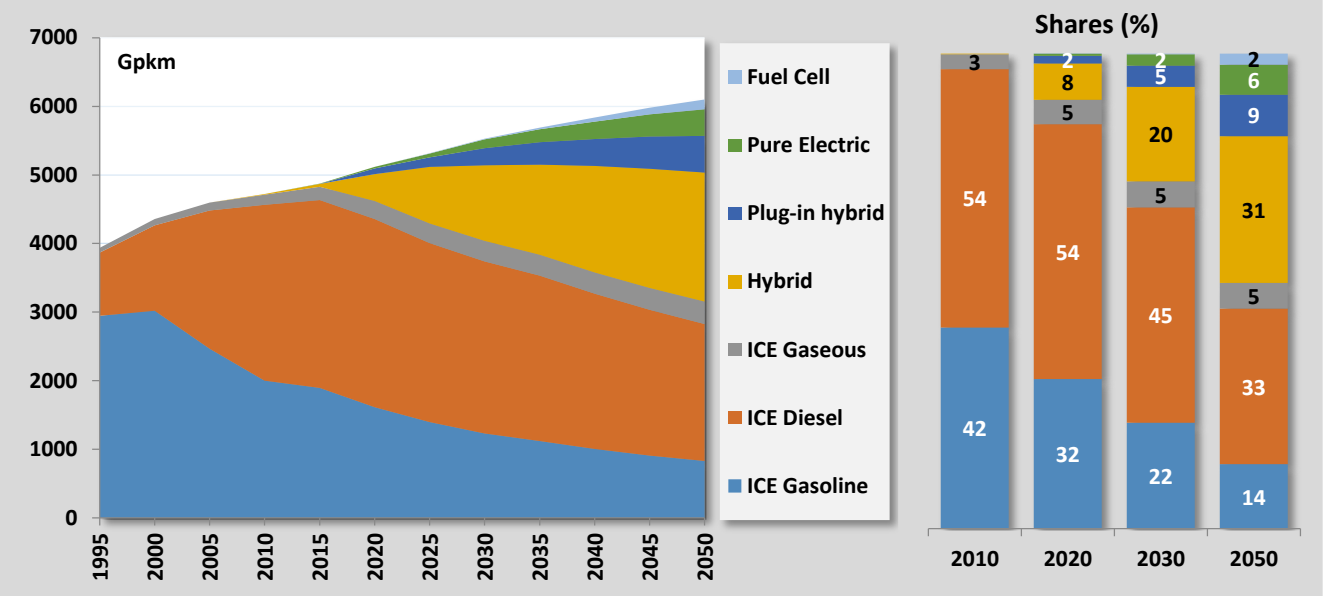
In particular, demand for heavy fuel oil increases at low rates (by 8% by 2020), being progressively substituted by marine diesel oil and LNG. Both fuel options are characterised by low sulphur content and they comply with the more stringent sulphur emission standards which apply to the Sulphur Emission Control Areas (SECAs) as enforced by Directive 2012/33/EU. Notably, demand for LNG for use as a marine fuel is expected to reach 7.3 Mtoe by 2050 (i.e. 10% of the overall energy needs of international maritime bunkers).

FIGURE 36: FINAL ENERGY DEMAND IN TRANSPORT BY FUEL TYPE



[49] Directive (EU) 2015/1513

FIGURE 37: EVOLUTION OF ACTIVITY OF PASSENGER CARS AND VANS BY TYPE AND FUEL



Outlook on Light Duty Vehicles

The market segment of light duty vehicles, which consists of cars and light commercial vehicles, is projected to experience changes, relative to historical trends, which are driven by adopted policies.

Car manufacturers are expected to comply with the CO_2 standards by marketing vehicles equipped with hybrid system on their powertrain (Figure 37), which are becoming more appealing to consumers thanks to their lower additional costs.

Electrically chargeable vehicles (EVs) emerge around 2020 as a result of EU and national policies as well as incentive schemes aiming to boost their penetration. Indeed, strong incentives placed by specific EU MS in terms of tax exemption or subsidisation make the acquisition of electric vehicles more appealing to the market segment of urban commuters and the early adopters.

The sales of Plug-in Hybrid Electric Vehicles (PHEVs) hold a significantly larger share in total sales of electrically chargeable vehicles in the mid-term. PHEVs, equipped with an internal combustion engine, do not pose range limitations to the travellers and are relatively less capital intensive than Battery Electric Vehicles (BEVs) resulting in their increased sales compared to BEVs especially over the period 2020-25. BEVs present higher levels of maturity, in particular, beyond 2025.

The developments of the battery costs assumed in the EU Reference Scenario 2016 allow a decrease in capital costs of BEVs and enable their penetration, especially in the urban zones. Fuel cell would still represent a niche market by 2050 due to the relatively higher, albeit decreasing, costs. The share of activity of total electric chargeable LDVs in the total activity of LDVs reaches 17% in 2050 (Figure 37).

The modelling exercise takes into consideration the national plans of the EU countries already in place for supporting the penetration of advanced vehicle options such as electric vehicles. National plans, which are usually reflected in the forms of subsidies, lower taxation, premiums and other incentives, are considered as explicit drivers in the model. Countries that have plans in place and support electrification of private road transport are expected to show higher penetration of electric vehicles (i.e. higher than the EU average). For example, this is the case of Finland, France and Denmark.

Finally, other energy forms such as LPG and natural gas maintain a rather small share in the final energy demand of the transport sector. Passenger cars running on LPG and CNG see a moderate increase especially stemming from countries with re-fuelling infrastructure already in place or in MS with plans for supporting the uptake of such fuels.

3.2 Energy supply

3.2.1 Power generation

The developments in power generation in the Reference Scenario are influenced by a number of drivers. These relate to assumptions on policies and technological costs described in Section 2, as well as on fuel price developments.

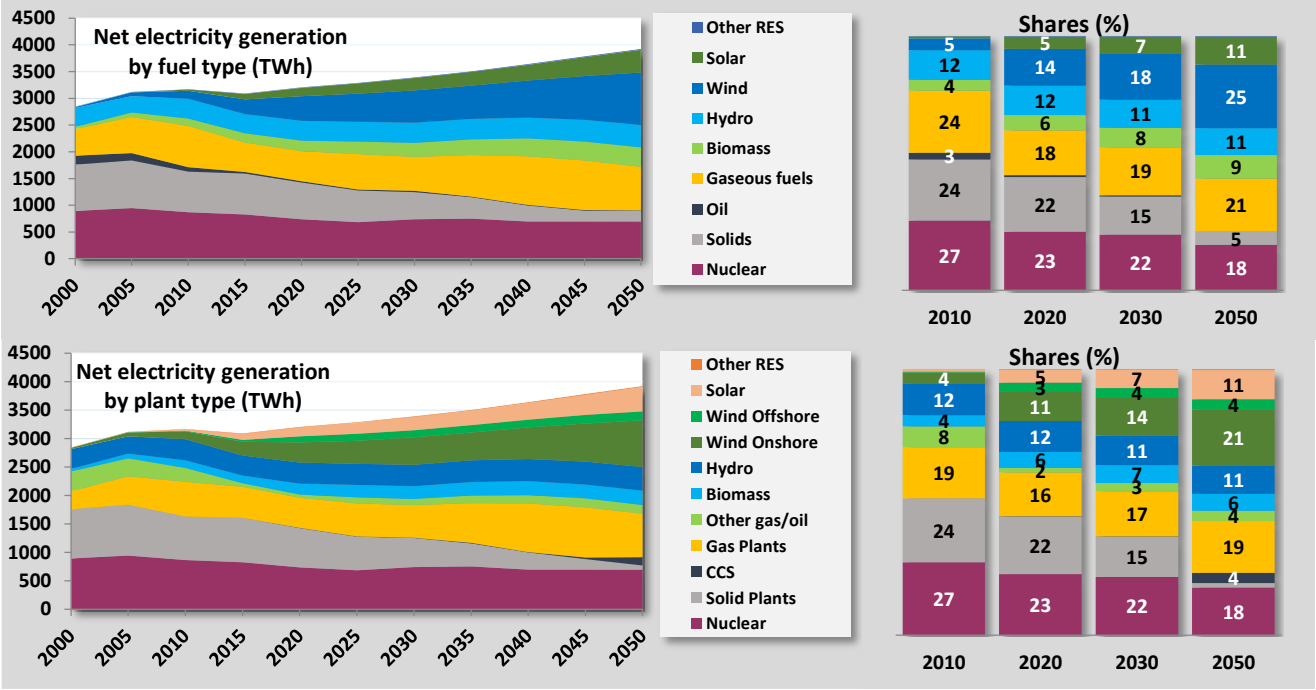
Moreover, the PRIMES model fully includes in its database all currently known planned investments, including lifetime extensions as well as planned decommissioning, based on commercial databases (e.g. Platts) and plans of large companies in all the Member States.

Therefore, the projections of large investments in the short term are strongly determined by such known investments and decommissioning plans.

The Reference Scenario also considers country specific potentials for RES penetration and CCS transport and storage.

For nuclear, the possibilities of extension of lifetime for power plants have been analytically assessed through a plant by plant survey based on the age, construction type (generation) of the power plant and national legislation. The construction of new power plants on new sites (i.e. in locations where there are currently no power plants) has become considerably more expensive in the model, based on issues related to public acceptance and information on recent nuclear projects for which the costs have been published[50]. The construction of new power plants on existing nuclear sites is limited based on surveys which assess the possibilities (e.g. based on spatial limitations) of expansion in existing locations.

FIGURE 38: ELECTRICITY GENERATION BY FUEL AND BY PLANT TYPE



Electricity generation

In the short term, the set of EU and national specific policies that promote RES (notably implementation of supportive financial instruments such as feed-in-tariffs) drive a significant penetration of RES in power generation. By 2020, RES in power generation are projected to increase to 35.5% (RES-E indicator[51]) or 37.2% of net electricity generation, of which 52% are projected to be variable RES (wind and solar). Beyond

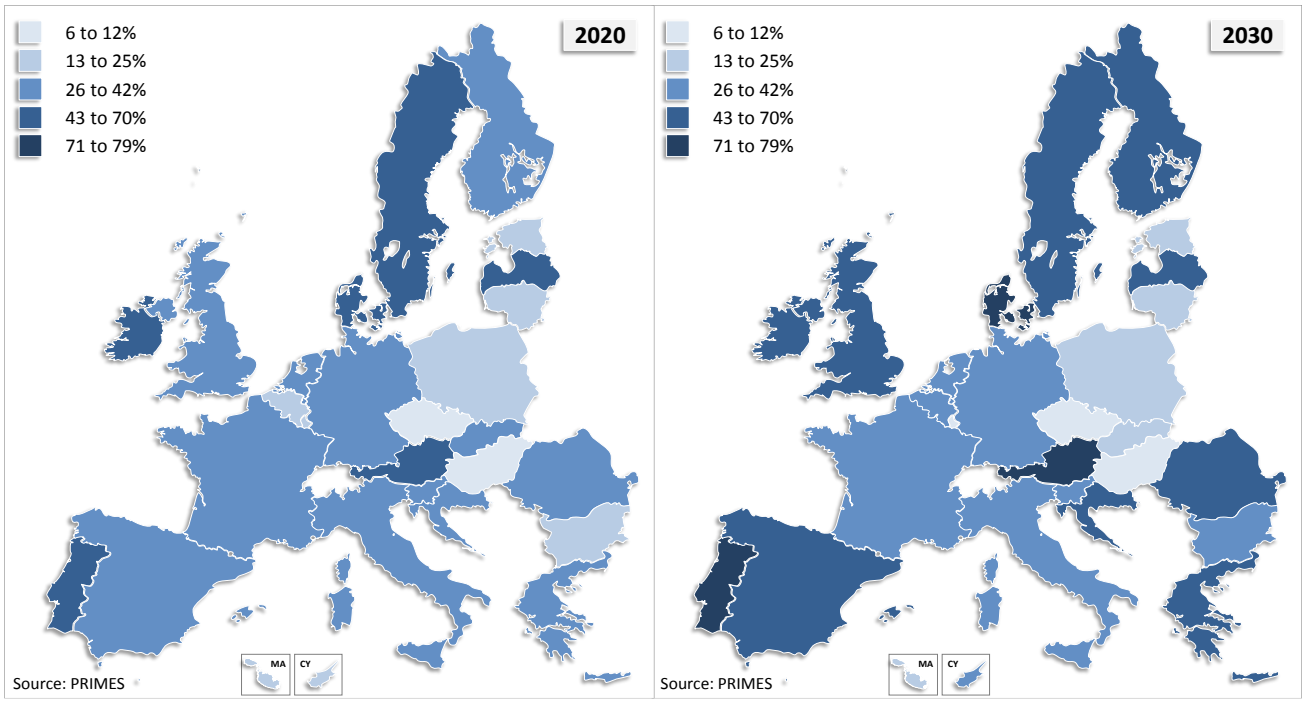
[50] Information was based on http://www.world-nuclear.org/ and related background links.

[51] Calculated according to the definitions of the RES Directive used also for the pertinent provisions of Eurostat statistics

2020 support schemes are phased out and further investments in RES are driven by market forces, the ETS and the improvement in the techno-economic characteristics of the technologies (see section 2.5.2).

While RES provide growing shares in electricity generation (up to 56% in 2050 of net power generation in overall EU28), the contribution of variable RES (solar, wind as well as tidal/wave in the definition used here) remains significantly lower. These variable RES reach 19% of total generation in 2020, 25% in 2030 and 36% in 2050, which is unlikely to pose any major issues to the grid stability. The development of solar PV and wind onshore post-2020 are based solely on market forces as support schemes are phased out.

FIGURE 39: RES-E SHARES IN EU MEMBER STATES IN 2020 AND 2030



Wind provides the largest contribution from RES supplying 14.4% of total net electricity generation in 2020, rising to 18% in 2030 and 25% by 2050. A share of 24% of total wind generation is produced from wind offshore capacities in 2020 (33 GW installed capacity), but the share of offshore wind declines thereafter, as the high costs of wind-offshore limit its market penetration. By 2050 there is 44.5 GW installed capacity of offshore wind which represents an increase of only 11 GW compared to 2020; at the end of the time period some substitution of existing offshore capacity takes place. Total wind capacities increase to 207 GW in 2020, 255 GW in 2030 and 367 GW in 2050, up from 86 GW in 2010.

Wind onshore capacity and generation increase because of exploitation of new sites but also because of the progressive replacement of wind turbines with newer taller ones which are assumed to have higher installed capacity and higher load hours.

Generation from PV contributes 4.8% in net generation by 2020. Beyond 2020, PV generation continues to increase up to 7% in 2030 and 11% in 2050. PV capacity is projected to reach 137.5 GW in 2020, up from 30 GW in 2010. Investment is mostly driven by support schemes in the short term and the decreasing costs of solar panels and increasing competitiveness in the long term, in particular where the potential is highest, i.e. Southern Europe. As a result, installed capacity reaches 183 GW in 2030 and 299 GW in 2050.

The use of biomass and waste combustion for power generation also increases over time, both in pure biomass plants (usually of relatively small size) and in co-firing applications in solid fuel plants. Biomass attains

a share in fuel input in thermal power plants of 17.3% in 2020, 22% in 2030 and 31.5% in 2050[52]. Pure biomass/waste plant capacities (excluding co-firing) reach 51.6 GW in 2020, up from 21.7 GW in 2010, 53.2 GW in 2030 and 57.3 GW in 2050. The share of biomass products in total inputs rises from 59% in 2010 to 76% in 2050, whereas waste products, including industrial waste, represent the remaining quantities.

The relative contribution of hydro generation remains rather constant at 10-11% of total net generation, with small hydro slightly increasing. Net installed capacity increases by 19 GW in the time period from 2010 to 2050; 8.5 GW are planned investments in hydro-reservoirs between 2010 and 2020. Beyond this period the majority of investments are in small run-of-river plants.

The share of geothermal electricity generation remains at approx. 0.2% throughout the projection period. Tidal and wave, which mainly develop after 2020 in a few Member States with such natural resources reach just below 0.2% at the end of the projection period.

Generation from conventional thermal plants decreases steeply up to 2020 and then stabilises or decreases moderately. The introduction of CCS starts with the demonstration plants that are assumed to be built up to 2020/25[53]. CCS then only develops further after 2040, driven by increasing ETS prices, reaching 4.8% of net generation by 2050. In 2050, total net CCS generation capacity amounts to 17 GW. The distribution of CCS by country is very uneven as the analysis is considering the specific policies as well as the availability of storage sites by Member State[54]. In practice, economically driven CCS investments take place only in the long term, and in countries with substantial solid generation and endogenous resources (Bulgaria, Czech Republic, Germany, Poland, Romania and Slovak Republic).

Generation from solid fuels declines significantly throughout the projection period. The majority of investments in solid plants which do occur are due to retrofitting of old plants; only very few new investments occur. By 2050, more than half of solid-fuelled generation (approx. 66%) is produced from facilities with installed CCS technologies; but overall power generation from solids, including CCS, only represents 5.1% of total net generation in 2050.

Gas-fired generation slightly decreases until 2020, but increases thereafter. In 2050 it reaches the same levels as in 2010. Total net investment in gas-fired plants in the period 2011-50 amounts to 290 GW (215 GW gas plants are operating in 2010); a third of this capacity investment is due to refurbishments. This strong increase in gas capacity despite rather stagnant generation from gas highlights the key role that gas is increasingly playing as a back-up technology for variable RES. The majority of investments are in CCGT plants, which increase over time.

Consequently, gas plays a crucial role in the context of emission reduction targets and increased penetration of variable RES. As a fuel it is less CO_2 emissions intensive relative to other fossil fuels, and gas units are flexible enough to serve the increased balancing requirements of RES.

The share of cogeneration in steam production, as well as in electricity production, increases throughout the projection period. The share of gross electricity produced by CHP plants also increases.

Specific nuclear phase-out policies that have been adopted by some EU MS (Germany and Belgium), and the higher costs derived from literature survey drive electricity generation from nuclear downwards throughout the projection period: starting with a capacity of approx. 133 GW in 2010, capacity declines to 114 GW in 2020, 110 GW in 2030 and 93 GW in 2050. The

[52] Calculated following Eurostat definitions, i.e. excluding energy consumed by industrial sectors and refineries for on-site CHP steam generation.

[53] The included power plants are: UK (White Rose) 0.4478GW net capacity, coal CCS; UK (Peterhead) 0.385 GW net capacity, gas retrofit; Netherlands (Rotterdam Capture and Storage Demonstration Project-ROAD) 0.227GW net capacity, coal CCS.

[54] The Reference Scenario assumes that no cross-border trade of CO_2 is possible therefore the CO_2 captured in a country must also be stored in the same country.

projected investments in nuclear capacity mainly occur on existing sites or are lifetime extensions through retrofitting; there are very few projected investments in nuclear capacities on new sites. More specifically, investments in nuclear power plants are only retrofitting in the time period to 2030. Beyond 2030 there are some investments in new nuclear power plants. However, the majority of these are brownfield investments, on existing sites; cumulatively in the period 2035 to 2050 27% of investments are retrofits and 75% of new investments are on existing sites.

Investment patterns

Considering the cumulative investments in the period 2011-50, retrofitting investments constitute just over a third of overall investments. As the share of non-dispatchable generation (variable RES) in the system is increasing, both the rate of use of capacities for CCGT and coal plants diminish, but for different reasons. For CCGT it is due to higher use of gas plants for flexibility and reserves, for coal it is due to lower competitiveness and aged equipment.

FIGURE 40: OPERATING POWER CAPACITIES

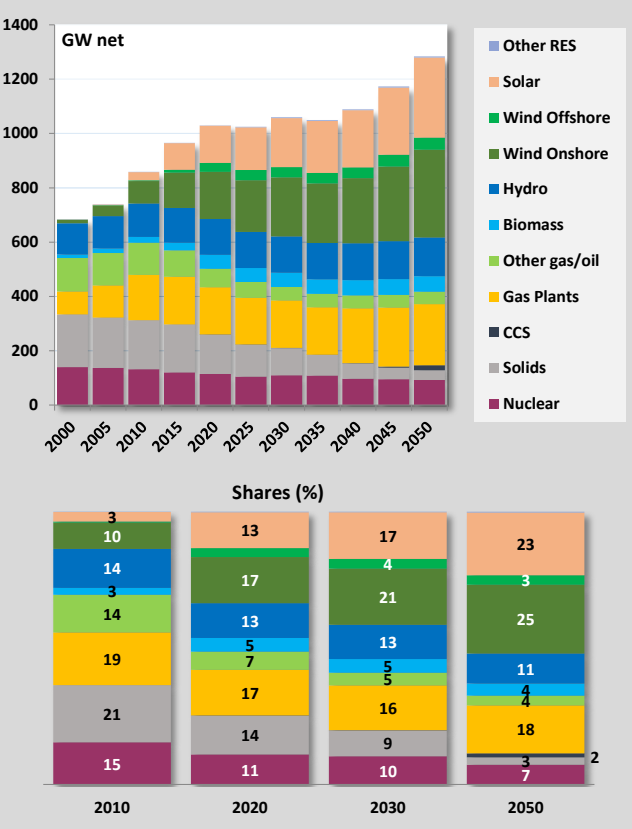
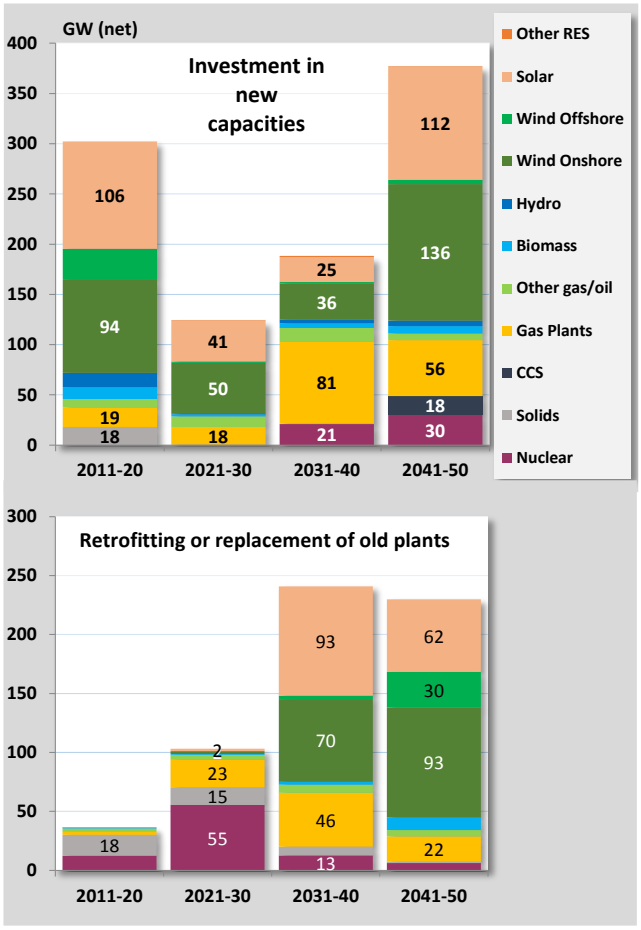


FIGURE 41: INVESTMENT AND PLANT REFURBISHMENT



Lower use of capacities usually leads to higher difficulties for recovering fixed and capital costs from markets. This is in particular true for old coal plants. Under a well-functioning market, gas plants delivering additional reserves and flexibility should be remunerated adequately. Thus undertaking large new investments in dispatchable capacities risks becoming increasingly uneconomic.

Hence, in the Reference Scenario, retrofitting investments, where possible, are desirable from an economic perspective, despite their short lifetime, due to their low capital intensity compared to the construction of new plants. RES retrofitting is assumed to be the replacement of existing plants on the same site. Such retrofitting is projected to occur with newer technologies which are assumed to be technically improved: in the case of wind the turbines are assumed to be taller and therefore with higher installed capacity and operation hours.

TABLE 6: INDICATORS OF POWER GENERATION

	2010	2020	2030	2050
Efficiency of thermal electricity production (%)	38.6	40.4	42.2	49.7
CHP indicator (% of electricity from CHP)	12.6	10.2	11.8	13.1
CCS indicator (% of gross electricity with CCS)	0.0	0.2	0.2	4.8
Non-fossil fuels in electricity generation (%)	48.5	59.2	64.9	73.1
– nuclear	27.5	23.0	22.0	18.1
– renewable energy forms and industrial waste	21.0	36.2	42.9	55.0

Following the retirement of obsolete thermal capacity and strong investment in modern thermal power plants there is an on-going trend towards higher efficiency of thermal electricity generation. This happens also because of an increasing share of CHP, which optimises the combined generation of electricity and heat from the same input fuel. CHP contributes to greater energy efficiency. This feature is not present for CCS, which actually requires more energy for the same output, but delivers this electricity output almost carbon free.

As can be seen from Table 6 the shares of zero (RES, nuclear), and low carbon technologies (here: CCS) are rising or at least remaining stable after 2020 (nuclear).

Electricity trade patterns

Over time the volume of trade in electricity is influenced by a number of opposing factors:

On the one hand, the full development of the internal market leads to higher NTCs which, all else equal, increases trade flows; on the other hand, the higher penetration of decentralised RES leads to the construction of flexible capacities close to the demand centres. All else equal, this leads to a reduction of the trade volume. Finally, the harmonisation of electricity prices also tends to a reduction of trade volumes.

TABLE 7: VOLUME OF TRADE FLOWS BY REGION OVER TIME (GWH)

2015

From \ To	BI	CW	IB	NP	EE	SE
BI	1010	0	0	0	0	0
CW	19388	139005	2574	0	1425	1048
IB	0	0	3893	0	0	0
NP	0	2486	0	30252	0	0
EE	0	9299	0	542	16901	0
SE	0	8588	0	0	552	27658
Total						264621
Interregional trade as % of total						17%

2020

From \ To	BI	CW	IB	NP	EE	SE
BI	1605	32	0	0	0	0
CW	9242	89940	10599	13	4	775
IB	0	0	6177	0	0	0
NP	4776	2746	0	10419	1131	0
EE	0	10241	0	0	9939	0
SE	0	10721	0	0	0	25684
Total						194046
Interregional trade as % of total						26%

2030

From \ To	BI	CW	IB	NP	EE	SE
BI	953	0	0	0	0	0
CW	8936	90187	11392	0	15	1957
IB	0	0	6688	0	0	0
NP	2471	12786	0	13975	1469	0
EE	0	14055	0	2	9251	0
SE	0	8293	0	0	0	30576
Total						213006
Interregional trade as % of total						29%

2050

From \ To	BI	CW	IB	NP	EE	SE
BI	3817	763	0	0	0	0
CW	1541	62946	5923	20	2	1046
IB	0	5110	5532	0	0	0
NP	5735	11888	0	20923	1045	0
EE	0	13807	0	1482	7992	0
SE	0	9469	0	0	0	33863
Total						192905
Interregional trade as % of total						30%

BI: British Isles (United Kingdom, Ireland), CW: Central West Europe (Belgium, Luxemburg, Netherlands, Germany, France, Austria, Italy, Malta, Switzerland, Slovenia, Hungary), IB: Iberian Peninsula (Spain, Portugal) and Africa, NP: Nordic Pool (Denmark, Sweden, Norway, Finland), EE: Eastern Europe (Czech Republic, Slovakia, Poland, Latvia, Estonia, Lithuania) and Russia, SE: South East Europe (Croatia, Romania, Bulgaria, Greece), non-EU countries of the Balkan region and Turkey [Cyprus is excluded as it is not interconnected according to the assumptions of Reference Scenario 2016.]

These effects can be observed in Table 7 which shows the evolution of volume of trade. EU countries are grouped in regions, each including countries which are at present well interconnected and form a relatively "closed" system. Looking at the trade flows, it can be seen that in the 2020-30 period, there is an increase in total trade flows, while post-2030, the factors that reduce trade volume overweigh, and total trade flows end up decreasing until the end of the projection period. At the same time, Table 6 reveals an "opening" of the regional systems, as they increase trade with other regions relative to trade within the regions. This effect is the result of the internal energy market and the improvement of inter-linkages. In particular, in 2015 trade flows between different regions represent 17% of total trade flows; this figure increases to 26% in 2020, 29% in 2030 and then stays almost stable for the remainder of the projection period reaching 30% in 2050.

Looking more closely at the results for each region: the British Isles appear to increase their trade with the Nordic Pool region as interconnections to the Nordic Pool are built; on the other hand, trade of the British Isles with other regions (and in particular the Central-West region) decrease. The Nordic Pool continues to remain a relatively closed system, however flows towards other regions tend to increase over time due to the interconnection developments assumed in the Reference Scenario. The Central-West region "opens" considerably, particular to Eastern Europe where the increase in connection possibilities and the better market functioning finally lead to the merging of the Eastern Europe and Central-West region. South East Europe remains a closed system due to the relatively limited developments in interconnection capacity assumed.

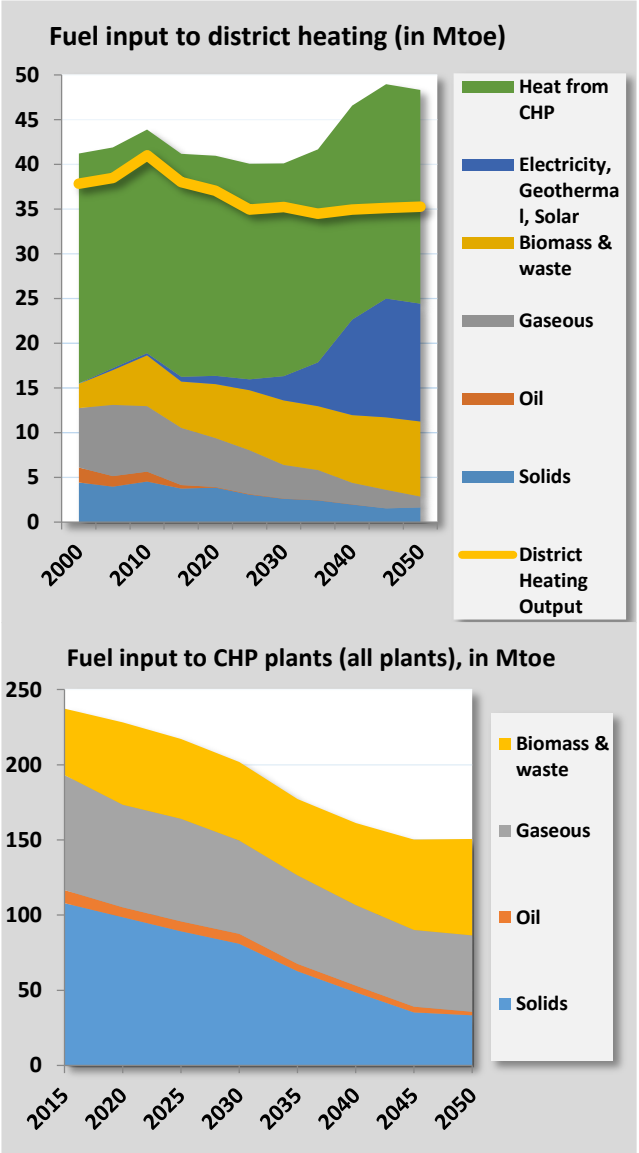
3.2.2 Steam and heat supply

Steam and heat demand in EU28 rises slightly in 2020 and 2025 and then remains approximately stable throughout the projection period. Main sources of demand are industry and households.

District heating is projected to maintain its share in demand for heat. In the short and medium term there is a gradual shift from solids and gas district heating boilers to biomass/waste boilers. In the long term electricity boilers, heat pumps, geothermal and thermal solar penetrate the district heating market and gain in market share.

While electricity generation from CHP plants increases throughout the projection period, steam output increases up to 2020 and remains almost constant thereafter.

FIGURE 42: FUEL INPUT FOR STEAM GENERATION



The role of cogeneration in steam and heat supply remains stable at approximately 60% until 2030 and then decreases to 50% in share terms in 2050; however the output remains rather constant over time. Industrial boilers and industrial CHP plants decrease only slightly; due to increasing efficiency, their steam output increases marginally.

Regarding district heating fuel input, the share of solids and oil decreases considerably, as well as the share

of gas. Biomass and waste as well as other RES and electricity in fuel input to district heating boilers increase, representing almost 42% of fuel input to district heating excluding heat from CHP in 2020 and 88% in 2050 (in comparison to 31% in 2010).

3.2.3 Primary energy supply

The trend in total primary energy supply (PES) is downward throughout the projection period due to energy efficiency reflected on primary energy demand (Gross Inland Consumption). The reduction pace slows down mainly after 2030. In parallel, there is a shift in primary energy requirements towards renewables along with a decline in the demand for solid fuels (Figure 43). Natural gas and nuclear maintain an almost stable share in total primary energy requirements throughout the projection period. This shift towards more renewables (variable and hydro) also contributes to lower primary energy intensity since they are accounted, in statistical terms, using an efficiency factor of 1, as opposed to alternative fossil fuel or nuclear technologies, which are accounted using energy conversion factors above 1.

Oil represents the largest share in total primary energy requirements and continues to do so as the largest consumer is transport where substitution possibilities are limited. The share drops between 2010 and 2020 due to the implementation of the CO_2 standards for cars. Further decreases are limited and the share stays constant over time later on.

Gas maintains its share in total primary energy requirements because convenience and low emissions relatively to other fossil fuels drive wide utilisation in all stationary energy demand, some emergence in transport and wide use in power generation. Solids decrease in share due to the decline of solid use in all sectors of demand and energy supply sectors.

Biomass and waste increase in volume and share mainly due to increases in power generation and industrial uses. The other renewables increase steadily throughout the projection period towards a share as high as that of gas, driven mainly by the impressive developments in the power generation sector.

FIGURE 43: PRIMARY ENERGY DEMAND AND SUPPLY

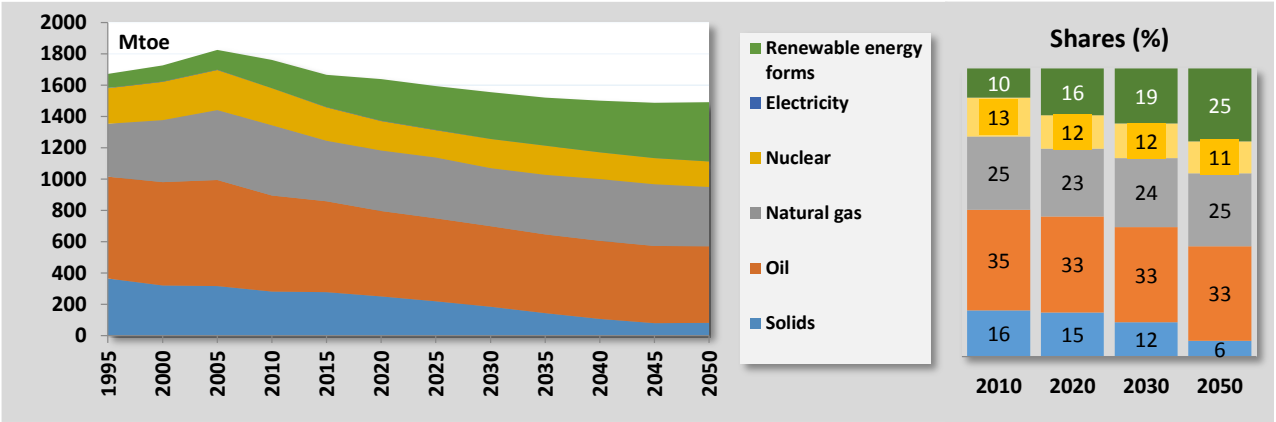


FIGURE 44: PRIMARY ENERGY PRODUCTION

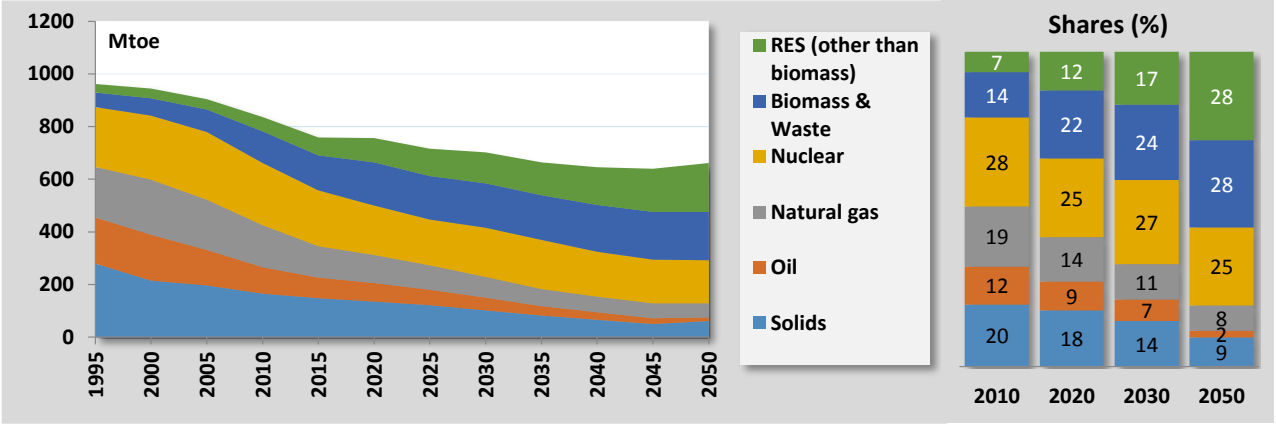
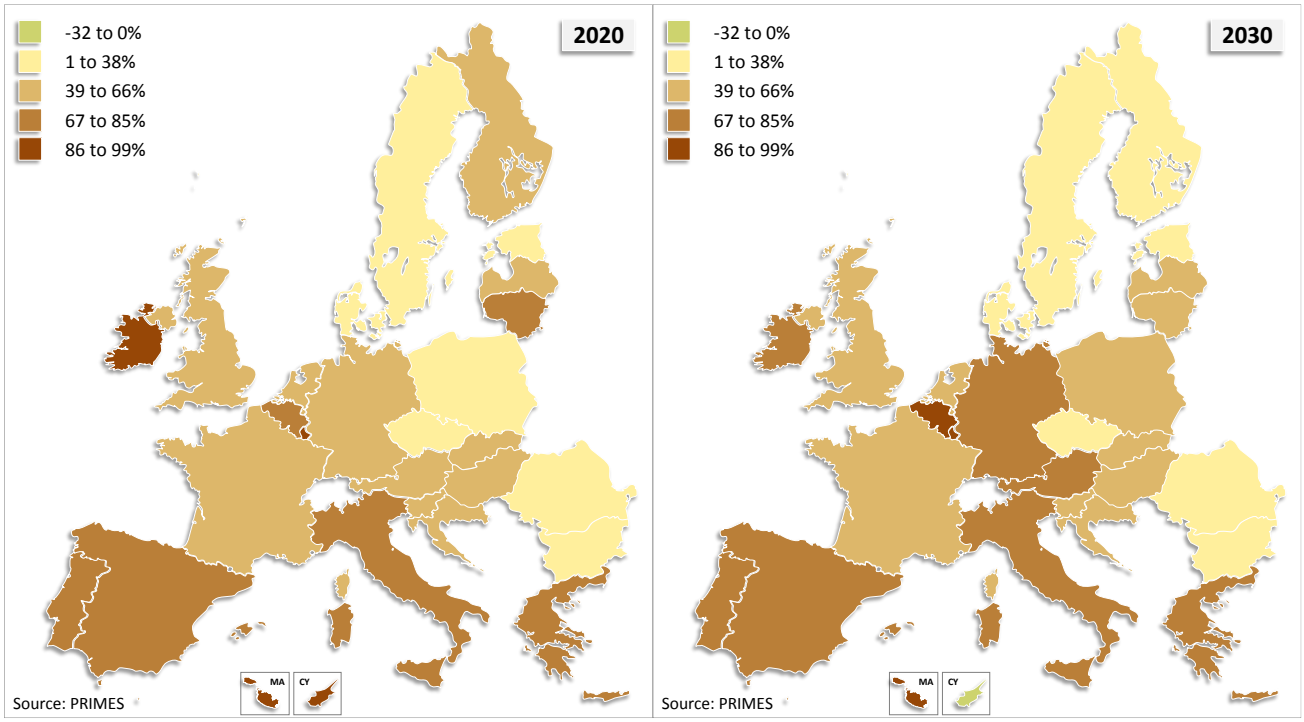


FIGURE 45: ENERGY IMPORT DEPENDENCE BY MEMBER STATE IN 2020 AND 2030



The evolution of primary energy production follows the declining trend of primary energy demand for solid fuels and the exhaustion of resources for oil and gas. The mix in primary energy production changes considerably over time, with renewables (including biomass) becoming dominant by 2050 (Figure 44). This increase more than compensates the reduction of primary energy production of fossil fuels.

3.2.4 Import dependency

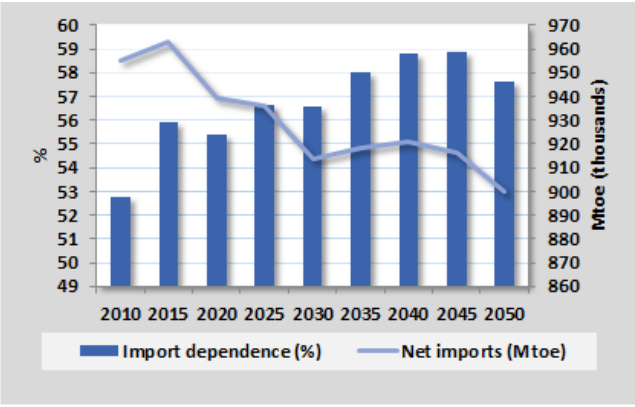
The situation in imports evolves only moderately. Despite the decreasing trend in final energy demand for fossil fuels and a decrease of overall net imports including crude oil, limited and decreasing domestic resources result in an increase in imports of natural gas and oil products. This drives import dependence moderately upward. Import dependence peaks in 2040-45 at just under 59% and decreases slightly to just under 58% in 2050 Figure 46).

The absolute level of imports however follows a declining trend throughout the projection period, even as domestic resources are reducing. Solid imports decline throughout the projection period, crude oil and feedstock imports decrease, while oil products slightly increase.

Natural gas imports increase slightly in the long term reaching approx. 300 Mtoe net imports in 2050 (Figure 47).

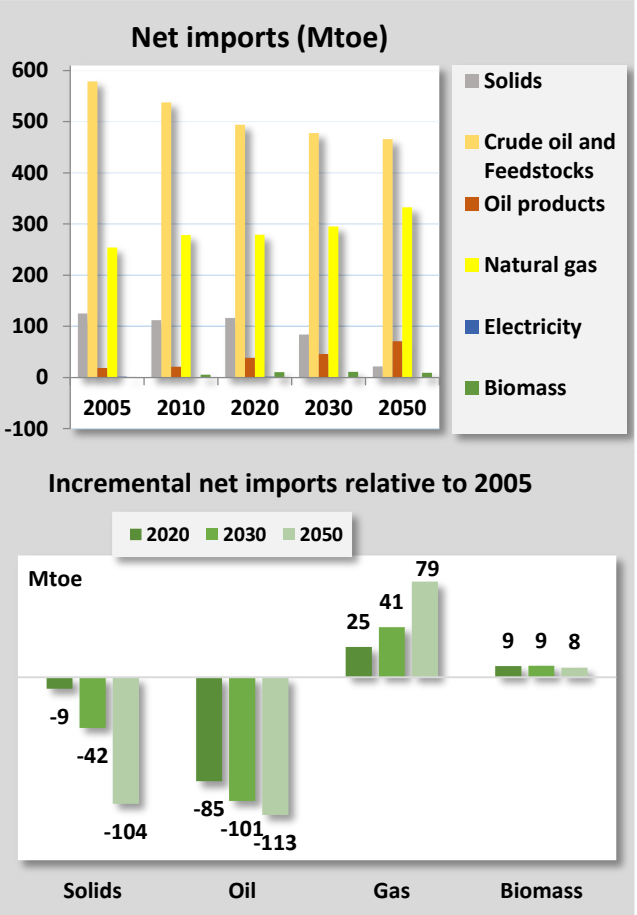
Import dependence in Member States is increasing between 2020 and 2030 (Figure 46), with the notable exception of Cyprus which starts exporting gas. In all other Member States energy import dependence either increases or stays constant as increased energy savings are compensated by lower domestic production of fossil fuels. The external fossil fuel bill of the EU is projected to rise in constant prices by around 41% from 2010 to 2030 and exceeds 2010 levels by around 88% in 2050, reaching around 487 bn €'13 and 578 bn €'13 in 2030 and 2050, respectively.

FIGURE 46: PRIMARY ENERGY IMPORTS



Biomass supply for energy purposes, which is projected to be mostly indigenous, i.e. supplied from within the EU, increases over time following the developments of biomass demand. Until 2020, the increase in the demand for bio-energy products is faster than the growth of the domestic production, resulting in a substantial increase in the share of imported bio-energy relative to past levels.

FIGURE 47: NET IMPORTS BY FUEL

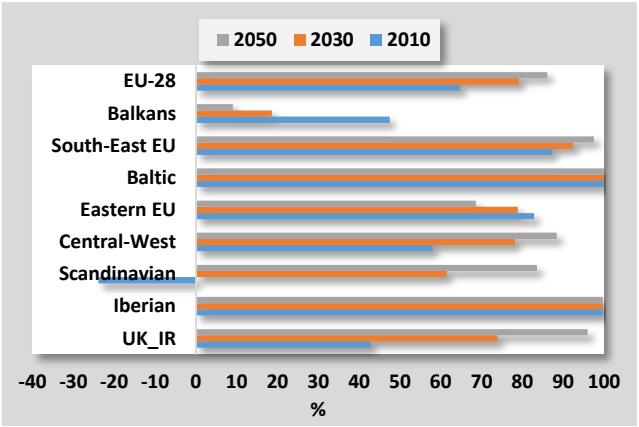


Beyond 2020, domestic production catches up, and the share of imported bio-energy remains stable until the end of the projection period at around 10%. The rate of gas import dependence is nearly 70% in 2015. The Reference Scenario shows a constant increase in EU gas import dependence to 87% by 2050, driven by declining gas production in most EU Member States.

With regard to the EU28 indigenous gas production, the Reference Scenario assumes constantly declining production in most countries following historic trends and exhaustion of resources, especially in the UK and in the Netherlands, while gas imports increase significantly both in the form of pipeline and LNG. Poland is one of the few countries where gas production increases as a result of large indigenous resources and policies that promote large-scale exploration of gas resources. Shale gas production in the EU is assumed to be particularly limited (despite the existence of resources in several EU28 countries), as the Reference Scenario uses conservative assumptions reflecting public acceptability concerns, lack of both EU and national policies promoting extraction of shale gas and environmental concerns.

Figure 48 shows gas import dependence projections in EU Member States grouped by region (based on geographical proximity and energy/gas system characteristics). The highest increases in import dependence between 2010 and 2030 are observed in the regions of Central-West EU (GE, FR, NL, BE, LX) and in UK+Ireland mainly driven by reduction in domestic gas extraction in Netherlands and UK respectively and sustained gas demand.

FIGURE 48: NET IMPORT DEPENDENCE (IN %)[55]



Scandinavian countries turn from net gas exporters (due to gas production in Denmark) to net importers in the period after 2020. In regions with no gas resources

[55] UK_IR: United Kingdom, Ireland
Iberian: Spain, Portugal
Scandinavian: Denmark, Sweden, Finland
Central-West: Germany, France, Netherlands, Belgium, Luxemburg
Eastern EU: Poland, Czech Republic, Slovakia, Hungary
Baltic: Estonia, Latvia, Lithuania
South-East EU: Italy, Austria, Slovenia, Croatia, Malta
Balkans: Romania, Bulgaria, Greece, Cyprus

and hence no production prospects (Iberian Peninsula and Baltics) net import dependence remains 100% over the period 2010-50. On the other hand, net import dependence declines in Eastern EU MS (mainly due to increasing gas production in Poland) and in Balkans driven by gas production in Romania and emergence of gas exports from Cyprus after 2025 combined with stagnant gas demand.

3.3 Electricity prices and costs

The electricity prices in PRIMES are calculated in order to recuperate all costs including those related to renewables (such as feed-in-tariffs), grid costs, recharging infrastructure for EVs and investment costs including stranded investments, back-up and reserve costs as well as profit margin. The PRIMES model differentiates electricity prices by sector reflecting load profiles, generation and grid costs.

Calculation of electricity prices in PRIMES

The electricity prices in PRIMES are calculated in order to recuperate all costs including those related to renewables (such as feed-in-tariffs), grid costs, recharging infrastructure for EVs and investment costs including stranded investments, back-up and reserve costs, profit margin etc.

The process to determine the electricity prices in PRIMES can be divided into four steps:

i) Determination of total system costs under least cost unit commitment and least cost expansion conditions mimicking well-functioning markets; ii) Simulation of wholesale markets by country and estimation of marginal system prices reflecting long run marginal costs, iii) Matching of load profiles of customer-types with the duration curve of long term marginal prices with customers sorted in descending order of their load factor mimicking bilateral contracting; iv) Calculation of prices by sector based on price levels by customer type calculated in step and the recovery of total system budget including variable generation costs and annuity payments for capital costs, recovery of additional costs for RES and cost of grid differentiated by voltage type.

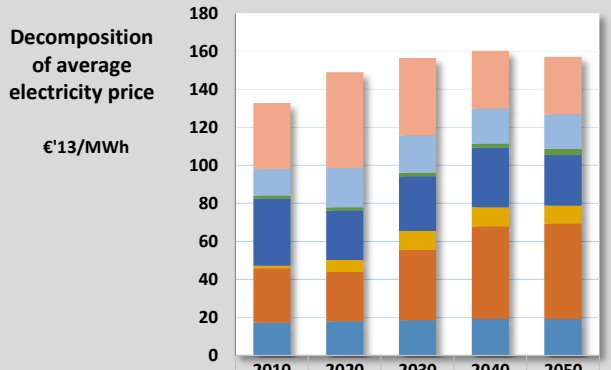
Grid cost recovery is based exclusively on load payments at average grid tariffs determined as levelised costs of regulated asset basis.

The pricing approach corresponds to the Ramsey-Boiteux methodology and allows for the differentiation of electricity prices by sector.

The developments in the EU28 power sectors have significant impacts on energy costs and electricity prices, in particular in the short term.

From 2010 to 2020, average electricity prices increase by 13%. This is due to increased capital costs which more than compensate the observed decrease in fuel costs. Beyond 2020, average electricity prices increase up to 2030 and then remain broadly stable beyond 2030 (Figure 49), as the benefits, in terms of fuel cost savings, resulting from the restructuring investments in electricity supply come increasingly to the fore. In addition, lower technology costs from technology progress and learning over time help contain electricity prices.

FIGURE 49: COST COMPONENTS OF AVERAGE ELECTRICITY PRICE



	2010	2020	2030	2040	2050
Annual capital cost	35	51	41	30	30
Fixed costs	14	21	20	19	18
Variable costs	2	2	2	2	3
Fuel costs	35	26	29	31	27
Tax on fuels and ETS payments	1	6	10	10	9
Grid costs	29	26	37	49	50
Excise tax and VAT on electricity	17	18	19	19	19
Average price of electricity (after tax)	133	150	158	162	159

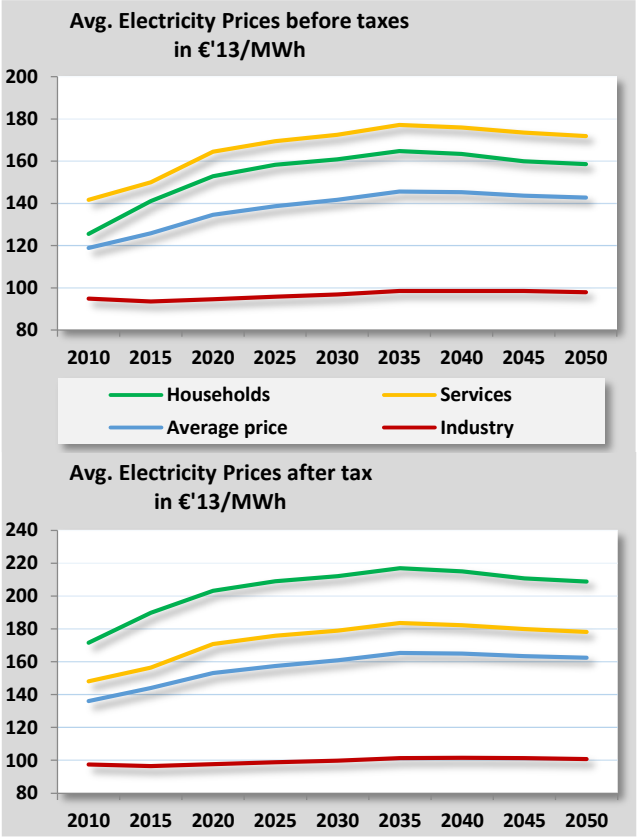
Prices of electricity across the EU tend to converge towards the EU average in the projection period; this convergence is driven by a combination of factors including the elimination of subsidies where these are still present, an increased penetration of RES in all countries, as well as wider market coupling.

Over time, the structure of costs slightly changes; capital intensive investments (RES and CCS) and increasing grid costs bring a decrease of the share of variable

cost components and a corresponding increase in the capital cost components.

More specifically, capital costs and fixed costs increase significantly. Higher shares of RES in power generation with similar fuel prices imply a reduction of the fuel cost component. Smaller components of the cost increase are national taxes and ETS allowance expenditures. In addition, there are the arithmetic effects of successful energy efficiency policies, which through curtailing electricity demand reduce the denominator for sharing out the electricity costs while the numerator is less affected due to the high share of fixed costs in electricity generation and supply.

FIGURE 50: PRICE OF ELECTRICITY BY SECTOR



The grid costs increase over time due to the augmenting share of RES, and particularly variable distributed RES. The PRIMES model although not being geographically defined uses functions to determine grid costs based on the share of distributed generation (mainly wind and solar); the function has been econometrically estimated based on the requirement for high, medium and low voltage grid requirements. In the period to 2030 the grid costs increase both due to the increase of distributed RES as well as to the development of the TYNDP of ENTSOE.

The prices for households and services are projected to increase moderately in the medium term and to decrease slightly in the long term. Prices for industry on the contrary are stable or decrease over time as industry maintains base-load profile and bears a small fraction of grid costs and taxes. Taxes apply mainly on prices for households and services.

3.4 Greenhouse gas emissions

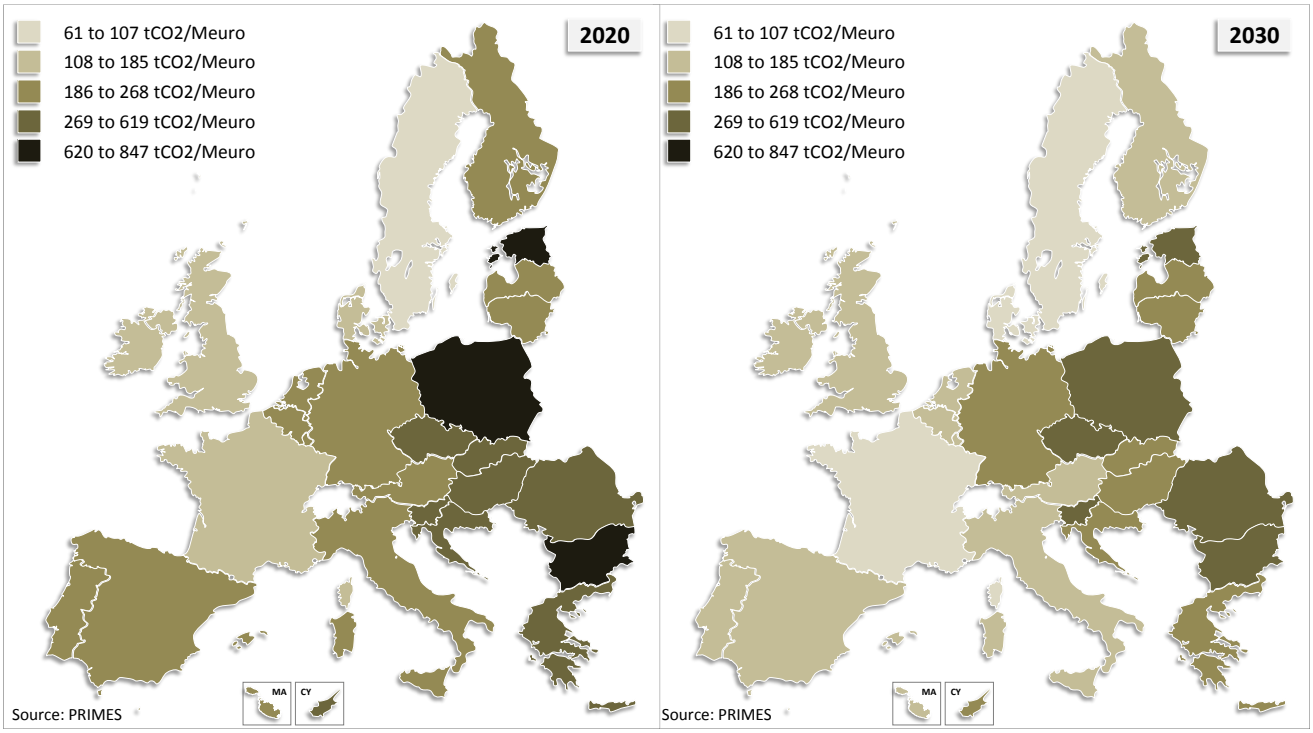
3.4.1 CO_2 emissions (excluding LULUCF)

The developments in the energy projections that have been described so far, following the provisions of the EU ETS, the RES Directive, the ESD, the EED and other specific policies, result in reduced energy intensity of activities in parallel with reduced carbon intensity of power generation and energy demand.

As a consequence of the lower energy demand, CO_2 emissions are projected to decrease steadily over time throughout the projection period. Emission reductions in the ETS sectors are larger than those in the ESD sectors as the carbon price is a driver for long term emission reduction. In ESD sectors there are no further drivers beyond market forces (e.g. rising fossil fuel prices) and the continued impact of adopted policies such as CO_2 standards for vehicles or energy performance standards for new buildings, to further reduce energy and consequently emissions. Non-energy and non-land use related CO_2 emissions (e.g. industrial processes) reduce only slowly throughout the projection period; however they only represent a small share of total CO_2 emissions (excluding LULUCF, for the latter see section below).

The main driver of CO_2 emissions reduction is the reduced energy intensity of GDP (i.e. as GIC over GDP). The reduction of the energy intensity of GDP is due to the structural changes in industry, the penetration of RES and the increasing energy efficiency in all sectors including transport. The CO_2 intensity of energy (i.e. CO_2 over GIC) makes in the medium term a small contribution to emission reductions, but stronger in long term. The reduction of CO_2 intensity is due to shifts in fuels.

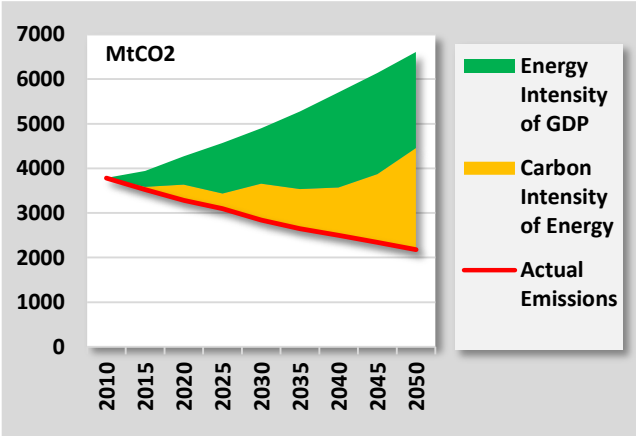
FIGURE 51: CARBON INTENSITY OF GDP IN 2020 AND 2030



For past years PRIMES calculates energy related emissions from the energy balances of Eurostat, using the emission factors of Regulation 2007/589/EC. For non-energy related emissions these are taken from the UNFCCC submissions by Member States as collected and quality checked by EEA[56]. ETS CO_2 emissions are calibrated to verified emission data: the focus is the calibration of 2005 as this is the base year for several emission reduction targets. Also 2010 is calibrated to the largest extent possible[57].

Similarly to energy intensity of GDP (see Figure 12), also carbon intensity develops in a similar direction across Member States, albeit from different starting points. The EU13 Member States are characterised by a higher dependence on solid fuels due to available indigenous resources, an older power plant park and older industrial facilities, as well as lower GDP levels; this implies that the carbon intensity of GDP is higher in these countries. However, the situation improves considerably, already in 2030, due to the replacement and/or renovation of production facilities, as well as a shift towards higher RES shares.

FIGURE 52: DECOMPOSITION OF ENERGY-RELATED CO_2 EMISSION REDUCTION RELATIVE TO PROJECTION WITH CO_2 INTENSITY OF GDP FROZEN TO 2010 LEVELS



[56] The calculated energy-related CO_2 emissions may therefore vary from energy-related CO_2 emissions reported to UNFCCC. PRIMES total CO_2 emissions are cross checked with total CO_2 emissions reported to UNFCCC for 2005 to the extent reasonably possible. In particular, in case of significant deviations adjustments have been done for process-related emissions to avoid possible double counting of CO_2 emissions.

[57] PRIMES ETS sector coverage corresponds to the phase 3 ETS scope as valid since 2013. The calibration for 2005 and 2010 is therefore based on verified emissions and recent estimates used by the EEA in their ETS data viewer for the historical size of scope adjustments and additional sectors. For the underlying methodology of the latter see Verena Graichen, Johanna Cludius, Sabine Gores: Estimate of historical emissions for stationary installations to reflect the current scope of the EU ETS (2013-20), ETC/ACM Technical Paper 2016/1, May 2016.

The evolution of the generation mix implies a steady decrease in carbon intensity of power generation (Figure 53) and leads to significant emissions reductions from the sector. Carbon intensity of power generation from thermal plants decreases by 17% in 2020 relative to 2005, by 32% in 2030 and 68% in 2050. The reduction of CO_2 emissions occurs mainly in the power and heat production sectors, as RES and ETS enable restructuring away from carbon-intensive generation. The substantial increase in power generation from RES, the closure of solid fired power plants as well as the increase in biomass use in steam/heat generation reduces emissions considerably.

Power generation carbon intensity explains the high carbon intensity of GDP in many countries. The countries with the highest carbon intensity of power generation are countries that use indigenous resources. Countries with high reliance on RES and nuclear already have very limited carbon intensity of power generation today and in 2020. Towards 2030 more countries decrease their carbon intensity of power generation mainly through the increase of RES. Several countries maintain a certain level of carbon intensity due to limited RES potential and the continued use of gas and indigenous coal and lignite resources.

FIGURE 53: CO_2 EMISSIONS OF POWER GENERATION AND ENERGY TRANSFORMATION

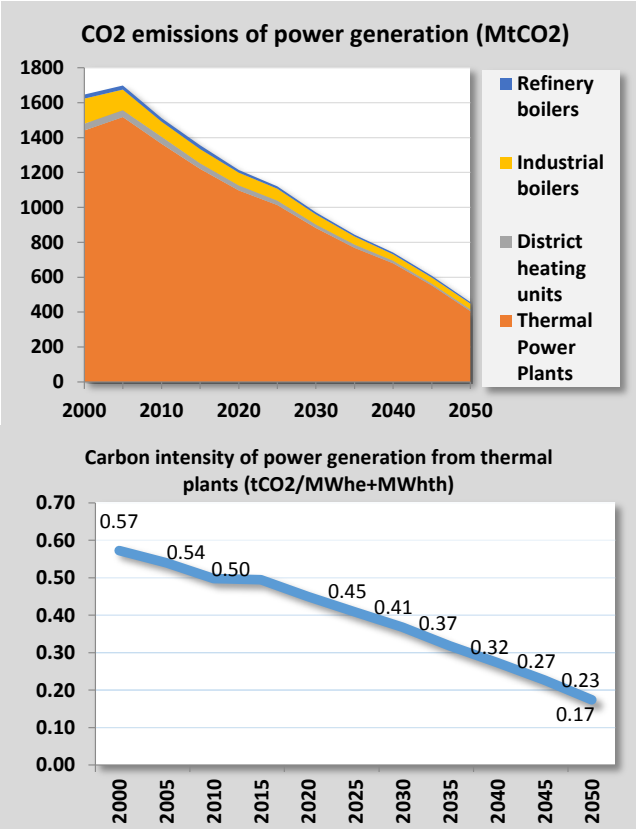
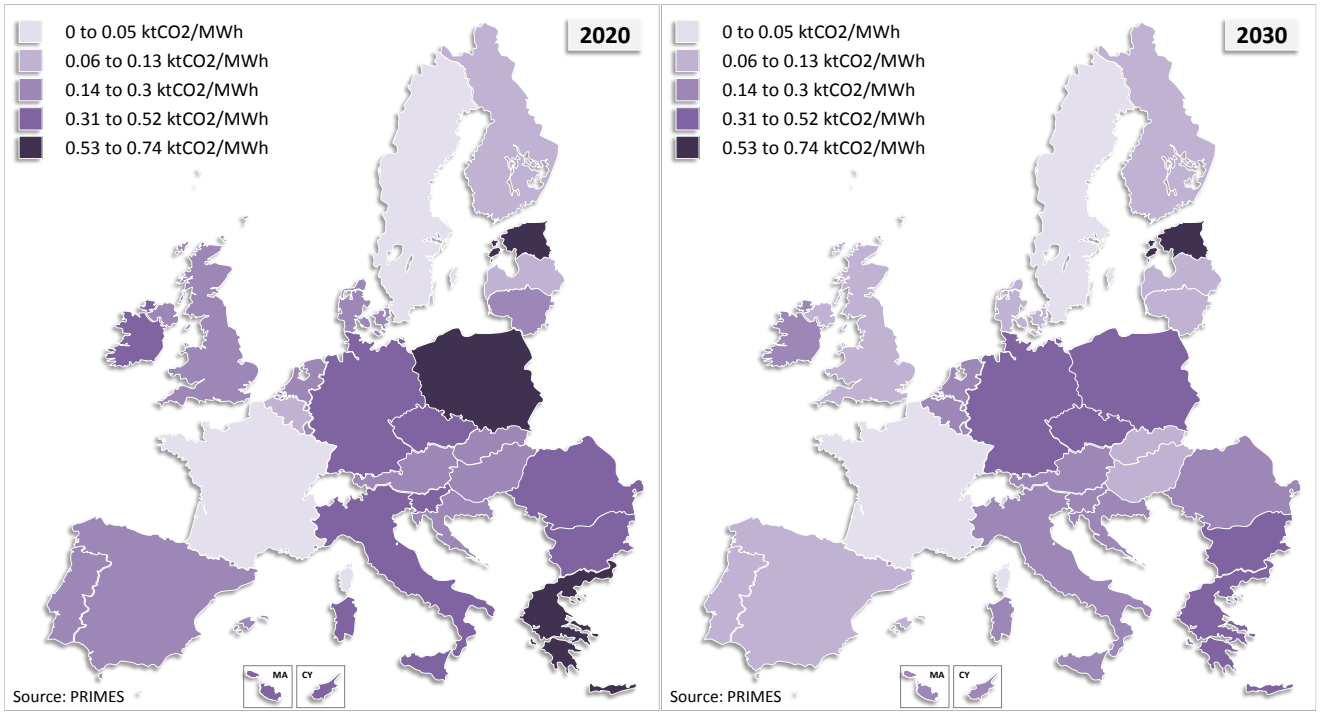


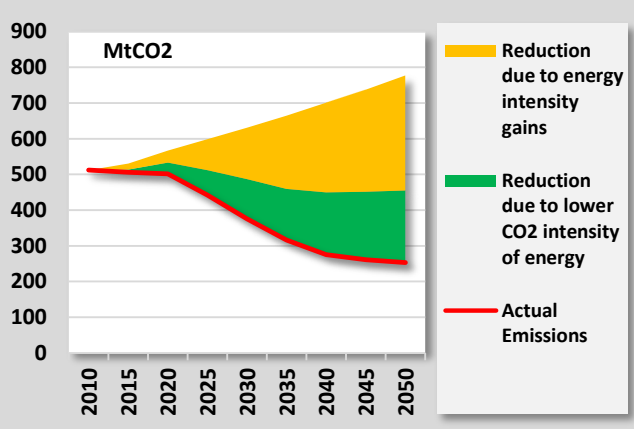
FIGURE 54: CARBON INTENSITY OF POWER GENERATION BY MEMBER STATE IN 2020 AND 2030



In the industrial sector, the ETS also drives a shift towards less carbon intensive fuels, for both energy related and process related uses. The shift toward higher value added products away from energy intensive products as well as faster growth for non-energy intensive industries leads to lower emissions. Industry as a whole is also expected to make substantial efforts on energy efficiency, notably because it is confronted with global competition.

The resulting effect on energy-related carbon intensity of the industrial sector is a slight decrease by 2020 relative to 2010 (2%), which is projected to reach 27% until 2030 and 51% until 2050. As demonstrated in Figure 55 the impact of energy intensity decreases is driving the bulk of emissions reductions.

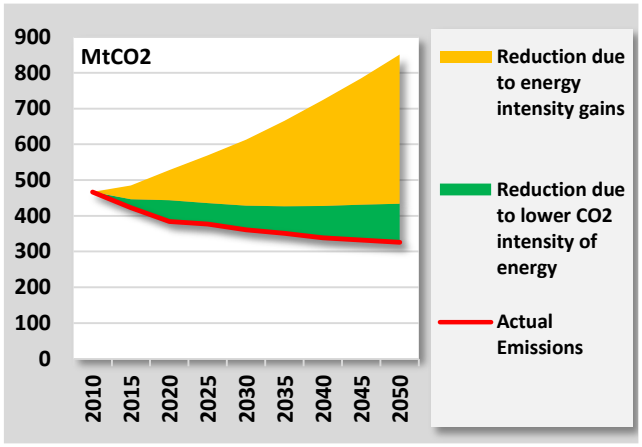
FIGURE 55: DECOMPOSITION OF ENERGY-RELATED CO_2 EMISSION REDUCTION IN INDUSTRY RELATIVE TO PROJECTION WITH CO_2 INTENSITY OF ACTIVITY FROZEN TO 2010 LEVELS



Process related emissions[58] decrease significantly already in statistical years and overall by 2020 process emissions reduce by 12% in 2020 relative to 2005. Further emission reduction is limited with emissions 21% below 2005 levels in 2030. Under the projected ETS prices, CCS for the reduction of process CO_2 emissions only becomes a viable option at the end of the time period in 2050.

The effect on emissions from energy intensity decrease is even more considerable for the residential sector (Figure 56), driven by the Energy Efficiency, Energy Performance of Buildings, and Ecodesign Directives and Regulations, as well as the increase in fuel prices in the long term. The effect of these policies, in combination with renewables policies and national specific policies on reducing pollutants (thus driving a shift towards less carbon intensive fuels), drives a decrease of carbon intensity of the sector by 18%, 20% and 28% relative to 2005 in 2020, 2030 and 2050 respectively.

FIGURE 56: DECOMPOSITION OF ENERGY-RELATED CO_2 EMISSION REDUCTION IN RESIDENTIAL SECTOR RELATIVE TO PROJECTION WITH CO_2 INTENSITY OF INCOME FROZEN TO 2010 LEVELS

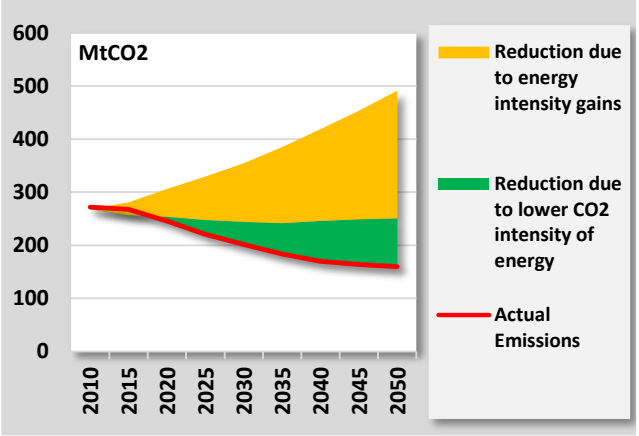


Similarly, in the tertiary sector (Figure 57), a significant progress occurs in terms of energy intensity decrease driven by energy efficiency policies, with projections showing a shift toward less carbon intensive fuels and electricity and in the long term by rising fuel prices. These sector emissions decrease substantially throughout the projection period, achieving carbon intensity reduction of 11%, 24% and 43% relative to 2005 in 2020, 2030 and 2050 respectively.

In the transport sector, CO_2 emissions (excluding international maritime) decrease by 8% between 2010 and 2050 (11% reduction for 2005-50). CO_2 emissions decrease until 2035 and slightly increase thereafter primarily driven by CO_2 emissions growth in freight road transport and aviation (Figure 58).

[58] These include also the small amount of CO_2 emissions in the fugitive, solvent and waste sectors.

FIGURE 57: DECOMPOSITION OF ENERGY-RELATED CO_2 EMISSION REDUCTION IN THE TERTIARY SECTOR RELATIVE TO PROJECTION WITH CO_2 INTENSITY OF ACTIVITY FROZEN TO 2010 LEVELS



Even though the transport sector becomes the largest contributor of CO_2 emissions by the end of the projection period, fuel efficiency gains driven by CO_2 standards for LDVs, as well as the increasing fossil fuel prices, contribute significantly to limiting emissions by 2050. Decreases in carbon intensity of energy consumption are less pronounced as the projections show a limited shift towards alternative fuels. A shift to alternative fuels, including electricity, is mainly projected in the longer run for the passenger cars segment and in rail while LNG becomes a candidate fuel for road freight and waterborne transport.

Road transport contribution to the transport sector CO_2 emissions is decreasing over time (Figure 58). The main drivers of declining emissions are the CO_2 emission standards for sales of new cars and vans, which result in significantly lower carbon intensity for the total passenger cars and vans fleet by 2050 (Figure 59). These bring about a considerable decrease in emissions from passenger cars and vans, with the highest reduction taking place in the period 2010-20. Beyond 2035, CO_2 emissions from passenger road transport stabilize as no additional policies are assumed. For road freight, the increased activity surpasses improvements in specific fuel consumption, especially for HGVs.

FIGURE 58: EVOLUTION OF CO_2 EMISSIONS OF THE TRANSPORT SECTOR

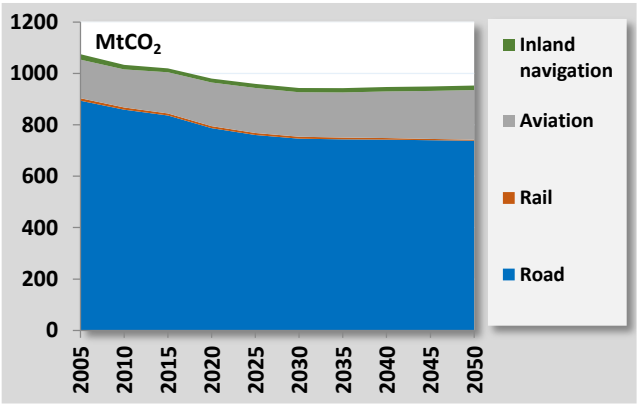
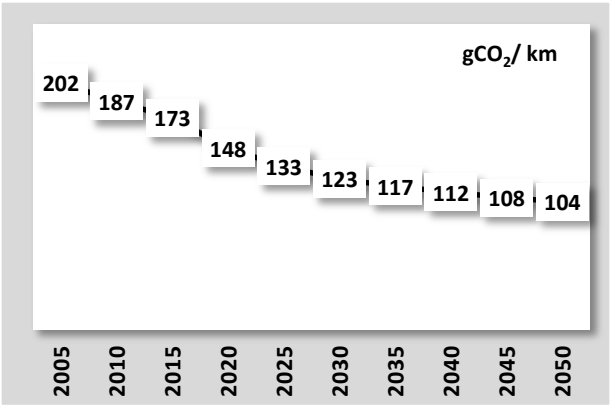


FIGURE 59: PASSENGER CAR SPECIFIC CO_2 EMISSIONS



Aviation emissions are increasing over the projection period, however at a slower rate than aviation activity, primarily due to the fuel efficiency improvements and the slow penetration of bio-kerosene beyond 2035, induced by rising ETS prices. CO_2 emissions from rail are decreasing as a result of switching from diesel to electricity and the shift from conventional passenger rail to high-speed rail. CO_2 emissions from inland navigation have a small share in transport emissions.

Maritime bunker emissions increase by 38% between 2010 and 2050 (35% relative to 2005), driven by sustained growth in transport activity. However, the improvements in fuel efficiency and the uptake of LNG result in much lower growth of emissions compared to that of international shipping activity (i.e. slightly over 70% for 2010-50).

FIGURE 60: EVOLUTION OF CO_2 EMISSIONS BY SECTOR

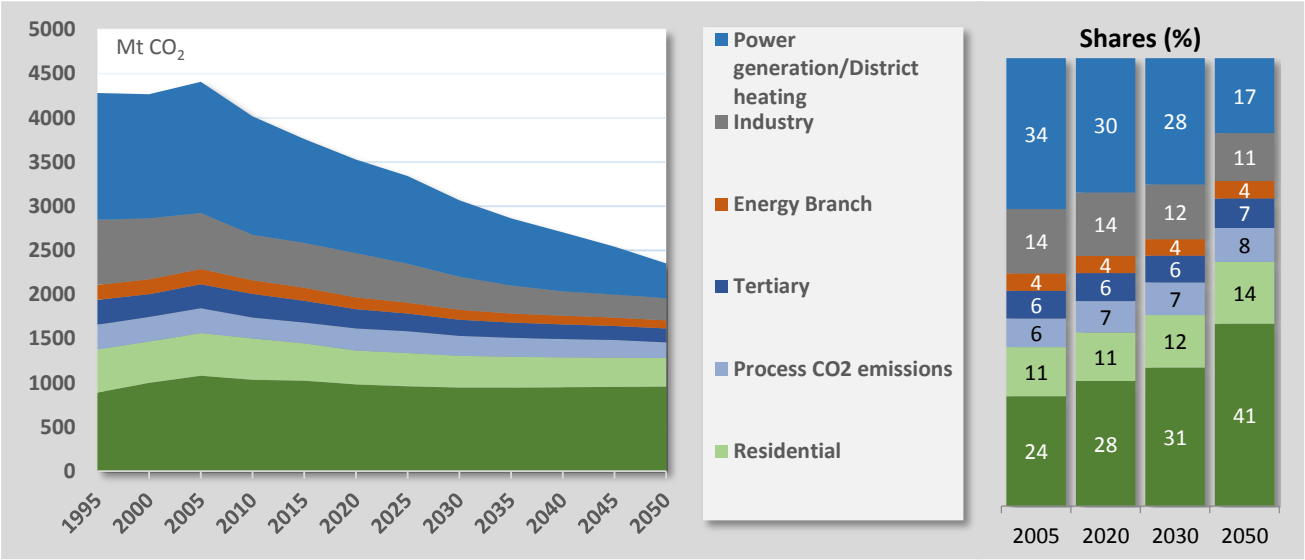
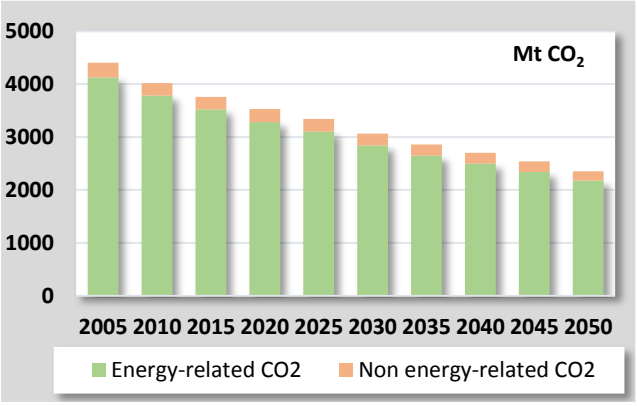


Figure 61 and Figure 60 depict the evolution of total CO_2 emissions excluding LULUCF; the trend in CO_2 emissions shows a very steep decrease in power generation, whereas emissions in the field of transport decrease at much slower pace between 2010 and 2050 due to the relatively high marginal abatement costs in this sector. In the long term, as power generation has strongly decreasing emissions, the transport sector becomes the largest source of CO_2 emissions.

FIGURE 61: EVOLUTION OF CO_2 EMISSIONS (EXCLUDING LULUCF)



3.4.2 Non-CO_2 emissions and their drivers

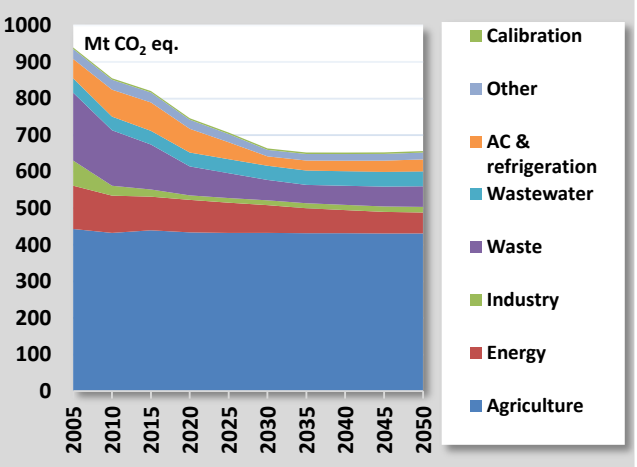
Non-CO_2 GHG emissions from all source sectors

Non-CO_2 GHGs are emitted from a variety of sources and sectors. Figure 62 shows the contribution of the major sectors to EU28 non-CO_2 emissions in 2005 and the projected development to 2050 in the Reference Scenario. Non-CO_2 GHG emissions are expected to decline from 940 to 664 Mt CO_{2eq} between 2005 and 2030 and to 656 Mt CO_{2eq} in 2050. The agricultural sector is a major contributor to non-CO_2 emissions with almost 50 percent in 2005 and only a minimal decline is expected in the future. Reference projections for non-CO_2 GHG emissions by country and sector are available in the Appendix 3.

The effect of already adopted policies on the Reference emissions determines the changes of the respective sector-related emissions after 2005 to a significant extent. Compared with the 2005 emission level, the implemented policies are expected to contribute to 29% lower non-CO_2 emissions in 2030 and 30% lower emissions in 2050. The expected decline in future non-CO_2 emissions is primarily the result of policy-driven technology adoption. The inclusion of nitric and adipic acid production in the EU-ETS system has stimulated widespread adoption of N_2O control technology. The implementation of the EU Mobile Air Conditioners Directive supported the phase-out of the use of HFC-134a and the use of coolants with lower greenhouse gas warming potentials. The implementation of the EU F-gas Regulation of 2014 phases out the total amount of HFCs that can be sold in 2030 to one fifth of the sales in 2015. Future CH_4 emissions from the waste sector are expected to decline in response to the EU Landfill Directive. The EU Nitrate Directive is expected to control nitrogen input on agricultural soils. Other reasons for declining non-CO_2 emissions are the expected decline in production of coal and oil in the EU, less ruminant livestock, and the natural turnover of

capital, e.g. the phase-in of Point-Feeder Prebake (PFPB technology in primary aluminium production.

FIGURE 62: EU28 REFERENCE NON-CO_2 GHGS BY MAJOR SECTORS 2005 TO 2050

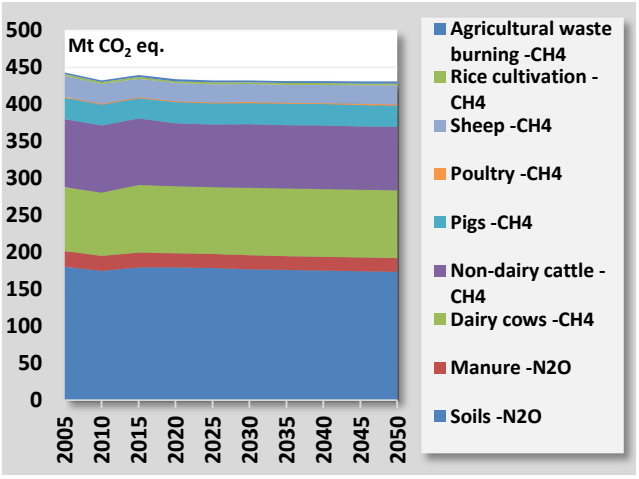


Agriculture sector

The main source of agricultural non-CO_2 GHGs is N_2O emissions from microbial processes in soils. This contributes to nearly half of agricultural non-CO_2 GHGs in EU28, as shown in Figure 63. The activity driver for soil emissions used in GAINS is nitrogen input on agricultural land, which is the sum of the nitrogen contained in mineral fertilizers applied, animal manure spread and crop residues left on fields. Historical activity numbers are taken from Eurostat (as of November 2015) while future trends in mineral fertilizer input on lands and animal numbers are adopted from projections made by the CAPRI model. Country-specific information on crop residues and animal excretion rates for years 2005 and 2010 are based on national reporting to the UNFCCC (November 2015 version) and kept constant in future years. N_2O emissions from soils are estimated at 181 Mt CO_2eq in 2005 with a slight decline of two percent to 2030 and four percent to 2050 due to declining trends mostly in mineral fertilizer use (see Figure 64). A marked decline in mineral fertilizer use occurs after 2025 in line with an expansion of new energy crops that do not need significant fertilizer quantities (see section on LULUCF).

The other major sector of agricultural non-CO_2 GHGs is livestock rearing, consisting of several individual sources (dairy and non-dairy cattle, pigs, sheep and poultry), which together account for 258 Mt CO_2eq in 2005 with a slight decline to 250 Mt CO_2eq in 2030. CH_4 emissions are released from enteric fermentation in ruminants and during management of animal manure. N_2O and CH_4 are formed from microbial activity in manure when handled under anaerobic conditions, N_2O also under specific aerobic conditions. Enteric fermentation and manure management emissions from dairy cows are driven by the development in animal numbers as well as by changes in metabolic activity: more productive cows (productivity expressed as milk yield per cow) will cause higher emissions per animal.

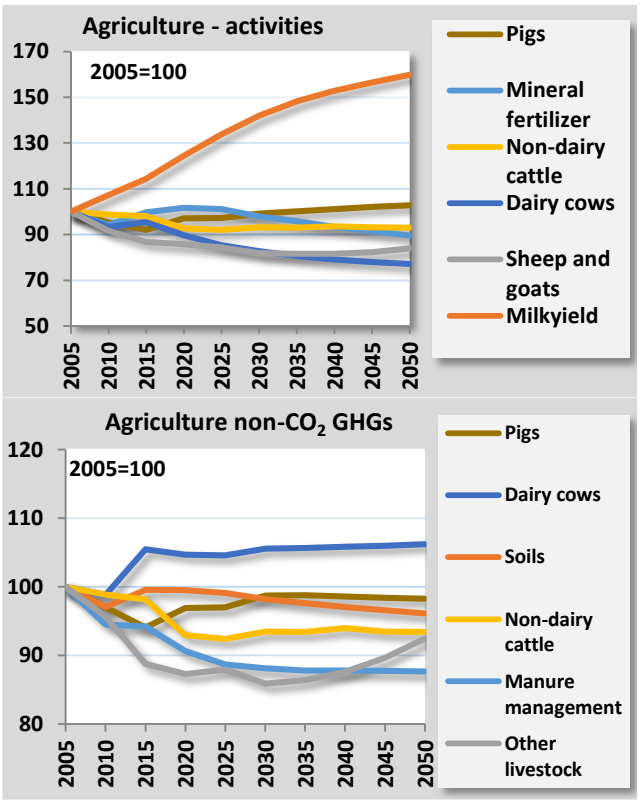
FIGURE 63: AGRICULTURE SECTOR: EU28 REFERENCE NON-CO_2 EMISSIONS 2005 TO 2050



The increase in CH_4 emissions from dairy cows in Figure 64 is the result of an increased milk production. This is the combined effect of a 17 percent decline in animal numbers and a 42 percent increase in the average milk yield per cow between 2005 and 2030. For other animal categories, emissions are driven by animal numbers disregarding effects of potential productivity increases. The CH_4 emissions from livestock remain stable despite increasing animal numbers across all years. This is related to the estimated effect on emissions of the capacity to treat manure in anaerobic digesters (ADs) to recover heat and electricity for on-farm and off-farm use. In the Reference projection, the capacity of farm ADs increases gradually over time due to existing incentives to stimulate farm AD adoption in several Member States as well as expected future implementation of additional policies also in other Member States to stimulate uptake of farm AD technology as part of national strategies to meet the agreed renewable targets for 2020. The latter uptake

is in GAINS modelled in consistency with PRIMES model assumptions on the effects of national renewable policies.

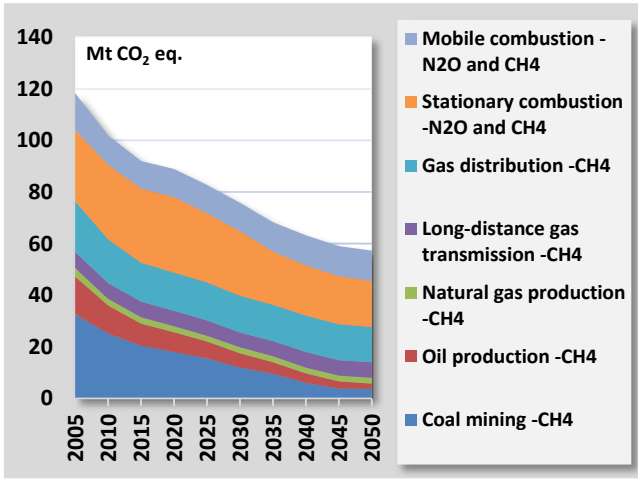
FIGURE 64: AGRICULTURE SECTOR ACTIVITY DRIVERS AND EMISSIONS OF NON-CO_2 GHGS IN EU28



Energy sector

Non-CO_2 GHG emissions from fossil fuel extraction and energy use were estimated at 118 Mt CO_{2eq} in 2005 and are expected to decline by 36 percent to 2030 and by over 50 percent to 2050. Energy sector sources of non-CO_2 GHGs are fugitive leakage of CH_4 from fossil fuel extraction and transportation and CH_4 and N_2O emissions from fuel combustion, as shown in Figure 65. N_2O from combustion sources is partly a direct by-product of combustion as well as a side-effect of using NO_x control technologies on both mobile and stationary combustion sources. Low-NO_x technologies like fluidized bed combustion or selective NO_x reduction technologies will reduce NO_x emissions but may in some instances strongly increase N_2O emissions. The relative decline in N_2O emissions from combustion in Figure 65 is stronger than the expected decline in total energy consumption. This is the result of a fuel use shift in stationary sources away from fluidized bed combustion of fossil solid fuels. CH_4 emissions from extraction of coal, natural gas and oil decline in line with the expected reduction in the production of these fuels in the EU. The driver for the projected leakage from long-distance gas transmission and gas distribution networks is the gas consumption in the respective country. Leakage from this source does not decline proportionately with gas consumption due to a relatively stronger increase in demand in countries which report higher leakage rates.

FIGURE 65: ENERGY SECTOR EMISSIONS OF NON-CO_2 GHGS IN EU28



Waste and wastewater sectors

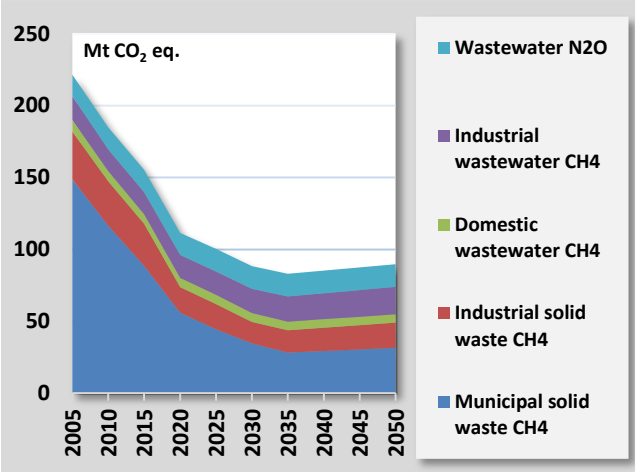
CH_4 from solid waste is released when biodegradable matter decomposes under anaerobic conditions in landfills or during storage and handling of biodegradable waste in different waste treatment processes. Due to the slow decomposition of waste in landfills, GAINS models future emissions as driven by the gross (pre-treatment) amounts of waste generated ten or twenty years before. Further parameters include the effect on emissions of all Member States meeting the requirements of the Landfill Directive by 2020, i.e., diverting biodegradable waste away from landfills and control and recovery of landfill gas. The gross amounts of solid waste generated are driven by GDP and urbanization rate for municipal solid waste and by value added in the relevant manufacturing industries. For a few countries, the methodological shift to the IPCC 2006 guidelines meant almost a doubling in reported methane emissions from landfills, while for others it did not have a significant effect. As the difference stems

from taking a longer historical time perspective into account, the approach has been to apply the GAINS methodology consistently across countries and refer any difference between the GAINS estimate and the landfill emissions reported by countries for years 2005 and 2010 to a separate emission category reflecting emissions from "Historical solid waste disposal". Due to the progressing decomposition, emissions in this category are expected to be phased-out linearly until year 2035.

In 2005 the waste and wastewater sectors in the EU28 are estimated to have released 225 Mt CO_2eq. About half comes from municipal solid waste as shown in Figure 66. The implementation of the EU Landfill Directive together with the phase-out of historical landfill emissions, are expected to reduce CH_4 emissions from municipal and industrial solid waste by more than 70 percent between 2005 and 2030. The deeper cuts in emissions between 2010 and 2030 are expected from the increased diversion of biodegradable waste away from landfills through source separation and treatment, and the expected reduction of activity in historic landfills. Taking into account the time lag between disposal and emission release from landfills, the full effect of the Landfill Directive on CH_4 emissions is achieved only in 2035. Thereafter emissions are expected to increase slightly in response to future growth in the generation of waste driven by growth in GDP and industry value added.

Wastewater from households and organic processes in industry contain nitrogen and organic compounds which are decomposed in wastewater treatment plants before discharge. During the process CH_4 and N_2O are formed and released. Figure 66 shows that the release of CH_4 and N_2O from wastewater handling and treatment in EU28 is expected to remain at a level of about 40 Mt CO_2eq between 2005 and 2050. The activity driver for N_2O emissions from wastewater is total population. Drivers for CH_4 emissions from domestic wastewater are the number of people connected to centralize (urban) and decentralized (rural) collection of wastewater. The activity data used to estimate CH_4 emissions from industry wastewater is the expected chemical oxygen demand in untreated wastewater from the manufacturing of food, pulp and paper, and organic chemical products. Projections of future emissions are driven by growth in value added in respective industry.

FIGURE 66: WASTE AND WASTEWATER SECTOR EMISSIONS OF NON-CO_2 GHGS IN EU28



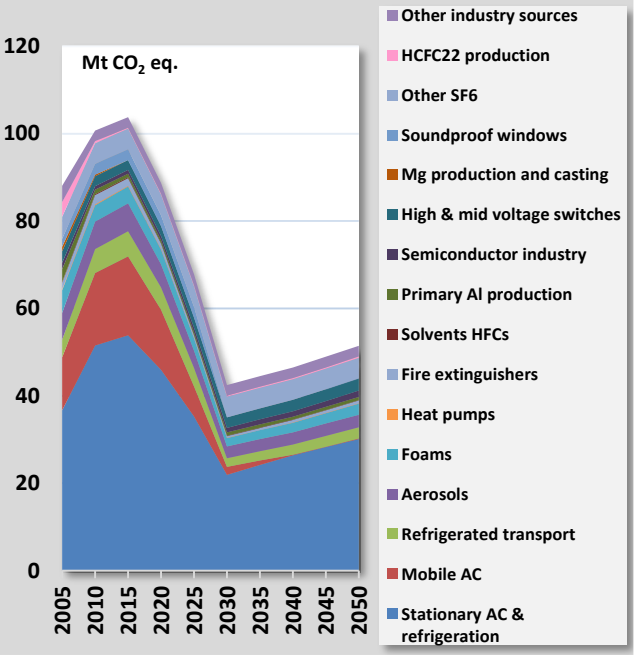
The EU Urban Wastewater Treatment Directive regulates the release of waterborne pollutants in wastewater from urban households and food industry. "Appropriate treatment" must be in place by 2005 and this is expected to require a conversion from primary mechanical treatment to secondary/tertiary anaerobic treatment with biogas recovery. As a side-effect of improved water quality, such a conversion also reduces the formation and release of CH_4. CH_4 emissions from domestic and industrial wastewater drop slightly between 2005 and 2010 primarily due to extensions of secondary/tertiary wastewater treatment in some Member States but also as more people in rural areas will be connected to centralized wastewater treatment. Future CH_4 emissions from domestic wastewater treatment decline due to replacement of old wastewater plants with more effective plants as part of the natural turnover of capital. This assumption does not apply to the more small-scale treatment of industrial wastewater and future CH_4 emissions from industrial wastewater are therefore expected to grow proportionately to value added in the relevant industries.

F-gas emissions sources

Emissions of fluorinated gases (F-gases) considered here are HFCs, PFCs and SF_6. HFCs are primarily used as cooling agent in air conditioners (AC) and refrigeration, but also as blowing agents in foams and as

propellants for aerosols. Sources of PFC emissions are primary aluminum production and semiconductor industry, while SF_6 serves a variety of uses in e.g., high and mid voltage switches, magnesium production and casting, soundproof windows, sports and military equipment. Although used in small quantities, the high warming potentials and long lifetimes in the atmosphere make the contribution of these gases to global warming significant in CO_2-equivalent terms. Figure 67 shows how F-gas emissions in EU28 are expected to remain at levels between 90 and 100 Mt CO_2eq between 2005 and 2020, with a marked decrease thereafter as a result of the new F-gas Regulation (EC 517/2014). After 2030, no further legislation is considered in the Reference Scenario. Thus, emissions are projected to increase with economic growth and increased demand for F-gas services.

FIGURE 67: F-GAS SOURCES: EU28 REFERENCE EMISSIONS 2005 TO 2050



In GAINS, demand for cooling and refrigeration is primarily driven by economic growth along with cooling degree days, commercial floor space and assumptions about technology penetration and saturation rates. The EU F-gas Regulation of 2006 banned the use of certain F-gases. The Directive on Mobile Air-Conditioning (MAC) systems (Directive 2006/40/EC) requires that passenger cars use more climate friendly refrigerants in steps from 2008 onwards. The phase-out of high GWP cooling agents in mobile air conditioners (MACs) is expected to contribute to significant emission reductions. In GAINS it is assumed that the use of HFC-134a in MACs is replaced by HFO-1234yf with a GWP_{100} of 4 resulting in an almost complete phase-out of the warming potential of these emissions by 2040. A major impact on emissions up to 2030 is expected from the new EU F-gas Regulation adopted in 2014. This Regulation requires a reduced sale of HFCs in the EU in 2030 to one fifth of the amount sold in 2015. The already implemented legislation to control F-gas release together with the stricter national F-gas legislation adopted in a few member states (Austria, Belgium, Denmark, Germany, Netherlands and Sweden) are expected to contribute to the significant reductions in future F-gas emissions displayed in Figure 67.

Non-CO_2 sources in the EU-ETS

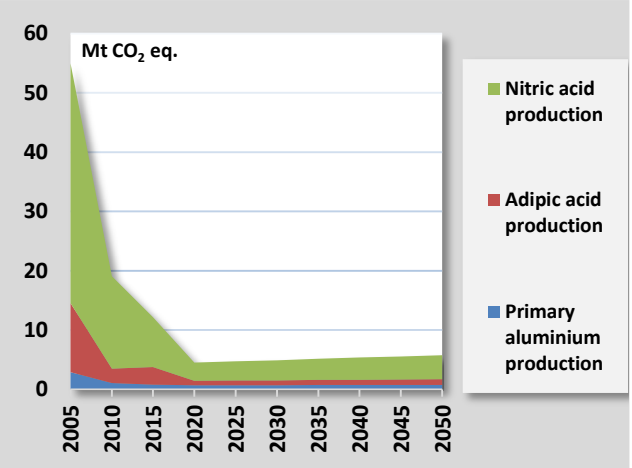
Since 2013 N_2O emissions from nitric and adipic acid production and PFCs from primary aluminum production are regulated under the EU Emissions Trading System (EU-ETS). In 2005 these emissions amounted to 55 Mt CO_2eq or 6 percent of total non-CO_2 GHGs in EU28 (see Figure 68). The anticipation of the ETS inclusion, the low mitigation costs relative to the carbon price level and the economic crisis, led to a sharp decline of 65 percent in reported emissions between 2005 and 2010 as shown in Figure 68. By 2020 the expected decline is more than 90 percent due to full adoption of available and improved technologies to control N_2O emissions in nitric and adipic acid production as well as a reduction in PFC emissions from primary aluminum production following a phase out of outdated production technologies.

Due to similarities in process, glyoxal production (one plant in EU28 employing the nitric acid production pathway) has been dealt with in combination with adipic acid production. Caprolactam production, which is not included in the EU-ETS, is now covered in GAINS separately outside the EU-ETS, using the same abatement technology and increase over time as nitric acid production.

According to country reporting of emissions to the UNFCCC, much of the mitigation potential existing in

2005 had been installed already in 2010. It is expected that this development continues in the future until the full mitigation potential is exhausted.

FIGURE 68: NON-CO_2 SOURCES IN THE EU-ETS: EMISSIONS IN EU28.

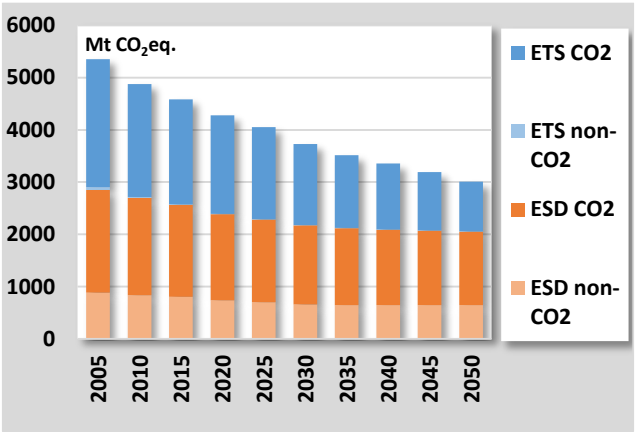


3.4.3 Total GHG, ETS and ESD emissions

Overall, in 2020, the total reduction in GHG emissions relative to 1990 is 25.7%, resulting from a 22% reduction of CO_2 emissions and a 39% reduction of emissions from non-CO_2 gases, particularly in waste and industry sectors. The projected reductions are higher than the EU's 20% GHG emission reduction target. In the ETS sectors, GHG emissions are reduced by 24.6% relative to 2005. Regarding the ESD sectors, GHG emissions reduce by 16.1% in 2020 relative to 2005, more than the EU wide 10% reduction target. The national 2020 ESD targets are projected to be achieved domestically in the majority of countries.

Until 2030, developments result in total GHG emissions being reduced by 35% relative to 1990. Emissions of the ETS sectors reduce by almost 38% compared to 2005, with 42% being the corresponding figure for power generation alone. Figure 69 shows the evolution of GHG emissions over the projection period. It can be noted that dedicated policies imply that ETS emissions reduce faster than overall emissions; this is true for both CO_2 and non-CO_2 emissions. ESD sectors also see a decrease in emissions but not as strong (by 23.7% compared to 2005). This reflects a blend of stronger reduction trends as in the ETS sectors, in sectors like waste and HFCs and lower reduction trends in other sectors, notably agriculture, transport and wastewater. Finally, in a 2050 perspective, emissions continue to decrease, primarily driven by developments in power generation. Overall GHGs emissions are reduced by 48% relative to 1990.

FIGURE 69: EVOLUTION OF TOTAL GHG EMISSIONS[59]



The decreasing trend in emissions also beyond 2030 is well pronounced, especially for the power generation sector, notably driven by the continuous decrease of the ETS cap in line with the current linear factor. However, in line with the EU's objective of 80 to 95% GHG emissions reduction in 2050 compared to 1990, the EU agreed on a domestic target of at least 40% GHG emissions reductions in 2030 and the Roadmap for moving to a low carbon economy in 2050[60] sets milestones for GHG emissions reductions in the EU of 60% in 2040 relative to 1990 and 80% in 2050, while the projections in the Reference Scenario are 35% reduction in 2030 and 48% reduction in 2050.

3.4.4 LULUCF emissions and removals and their drivers

The EU28 LULUCF sector is at present a net carbon sink which has been sequestering annually on average more than 300 Mt CO_2eq over the past decade (2000-13) according to the UNFCCC inventory data[61]. In the Reference Scenario, the LULUCF sink is expected to decline in the future to -288 Mt CO_2eq in 2030 from -299 Mt CO_2eq in 2005 and decreases further after 2030. This decline is the result of changes in different

[59] Excluding LULUCF emissions and removals. For comparability reasons over time, ETS and ESD emissions for 2005 and 2010 are reported in ETS phase 3 scope as valid from 2013.

[60] COM(2011)112

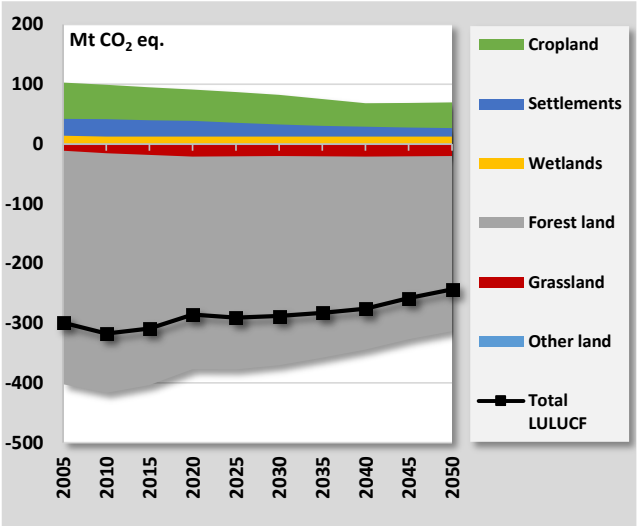
[61] http://unfccc.int

land use activities of which changes in the forest sector are the most important. The latter are partly driven by the increase in timber demand for bioenergy that is expected in order to reach the Renewable Energy targets in 2020, but also due to the age structure of EU forests which leads to less annual increment. Figure 70 shows the projection of the total EU28 LULUCF sink in the Reference Scenario and the contribution from different land use activities. Reference projections for LULUCF emissions by country and subsector are available in Appendix 4.

At present, the carbon sink in managed forests[62] (-354 Mt CO_2eq in 2005), without applying any accounting rules, is the main contributor to the LULUCF sink. The forest management sink is driven by the balance of forest harvest and forest increment rates (accumulation of carbon in forest biomass as a result of growth of the trees with the age). Forest harvest is projected to increase over time from 516 million m^3 in 2005 to 565 million m^3 in 2030 due to growing demand for wood for energy production but also material use up to 2050. The forest increment is projected to decrease with the EU forest becoming older from 751 million m3 in 2005 to 725 million m3 in 2030. As a consequence, the carbon sink in managed forests declines by 32% until 2030. This decline in the managed forests carbon sink is partially compensated by a rising carbon sink from afforestation and decreasing emissions from deforestation. Increasing demand for biomass drives wood prices up and increases the value of forest areas.

Emissions from deforestation continue to decline, in line with past trends, from 63 Mt CO_2eq in 2005 to 20 Mt CO_2eq in 2030. Carbon sequestration from afforested areas increases steadily to 99 Mt CO_2eq by 2030, as new forests are continuously, though at slower rate, being established. But also young forests that were established over the last 20 years get into a phase of high biomass production.

FIGURE 70: DEVELOPMENT OF THE EU28 LULUCF EMISSIONS IN MT CO_2EQ UNTIL 2050

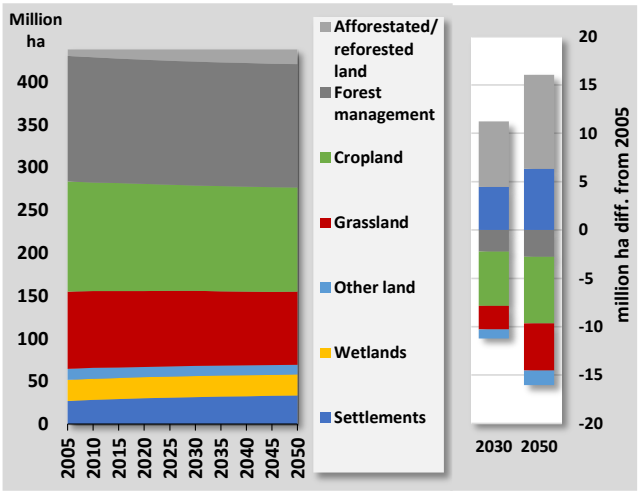


Activities in the agricultural sector (cropland and grassland) have a smaller impact on the total LULUCF sink compared to the forest sector. Still, net carbon emissions from cropland are projected to decline by some 18% by 2030 compared to 2005 as soils converge towards soil carbon equilibrium over time. In addition, perennial crops (miscanthus, switchgrass and short rotation coppice) that typically sequester additional carbon in soil and biomass contribute to decreasing cropland emissions. By 2030, 0.9 Mha of perennial crops are expected to be cultivated. The grassland sink doubles by 2030 compared to 2005 levels as land continues to be converted to grassland e.g. through cropland abandonment and stabilizes at -19 Mt CO_2eq thereafter.

Figure 71 shows the EU28 LULUCF sector land balance until 2050. Over time, the forest area expands by 3% in 2030 and 4% in 2050 compared to 2005 at the expense of cropland and grassland taken out of production. Cropland (-5%) and grassland (-5%) areas decrease slightly until 2050 due to afforestation and expansion of settlements. The area of perennial crops for renewable energy production is growing slowly until 2030 and only thereafter at a higher pace.

[62] Forest land remaining forest land

FIGURE 71: EU28 LULUCF SECTOR LAND BALANCE IN MHA UNTIL 2050



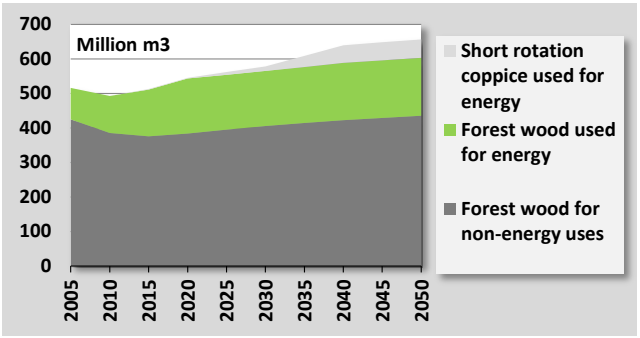
The following sections provide a more detailed overview of the drivers, emission projections and overall trends in the different LULUCF sub-sectors.

Emissions from forest land

The current net forest sink (the sum of forest management, afforestation, deforestation and harvested wood products) is projected to decrease from -391 Mt CO_2eq in 2005, to -350 Mt CO_2eq in 2030 and -293 Mt CO_2eq in 2050 which corresponds to a decline by 10% and 25% in 2030 and 2050, respectively. This is the result of different, partly, opposing trends. Increasing wood demand is an important driver which increases forest harvest and drives biomass prices up but also a projected decline in the forest increment due to forest ageing results in a decrease in the forest management sink. However, rising demand for wood also drives additional afforestation and less deforestation which dampens the overall decline of the net forest sink.

The carbon sink in managed forests declines from minus 354 Mt CO_2eq in 2005 to minus 242 Mt CO_2eq in 2030 and minus 151 Mt CO_2eq in 2050 as forest harvest removals increase steadily over time. Total forest harvest in EU28 is projected to rise from 516 million m^3 in 2005, to 565 million m^3 in 2030 and 603 million m^3 in 2050. Until 2030, additional forest harvest is mainly driven by increasing biomass demand for energy production. The share of wood removed for energy production in the total forest harvest increases from 18% in 2005, to 28% in 2030 and stabilizes thereafter.

FIGURE 72: EU28 BIOMASS HARVEST FROM FOREST (REMOVALS) AND SHORT ROTATION COPPICE IN MILLION M3 UNTIL 2050

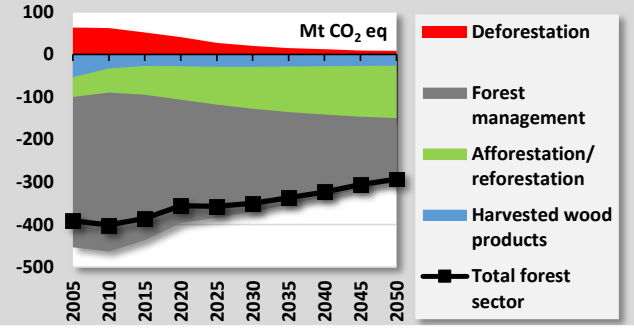


Increment of forests available for wood supply is slowly decreasing from 4.9 m^3/ha in 2005 to 4.3 m^3/ha in 2050 (total increment of forests available for wood supply declines from 751 million m^3 in 2005 to 688 million m^3 in 2050). Reasons for the declining forest increment are a change in age class structure towards a higher share of older forest stands that grow at lower rates and a saturation of biomass accumulation. This trend might be reversed after 2050 following the more intensive use of forest (resulting in re-established younger forests stands) in the second half of the century. Despite a decrease of forest increment over time due to forest ageing, in 2050 the total forest increment is still well above the total wood removals which sum up to 603 million m^3. By 2030, short rotation coppice provide 14 million m^3 of biomass for energy production, by 2050 it rises to 53 million m^3. The carbon sink in harvested wood products (biomass for material use is processed to final products) is decreasing over time, as harvested wood for material declines between 2005 and 2015 and the historical harvested wood pool is decaying over time. Consequently, the carbon sink of harvested wood products decreases from -54 Mt CO_2eq in 2005 to -29 Mt CO_2eq in 2030 and -26 Mt CO_2eq in 2050.

The carbon sink from afforested areas is also growing steadily until 2050. Even though annual afforestation and reforestation rates decrease over time, a total of 7 Mha of land will be afforested between 2005 and 2030, and 10 Mha by 2050. In 2030, 4% of the total forest area will be newly planted forests since 2005, 6% in 2050. The total forest area is projected to increase from 155 Mha in 2005, to 159 Mha in 2030 and 162 Mha in 2050. In total, afforested areas are projected to sequester 99 Mt CO_2eq in 2030 and 123 Mt CO_2eq in

2050 (see Figure 73). Progressively the new forests go into a phase of high production and provide biomass to the market. Towards 2050 these forests are therefore also taking harvest pressure from older forests and thus help to preserve the sink in existing managed forests.

FIGURE 73: DEVELOPMENT OF THE EU28 EMISSIONS/REMOVALS IN THE FOREST SECTOR IN MT CO_2EQ UNTIL 2050



Emissions from deforestation continue to decrease from 63 Mt CO_2eq in 2005, to 20 Mt CO_2eq in 2030 and 8 Mt CO_2eq in 2050 as deforestation drops from 160,000 ha in 2005 to 43,000 ha in 2030. This development is consistent with historical trends and the stricter deforestation policies but is also driven by increasing biomass prices that increases the value of forest areas. Figure 73 shows the development of the carbon sink in the forest sector for the different activities until 2050.

Emissions from cropland

Cropland is currently a net source of CO_2 in EU28. Over time, emissions are projected to decrease from 61 Mt CO_2eq in 2005, to 50 Mt CO_2eq in 2030 (18% decrease in comparison to 2005) and 43 Mt CO_2eq in 2050 (30% decrease). One of the main drivers for this decline is a saturation effect as soils emit less carbon when converging towards their equilibrium carbon stocks given a certain management practice over time. Disturbances of the equilibrium due to a change in management or land use lead to a new equilibrium.

Another important driver is the projected establishment of perennial crops for renewable energy production which has a positive effect on the amount of carbon stored in the soil compared to conventional crops. The PRIMES biomass supply indicates that with growing demand in bioenergy the supply of these crops will grow and substitute partially forest biomass in the long term as they are relatively cost-effective. Cropland area used for energy productions stabilizes at around 11 Mha from 2030 onwards, of which 1 Mha by 2030 and 3 Mha by 2050 are covered by perennial crops. Emissions from cropland remaining cropland decline from 56 Mt CO_2eq in 2005 to 45 Mt CO_2eq in 2030 and 37 Mt CO_2eq in 2050 while emissions from land converted to cropland remain at around 5 Mt CO_2eq over time.

Total cropland area is projected to decrease from 129 Mha in 2005, to 123 Mha in 2030 and 122 Mha in 2050. The main subcategory, cropland remaining cropland, declines stronger from 123 Mha in 2005 to 112 Mha in 2030 and 105 Mha in 2050. Land converted to cropland increases from 6 Mha in 2010 to 11 and 16 Mha in 2030 and 2050 respectively.

Emissions from grassland

Grassland is a net carbon sink in the EU28. Over time, this sink increases from -9 Mt CO_2eq in 2005 to -19 Mt CO_2eq in 2030 and stabilizes thereafter. This result is mainly driven by land conversion to grassland as this land use change tends to sequester carbon after conversion. Even though total grassland area decreases slightly from 90 Mha to 86 Mha by 2050, land converted to grassland sequesters by 2030 around 40 Mt CO_2eq thereby being the main driver of the increase in the net grassland sink. Grassland remaining grassland declines from 77 Mha in 2005 to 70 Mha in 2030 and 69 Mha in 2050 due to afforestation and expansion of settlements. Land converted to grassland increases from 14 Mha in 2010 to 18 Mha in 2030 e.g. through the abandonment of cropland but stabilizes thereafter until 2050.

Emissions from wetlands, settlements and other land

Emissions from wetlands are not modelled and kept constant at 2013 levels as reported in UNFCCC 2015 data[63]. Emissions from wetlands amount to 12 Mt CO_2eq. Settlement area is assumed to increase at a

[63] http://unfccc.int

smaller pace over time following a logarithmic expansion trend based on historical UNFCCC data. Consequently, settlements emissions are projected to decrease from 28 Mt CO_2eq in 2005 to 20 Mt CO_2eq by 2030 and 14 Mt CO_2eq by 2050. Emissions from other land remain stable at around 2 Mt CO_2eq over time. In EU, around 25 Mha are covered by wetlands, 12 Mha by other land and settlements are projected to increase from 27 Mha in 2005 to 31 Mha by 2030 and 33 Mha by 2050.

3.5 Total energy system and other mitigation costs

3.5.1 Investment expenditures

Investment expenditures for energy supply purposes increase until 2020, slow down until 2035 and increase again more significantly from 2035 onwards. An exception is grid investment which is higher than historical trends.

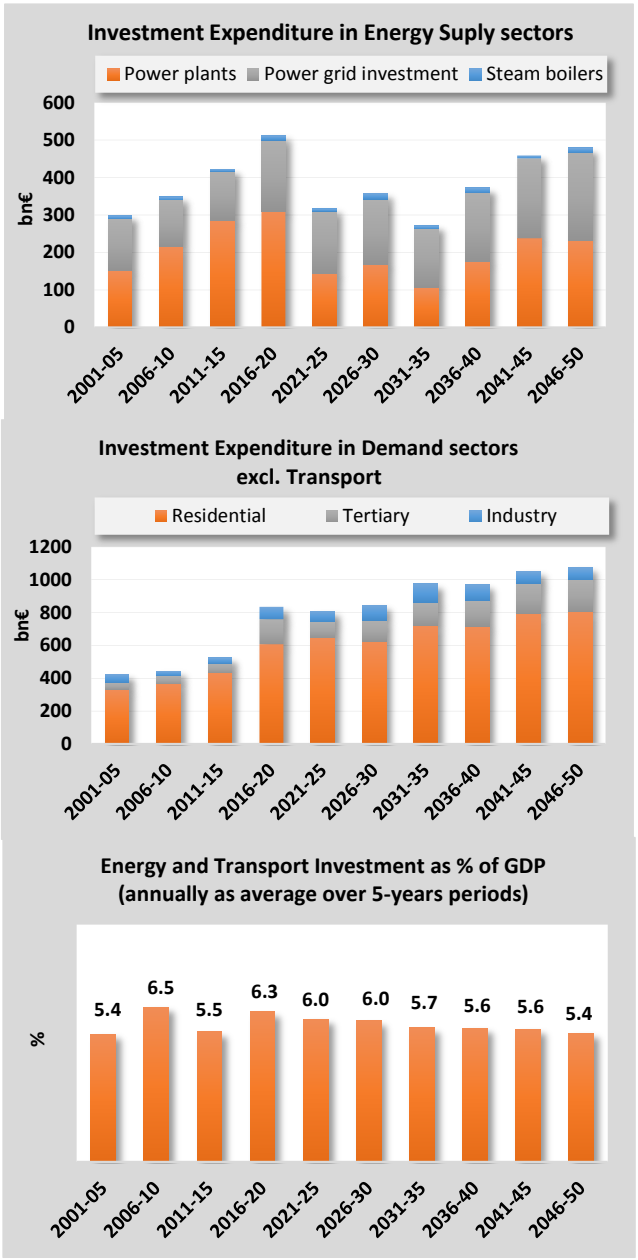
Power plants investments are high in the time period until 2020 driven by high investments in RES required to achieve the 2020 targets, as well as the known investments for new power plants and refurbishment of thermal and nuclear power plants. Details on the investments in power generation can be found in section 3.2.1.

Energy-related investment expenditures in demand sectors remain higher than past trends over the entire projection period. The largest increase is in the short term to 2020 due to the policies giving incentives for energy efficiency investments. However the investments continue to increase throughout the projection period as more efficient equipment (with higher capital costs) enter the market.

Investment expenditures for the transport sector (related to transport equipment) increase throughout the projection period, however they remain between 4% and 4.5% of GDP throughout the projection period.

Overall investments in energy and transport remain rather stable as a share of GDP over the projection period.

FIGURE 74: INVESTMENT EXPENDITURES



3.5.2 Energy system costs

The PRIMES model calculates energy system costs from an end-user perspective; they are annual costs incurred for energy services of end-users including annualised capital costs, variable and fuel costs. To annualise investment expenditures of end-users for reporting purposes the version of PRIMES used for the Reference Scenario uses a 10% discount rate across all sectors.

Energy system costs are increasing throughout the projection period. However, relative to GDP the energy system costs stay rather stable and even decline in the medium to long term. Energy system costs increase to

2020, also as percentage of GDP, as a large number of investments are undertaken to achieve the existing policy targets and objectives. Moreover, increasing international prices contribute to the increase of energy system costs, even though fuel cost becomes a less important component of energy cost over time, due to energy efficiency gains and electrification.

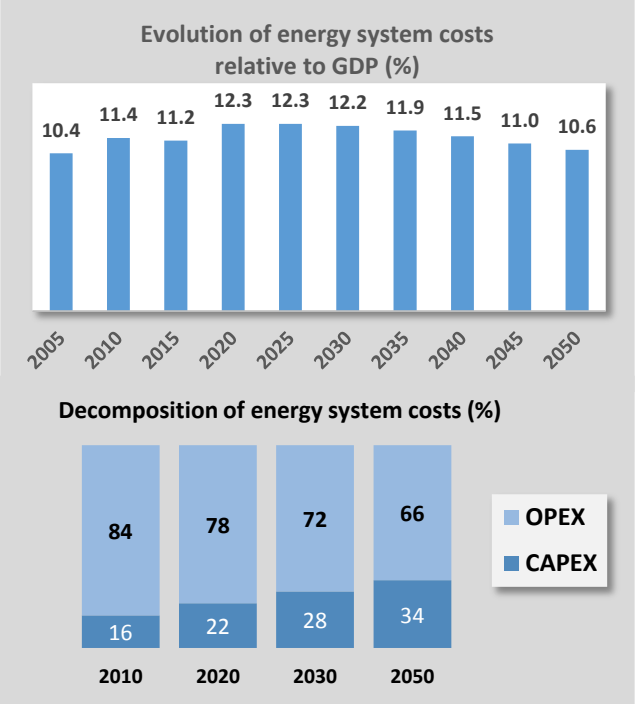
Overall, in 2020 total system costs constitute 12.2% of GDP, rising from 11.4% in 2010[64]. In 2020 the share rises to 12.3% and decreases thereafter, reaching 2005 levels in 2050, as the system reaps benefits from previously undertaken investments (notably via fuel savings).

Reflecting increasing capital intensiveness of the energy system, the share of CAPEX (capital costs and direct efficiency investments) in total system costs increases over time, reaching 34% in 2050 from 16% in 2010 (excluding ETS auction payments). Auction payments are very small compared to total energy system costs; it should be noted that auction payments do not represent an actual economic cost, as the revenues are recycled into the economy.

Regarding OPEX, electrification of the residential and the tertiary sectors over time result in electricity costs becoming the main OPEX component for these sectors, as well as steam costs. Conversely, the share of other fuel costs declines over time, despite increasing fuel prices. CAPEX costs increase throughout the projection period and increase their share from 32% in 2010 to, respectively, 35% in 2020, 41% in 2030 and 46% in 2050 for households; for services the share increases from 16% in 2010 to 28% in 2050. This increase is due to investments in more efficient appliances and equipment which have higher capital costs and lower fuel expenditures.

For the industrial sector, fuel expenditures, including electricity, increase slightly throughout the projection period. Decreasing long term electricity prices somehow compensate the increase in fossil fuel expenditures. Also for this sector the share of CAPEX costs increase over time as more efficient investments in equipment occur.

FIGURE 75: EVOLUTION OF ENERGY SYSTEM COSTS



Note: OPEX and CAPEX are calculated at the level of final energy consumers. For example, payment for electricity consumption is OPEX from the perspective of the final consumer.

In the transport sector capital costs play an increasing role; the investments in electrically chargeable vehicles lead to higher investment expenditure. The projected uptake of electric vehicles in the Reference Scenario is not sufficient to lead to a breakthrough in the battery cost development which would lead to significant lower costs and possibly lower fuel expenditures. The fuel expenditures increase over time due to increasing fuel prices, although energy consumption reaches similar levels to those of 2010 by 2050.

3.6 Summarising remarks

The policies included in the Reference Scenario – the agreed policies at EU and Member State levels until December 2014 including the legally binding GHG and RES targets for 2020 - are expected to lead to considerable changes in the energy system.

The Reference Scenario analyses key policies aiming at reducing GHG emissions (e.g. EU ETS, CO_2 standards for light duty vehicles), at increasing the RES share (e.g. RES targets and implementing policies), and at improving energy efficiency (e.g. Energy Efficiency Directive, Ecodesign). The increase in RES and

[64] Total system costs include total energy system costs, costs related to process-CO_2 abatement and non-CO_2 GHG abatement.

improvements in energy efficiency also lead to the reduction of GHG emissions. The modelling captures these policy interactions.

Furthermore, the scenario analysis also provides indicators related to competitive energy provision for businesses and affordability of energy use, as these are key aspects for economic and social development.

In the Reference Scenario, GHG emissions decrease in most sectors of the energy system. This is particularly the case in the power generation sector as various decarbonisation technologies reach maturity, despite the increase in gross electricity demand. As a result, the EU energy system sees a strong reduction in the carbon intensity of power generation.

Non-CO_2 emissions trends are diverse, with substantial decreases in e.g. waste and HFCs and small decreases in agriculture. LULUCF is currently an emission sink, although this is projected to decline.

The Reference Scenario projects an increase in renewable energy shares over the projected period. This is first driven by dedicated RES policies and later in the period by the long-lasting effect of current policies, technological progress and better market functioning.

Additionally the energy system is characterised by a continued decoupling of GDP growth and energy demand growth: while the economy grows by 75% between 2010 and 2050, total energy consumption reduces by 15% in the same time period.

Focusing on the short to medium term, the Reference Scenario shows that the period between 2010 and 2020 sees substantial changes in the energy system. This is notably driven by the legally binding targets of the 2020 Energy and Climate package, the CO_2 standards for cars and vans, and the Energy Efficiency Directive. The projection shows that the combined measures achieve 18.4% energy efficiency gains. The EU 2020 RES share is 21.0%, while GHG emission reductions would reach 25.7%. Adopted policies are found to be sufficient to achieve the EU level 2020 target for effort sharing sectors.

Regarding the medium to long term, GHG emission reductions are projected to reach 35.2% in 2030 and 47.7% in 2050. Although emissions reduce substantially, the decrease is less than the target agreed for 2030 and the objective for 2050. The RES share reaches 24.3% in 2030. The ETS, which leads to continued reductions of allowances over the projection period and increasing carbon prices, is a significant driver to RES penetration and further emission reduction. The influence of energy efficiency policies, the CO_2 standards for cars and vans, etc. continues beyond the 2020 horizon, with energy savings of 23.9% projected for 2030.

The changes that the power generation sector undergoes entail considerable capital intensive investments. These include investments into the transmission and distribution systems not least because of the development of the ENTSOE Ten Year Development Plan until 2030. Investment costs have an upward effect on electricity prices - and on energy system costs - in the transitional period until 2030.

Beyond 2030, however, electricity prices stabilize and even decrease. A general effect on total energy system costs is that they become more capital intensive over time. After the structural adjustments in order to cope with the 2020 targets and policies, of which the effects continue in the longer term, total energy system costs grow slower than GDP. This leads to a decreasing ratio of energy system costs to GDP in the period 2030-50.

ANNEXES

4 Annexes

4.1 Detailed policies included in the Reference Scenario

4.1.1 Energy efficiency policies

A description of how energy efficiency policies are modelled within PRIMES is included in section 2.2.1.

Energy Efficiency		
1	Ecodesign Framework Directive	Directive 2005/32/EC
	Stand-by Regulation	Commission Regulation (EC) No 1275/2008
	Simple Set-to boxes Regulation	Commission Regulation (EC) No 107/2009
	Office/street lighting Regulation	Commission Regulation (EC) No 347/2010
	Lighting Products in the domestic and Tertiary Sectors Regulations	Commission Regulation (EU) No 347/2010 Commission Regulation (EC) No 859/2009 Commission Regulation (EC) No 244/2009 Commission Regulation (EC) No 245/2009
	External power supplies Regulation	Commission Regulation (EC) No 278/2009
	TVs Regulation (+labelling) Regulation	Commission Regulation (EC) No 642/2009
	Electric motors Regulation	Commission Regulation (EC)No 640/2009
	Freezers/refrigerators Regulation	Commission Regulation (EC) No 643/2009
	Household washing machines Regulation	Commission Regulation (EU) No 1015/2010
	Household dishwashers Regulations	Commission Regulation (EU) No 1016/2010
	Industrial fans Regulation	Commission Regulation (EU) Regulation No 327/2011
	Air conditioning and comfort fans Regulation	Commission Regulation (EU) No 206/2012
	Circulators Regulation	Commission Regulation (EC) No 641/2009
2	Energy Labelling Directive and delegated Regulations covering: • lamps and luminaires, • household tumble driers • air conditioners • televisions • household washing machines • household refrigerating appliances • household dishwashers • and Commission Directives covering: • household electric ovens • household combined washer-driers • household electric tumble-driers • Labelling of tyres Regulations	Directive 2010/30/EU supplemented by Delegated Regulations and Commission Directives Regulation (EC) No 1222/2009 Commission Regulation (EU) 228/2011 Commission Regulation (EU) 1235/2011
3	Energy Performance of Buildings Directive	
4	Energy Efficiency Directive	Directive 2012/27/EU

4.1.2 Power generation and energy markets

A description of how the internal market is modelled in PRIMES is available in section 2.2.5 and information about the RES Directive is provided in section 2.2.3.

Energy taxation, as well as all national excise duties and VAT are included explicitly in the modelling based on data available from DG TAXUD in the Excise duty tables for energy products.[65] The Energy Taxation Directive is reflected in the EU Reference Scenario 2016; the up to date excise duties rates are kept constant in real terms over time.

Safety and waste management Regulations and Directives for nuclear and other energy products are included in the costs of the technologies and fuels; all facilities are assumed to be compliant with the Regulations.

Power generation and energy markets		
5	Completion of the internal energy market (including provisions of the 3rd package). Since March 2011, the Gas and Electricity Directives of the 3rd package for an internal EU gas and electricity market are transposed into national law by Members States and the three Regulations: - on conditions for access to the natural gas transmission networks - on conditions for access to the network for cross-border exchange of electricity - on the establishment of the Agency for the Cooperation of Energy Regulators (ACER)	Directive 2009/73/EC Directive 2009/72/EC Regulation (EC) No 715/2009, Regulation (EC) No 714/2009 Regulation (EC) No 713/2009
6	Energy Taxation Directive	Directive 2003/96/EC
7	Regulation on security of gas supply	Regulation (EU) 994/2010
8	Regulation on market integrity and transparency (REMIT)	Regulation (EU) 1227/2011
9	Nuclear Safety Directive	Council Directive 2009/71/Euratom
10	Nuclear Waste Management Directive	Council Directive 2011/70/Euratom
11	Basic safety standards Directive	Council Directive 2013/59/EURATOM
12	Directive on the promotion of the use of energy from renewable sources ("RES Directive") incl. amendment on ILUC	Directive 2009/28 EC as amended by Directive (EU) 2015/1513
13	Guidelines on State aid for environmental protection and energy 2014-20	2014/C 200/01

4.1.3 (Cross sectorial) Climate Policies

The ETS Directive including the Market Stability Reserve is fully modelled in PRIMES as described in section 2.2.1. The emission reductions stemming from the Effort Sharing Decision are assumed to be achieved at EU level, which turns out to be the case without the need to assume additional incentives. National targets do not need to be achieved domestically given the existing flexibilities in the legislation and are therefore considered non-binding for the modelling of MS specific emissions. However most MS achieve their targets domestically.

The Regulations and Directives for geological storage of CO_2 are taken into account through the cost of CO_2 storage; national legislation regarding CO_2 storage and its availability are also taken into account.

The F-gas Regulation and the EU framework for LULUCF are fully taken into account in the GAINS and GLOBIOM

[65] http://ec.europa.eu/taxation_customs/taxation/excise_duties/energy_products/rates/index_en.htm

models respectively.

(Cross-sectorial) Climate policies		
14	EU ETS Directive	Directive 2003/87/EC as amended by Directive 2004/101/EC (international credits), Directive 2008/101/EC (aviation), Directive 2009/29/EC (revision for 2020 climate and energy package), Regulation (EU) No 176/2014 (back-loading), Decision (EU) 2015/1814 (Market Stability Reserve), and implementing Decisions, in particular 2010/384/EU, 2010/634/EU, 2011/389/EU, 2013/448/EU (cap), 2011/278/EU, 2011/638/EU (benchmarking and carbon leakage list)
15	Directive on the geological storage of CO_2	Directive 2009/31/EC
16	GHG Effort Sharing Decision	Decision 406/2009/EC
17	F-gas Regulation	Regulation (EU) No 517/2014
18	EU framework for LULUCF	Decision No 529/2013/EU on accounting rules on greenhouse gas emissions and removals resulting from activities relating to land use, land-use change and forestry and on information concerning actions relating to those activities
19	Guidelines on certain State aid measures in the context of the greenhouse gas emission allowance trading scheme post 2012.	2012/C 158/04

4.1.4 Transport related policies

The PRIMES-TREMOVE model of the PRIMES modelling suite is able to take into account the majority of transport-related policies in an explicit way.

The legally binding targets of the RES and FQD for 2020, as amended by the ILUC Directive, are taken into account. Blending mandates are explicitly reflected when foreseen by the Member States.

The Regulations of CO_2 from cars and vans are fully modelled; their implementation is assumed to occur at Member State level.

EURO Regulations for light duty vehicles and heavy duty vehicles are fully taken into account in the model; through the vintage structure of the model the characteristics of the vehicles are maintained throughout the lifetime of the vehicle stock.

Eurovignette and other road charges are taken into account explicitly in the modelling and included in the transportation costs.

Policies affecting transport demand (Single European Sky II, Directive establishing a single European railway area, etc.), are taken in consideration through changes in operation costs, occupancy rates for passenger transport and load factors for freight transport.

Policies associated with the development of refuelling and recharging infrastructure for alternative fuels are fully considered; the model simulates perception of infrastructure availability, and depending on the matching between geographic coverage and trip types availability influences consumer choices.

Transport related policies		
20	Regulation on CO_2 from cars	Regulation (EC) No 443/2009, amended by Regulation EU No 333/2014
21	Regulation EURO 5 and 6	Regulation (EC) No 715/2007
22	Directive on the promotion of the use of energy from renewable sources ("RES Directive") incl. amendment on ILUC	Directive 2009/28 EC as amended by Directive (EU) 2015/1513
23	Fuel Quality Directive	Directive 98/70/EC, as amended by Directive (EU) 2015/1513
24	Regulation Euro VI for heavy duty vehicles	Regulation (EC) No 595/2009
25	Regulation on CO_2 from vans	Regulation (EU) No 510/2011, amended by Regulation EU 253/2014
26	Eurovignette Directive on road infrastructure charging	Directive 2011/76/EU
27	Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles (in public procurement)	Directive 2009/33/EC
28	End of Life Vehicles Directive	Directive 2000/53/EC
29	Mobile Air Conditioning in motor vehicles Directive	Directive 2006/40/EC
30	Single European Sky II	COM(2008) 389 final
31	Directive on inland transport of dangerous goods	Directive 2008/68/EC
32	Third railway package	Directive 2007/58/EC
33	Directive establishing a single European railway area (Recast)	Directive 2012/34/EU
34	Port state control Directive	Directive 2009/16/EC
35	Regulation on common rules for access to the international road haulage market	Regulation (EC) No 1072/2009
36	Directive concerning social legislation relating to road transport activities	Directive 2009/5/EC
37	Regulation on noise-related operating restrictions at Union airports	Regulation (EU) No 598/2014
38	Directive on the sulphur content of marine fuels	Directive 2012/33/EU
39	Roadworthiness Package	Directive 2014/45/EU, Directive 2014/46/EU, Directive 2014/47/EU
40	Regulation on the sound level of motor vehicles	Regulation (EU) No 540/2014
41	Commission Implementing Regulation laying down a performance scheme for air navigation services and network functions	Commission Implementing Regulation (EU) No 390/2013
42	Directive on the deployment of alternative fuels infrastructure	Directive 2014/94/EU

4.1.5 Infrastructure, innovation and RTD and funding

The guidelines on infrastructure have been taken into account in the modelling and the infrastructure developments assumed can be found in section 2.2.6

The funding programmes EEPR and NER300 are taken into account by taking as exogenous investments the facilities which have resulted from these programmes.

Other funding and research projects are taken into account by assuming that these will e.g. lead to improvements in technologies. When the funding leads to specific investments, these are specifically reflected.

Infrastructure, innovation and RTD and funding		
43	TEN-E guidelines	Regulation (EU) 347/2013
44	Regulation establishing the Connecting Europe Facility	Regulation (EU) 1316/2013
45	EEPR (European Energy Programme for Recovery) and NER 300 (New entrants reserve) CCS and innovative renewables funding programme	Regulation (EC) No 663/2009, ETS Directive 2009/29/EC Article 10a(8), further developed through Commission Decision 2010/670/EU and implementing decisions, e.g. C(2014) 4493 and C(2015) 6882
46	Horizon 2020 support to energy research and innovation	Energy research under H2020: info available here: http://ec.europa.eu/programmes/horizon2020/en/area/energy
47	European Structural and Investment Funds European Regional Development Fund (ERDF) European Social Fund (ESF) Cohesion Fund (CF) European Agricultural Fund for Rural Development (EAFRD) European Maritime & Fisheries Fund (EMFF)	Regulation (EU) No 1303/2013 Regulation (EU) No 1301/2013 Regulation (EU) No 1304/2013 Regulation (EU) No 1305/2013
48	TEN-T guidelines	Regulation (EU) No 1315/2013 supported by the Connecting Europe Facility (Regulation (EU) No 1316/2013)

4.1.6 Environments and other related policies

Policies related to the environment are taken into account in the GAINS (IIASA) and where relevant the CAPRI (Eurocare GmbH) models. The Industrial Emissions Directive is taken into account also in the PRIMES model by premature retirement of power plants or limiting operation hours of power plants.

Environment and other related policies		
49	General block exemption Regulation	Commission Regulation (EU) No 651/2014
50	Landfill Directive	Directive 99/31/EC
51	EU Urban Wastewater Treatment Directive	Directive 91/271/EEC
52	Waste Framework Directive	Directive 2008/98/EC
53	Nitrate Directive	Directive 91/676/EEC
54	Common Agricultural Policy (CAP)	e.g. Council Regulations (EC) No 1290/2005, No 1698/2005, No 1234/2007, No. 73/2009 and Regulations (EU) No 1305-1308/2013
55	Industrial emissions (Recast of Integrated Pollution and Prevention Control Directive 2008/1/EC and Large Combustion Plant Directive 2001/80/EC)	Directive 2010/75/EU
56	Directive on national emissions' ceilings for certain pollutants	Directive 2001/81/EC
57	Water Framework Directive	Directive 2000/60/EC
58	Substances that deplete the ozone layer	Relevant EU legislation implementing the Montreal protocol, e.g. Regulation (EC) No 1005/2009 as amended by Commission Regulation (EU) 744/2010

4.1.7 National measures

Relevant national policies and measures indicated in the answers to the Member States' questionnaire are also reflected in the Reference Scenario. This notably includes national RES and energy efficiency policies.

National RES policies are modelled explicitly in PRIMES, with financial incentives leading to additional investments which are "must-take" for the model. Information was taken from the Member States' replies to the questionnaire as well as from additional complementary sources when necessary.

National energy efficiency policies are also taken into account.

Further energy plans already transformed into law such as nuclear policies are also fully taken into account.

NATIONAL MEASURES		
59	Strong national RES policies	National policies on e.g. feed-in tariffs, quota systems, green certificates, subsidies, favourable tax regimes and other financial incentives are reflected.
60	National Energy Efficiency policies	National policies promoting energy efficiency implementing EU directives and policies, as well as specific national policies are fully taken into account

4.1.8 Other policies adopted at international level

Other policies not defined at EU or national level but by international organization are also relevant within the EU. The effect of the energy star programme is taken into account similarly to the eco-labelling.

The WTO agreements are taken into account in the CAPRI modelling; the voluntary PFC (Perfluorinated Compounds) agreement to reduce perfluorocarbon emissions in semiconductors within GAINS.

Relevant International Maritime Organisation (IMO) regulations for energy efficiency of ships and pollutant emissions are taken into account in the PRIMES model for international shipping; the establishment of Sulphur Emission Control Areas (SECAs) zones is also taken into account in the modelling.

OTHER POLICIES AT INTERNATIONAL LEVEL		
61	Energy Star Program (voluntary labelling program)	
62	International Maritime Organisation (IMO) International convention for the prevention of pollution from ships (MARPOL), Annex VI	2008 amendments - revised Annex VI (Prevention of Air Pollution from ships)
63	WTO Agreement on trade with agricultural products from Uruguay round fully respected	
64	Voluntary agreement to reduce PFC (perfluorocarbons, potent GHG) emissions in the semiconductor industry	
65	International Civil Aviation Organisation (ICAO), Convention on International Civil Aviation, Annex 16, Volume II (Aircraft engine emissions)	
66	IMO, Inclusion of regulations on energy efficiency for ships in MARPOL Annex VI	IMO Resolution MEPC.203(62)

4.2 Background information on macroeconomic assumptions

4.2.1 Methodology

Technical approach

For the simulation of the macroeconomic scenario the GEM-E3 model makes use of all the information available on current trends and policies and of a fully updated database as available by the beginning of 2015. GEM-E3 represents in detail agents' behaviour distinguishing between households, firms, the government and the external sector. The model includes the representation of global linkage of capital markets and it represents sectoral investments in an endogenous manner. The macroeconomic scenario simulated with the GEM-E3 model makes use of predefined assumptions on aggregate GDP growth, population, fuel prices, energy and environmental policies that are used as inputs to the GEM-E3 model for each EU Member State and for other countries and regions represented in the model.

GEM-E3 is then calibrated so as to reproduce the GDP and other projections obtained from the studies used. The calibration of the GEM-E3 model to the different data sources is controlled for by productivity figures. Productivity figures are calibrated within a range of values documented in econometric studies in the existing literature, ensuring thus consistency with empirical evidence on productivity developments.

The Reference Scenario simulated with the GEM-E3 model provides numerical projections for the period 2010-50 in 5-year time steps for each EU Member State and for the rest of the world represented by 10 countries/regions. Scenario results regard GDP (in volume), population and labour force, private consumption and investment, energy demand, supply and emissions, trade flows by product type and sectorial activity (using gross value added in volume as a proxy) for 22 sectors in each country/region included in the model. Model results on sectoral activity are used as inputs to the PRIMES model. Sectorial activity is projected in a fully endogenous manner in the GEM-E3 model and it is consistent with the projected macroeconomic structure. Sectorial production includes the detailed representation of agriculture, construction, services that are disaggregated in several sectors (market, non-market services and trade), energy intensive industries, split in 10 sectors, and the rest of the industry sectors aggregated in 6 sectors. Sectoral production of energy intensive industries and its world distribution in the GEM-E3 model respect econometric projections based on the US Geological Survey (USGS) data on physical production by country.

The projection for world energy prices are provided by the PROMETHEUS model. GEM-E3 makes use of identical GDP and population assumptions as in the PROMETHEUS world energy model.

Theoretical considerations

The dynamic calibration of the GEM-E3 macroeconomic projections is based on the assumption that countries record a sustainable output growth rate, where for example excessive current account deficits or surpluses are gradually eliminated. This assumption is compatible with a zero output gap, as the output gap suggests that the economy operates in an inefficient manner. Considering the differences between potential and actual GDP, the macroeconomic projection simulated with the GEM-E3 model assumes that the output gap closes in 2018 so actual and potential GDP growth rates are the same from 2018 onwards. This assumption is compatible with the 2015 Ageing Report prepared by the European Commission.

The model accounts for labour market imperfections since GEM-E3 computes involuntary unemployment through an empirical wage curve. In the long term it is assumed that the economy converges to full potential having no idle resources. The Reference Scenario design is based on the assumption that unemployment rate will decrease and in the long term will converge to the natural rate of unemployment. This assumption is consistent with the 2015 Ageing Report labour market projections to which the GEM-E3 model is calibrated.

Public expenditures are dynamically adjusted in the model so that the public budget of each country balances in the long term and excess deficits or surpluses are reduced. Sectorial investment is derived in the model by an endogenous part, where investments are computed by comparing the sectorial rate of return on

capital with the cost of replacing capital, and partly exogenously, where sectorial growth expectations are introduced.

4.2.2 Data

The macroeconomic scenario makes use of several well established datasets for the EU and the non-EU countries. The database compiled for the macroeconomic scenario has been updated to the latest data available as of the first quarter of 2015. For the EU countries the latest Eurostat statistics have been used including historical data covering the period from 1995 to 2010. Thus the economic indicators reflect in full the latest economic crisis. Depending on data availability the NACE 64, NACE 38 and NACE 10 datasets have been used. All past data are expressed in chain linked volumes of 2010. The methodology follows ESA95 and NACE r2 (chained with NACE r1). In few cases normalization to the NACE 10 figures has been performed. This approach has been employed in cases where the total gross value added in current prices was not equal to the sectoral sum in NACE 64 and NACE 38. Structural Business Statistics (SBS) have also been used in order to disaggregate some sectors into subsectors. For instance the Chemicals sector has been disaggregated into Fertilisers, Petrochemicals, Other Chemicals and Pharmaceuticals.

4.2.3 Sources of main exogenous projections

Projections on the aggregate GDP of the EU countries until 2016 have been based on the European Economic Forecast Autumn 2014[66] prepared by the European Commission-DG ECFIN. Projections on the GDP of the EU Member States for the period after 2016 have been based on the 2015 Ageing Report[67].

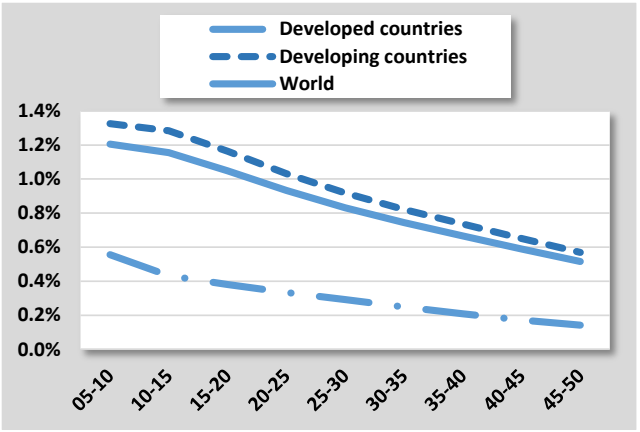
Population projections for the EU make use of the European Population Projections, base year 2013 (EUROPOP2013), for the period 2010 to 2050. The population projections used are compatible with GDP projections as the starting point of the 2015 Ageing Report projections is also the EUROPOP2013 population projections for the period 2013-60.

For non-EU countries GDP projections for the period 2015-19 have been based on the IMF World Economic Outlook[68]. For the period 2020-50 the trends of the IEA World Energy Outlook[69] and OECD Economic Outlook[70] have been followed and GDP growth projections from POLES global scenarios[71] have been taken into account. Population projections for non-EU countries have been based on the use of the medium fertility scenario of 2012 UN Population Prospects.

4.2.4 Global population projections

Population projections show world population to grow from 6.9 billion in 2010 to 9.6 billion in 2050. Population growth is driven mainly by changes in the developing countries and it is projected to lower over time. Projections show a shift in the ageing structure of the world population with a fall in the population aged 15-64.

FIGURE 76: ANNUAL GROWTH RATE OF POPULATION



[66] European Commission (2014). European Economic Forecast. Autumn 2014. Directorate-General for Economic and Financial Affairs. European Economy 7/2014.

[67] European Commission (2014), The 2015 Ageing Report: Underlying Assumptions and Projection Methodologies. European Economy 8/2014. Directorate-General for Economic and Financial Affairs (DG ECFIN) http://ec.europa.eu/economy_finance/publications/european_economy/ageing_report/index_en.htm

[68] International Monetary Fund (2014), World Economic Outlook Database, October 2014 Edition.

[69] International Energy Agency (2014), World Energy Outlook, November 2014 Edition

[70] OECD (2014), OECD Economic Outlook, OECD Publishing, Paris.

[71] Ariane Labat, Alban Kitous, Miles Perry, Bert Saveyn, Toon Vandyck, Zoi Vrontisi. (2015), 'Assessment of Low Emission Levels under World Action Integrating National Contributions, Global Energy and Climate Outlook Road to Paris - GECO 2015', Technical report, JRC-IPTS.

4.2.5 Global economic projections

Ageing population is projected to impact on the world and EU economic outlook to 2050. Demographic effects add to the effects of slow global trade developments, structural changes and productivity growth.

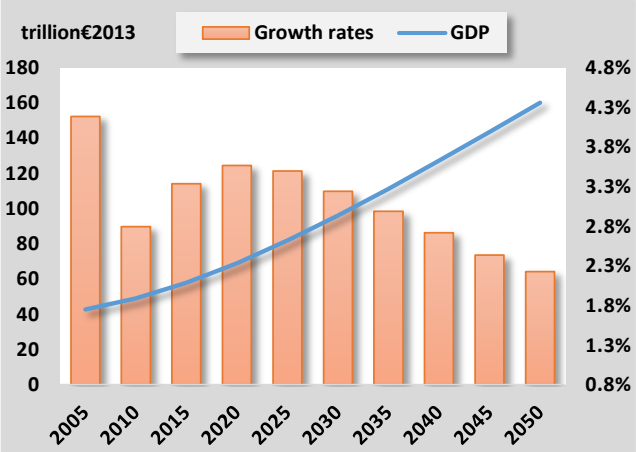
Following the financial crisis, world GDP growth is projected to recover in the coming years, at rates though that reflect weak global trade growth and vulnerable emerging economies (OECD, 2014; 2015[72]). Average GDP growth rate in emerging economies is projected to converge at an annual rate of 0.6%. Decreasing GDP growth rate over time of the emerging economies is partly attributed to lower demand for their exports by the rest of the world.

The transition of the Chinese economy from investments in infrastructure and manufacturing to consumption and services is projected to put further downwards pressure on commodities markets and impact GDP prospects in commodity exporters (like Brazil, Canada, Australia, Russia) but also economies with strong trade links to China (like Japan, Korea and the South-East Asian economies).

Growth in advanced economies, which has been already declining before the financial crisis, recovers at a slow pace reflecting ageing population effects and the slowdown in investment, leading to low capital growth. Advanced economies are projected to deal with the legacies of the crisis regarding negative output gaps and high private or public debt, or both.

The outlook of developing economies incorporates projections on the financial challenges that they will be faced within the coming decades and their possible impact on the economic activity and growth of these countries (see OECD 2014; 2015 and IMF, 2015[73]). Emerging markets have been recently subjected to large and volatile moves of cross-border capital flows.

FIGURE 77 WORLD GDP (EXCLUDING EU MEMBER STATE COUNTRIES)



Despite the growth and financial weaknesses, world GDP is projected to rise to 2050 as a response to supportive macroeconomic policy actions like stimulus measures in China, regional trade agreements, structural reforms and unification of financial architecture in the EU, etc. (OECD, 2015[74]). In the short term the projected decline in commodities prices, particularly in energy prices, underpin the expected short recovery in advanced economies. Global GDP increases indicating an uptake in growth in emerging markets and developing economies that counterbalances the more modest growth in advanced economies. This development reflects the underlying assumption that countries return to more normal rates of growth in countries and regions under stress or in those economies growing below potential in the recent years. In a similar manner developed economies are projected to grow to 2050 at more modest rates reflecting the gradual closure of output gaps (particularly in the EU and the United States) due to the legacies of the latest crisis as well as the impact of demographic development on labour supply and hence on potential output, on public debt or both.

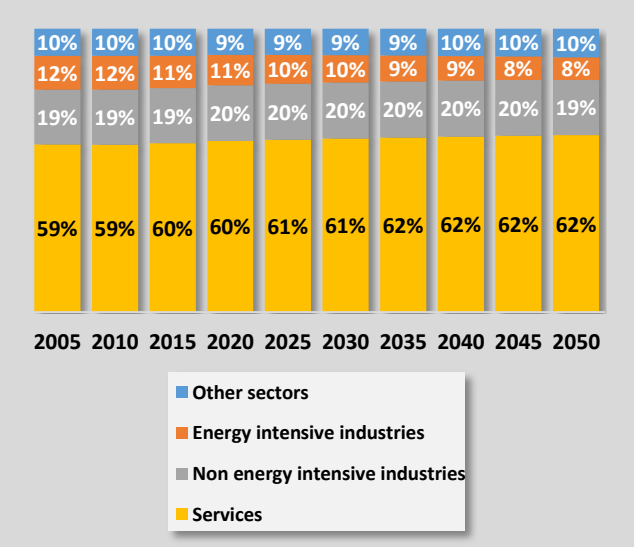
4.2.6 Global sectorial projections

The macroeconomic projections show that at global level services account for 62% of total gross value added in 2050 from 59% in 2010. Services continue to

[72] OECD (2014), OECD Economic Outlook, OECD Publishing, Paris.
OECD (2015), OECD Economic Outlook, OECD Publishing, Paris.
[73] OECD (2014), OECD Economic Outlook, OECD Publishing, Paris.
OECD (2015), OECD Economic Outlook, OECD Publishing, Paris.
IMF (2015). World Economic Outlook. Uneven growth. Short and long-term factors. World Economic and Financial Surveys. International Monetary Fund. Washington, DC.
[74] OECD (2015), OECD Economic Outlook, OECD Publishing, Paris.

play an important part in the economic activity recorded in developed countries. Services also increase significantly in developing countries which are assumed to converge in terms of economic structure with developed economies where services account for a large share of the economic activity.

FIGURE 78: STRUCTURE OF THE WORLD ECONOMIC ACTIVITY



Energy intensive industries are projected to reduce their share in total economic activity at world level, while other sectors maintain their current shares to 2050.

4.3 Methodological assumptions on fossil fuel price projections

The purpose of the Reference Scenario projections as developed by PROMETHEUS is the quantification of a consistent global fossil fuel price outlook for the period 2015-50 which is then used as an input to the European energy system modelling with PRIMES.

The evolution of prices for internationally traded fossil fuels in the Reference Scenario takes into account recent trends and historical tendencies in global energy markets, already announced climate pledges, energy and transport policies, hydrocarbon resource and macroeconomic assumptions at the EU and global level.

World fossil fuel price projections have undergone revisions compared to the EU Reference Scenario 2013 and have been finalised during the first months of 2015. Thus hydrocarbon prices are projected to develop along new trajectories rather different from the ones used in previous Reference scenario.

The most important revised assumptions include demographic and macro-economic developments, reserves and resources of both conventional and unconventional oil and gas, technical and economic characteristics of energy technologies, the reflection of climate pledges and incorporation of recent trends in fossil fuel prices (e.g. drop in international price of Brent during 2014/2015). Furthermore, the model database, including time series on energy demand and supply, power generation mix and energy prices, has been updated to the latest IEA and ENERDATA statistics including the year 2013. Depending on the availability of long time-series, several econometric equations of PROMETHEUS have been re-estimated taking into account recent data up to 2013.

The global energy projections are based on a series of assumptions reflecting continuation of historical and current trends and a conventional wisdom view on the future developments of several elements of the world energy demand and supply system. Same macroeconomic assumptions as the ones described in the previous section were used.

The Reference Scenario incorporates upward revisions for conventional oil and gas reserves in line with updated geological estimates of IEA, BP and BGR. Moreover, updated USGS[75] estimates for global conventional oil and gas remaining recoverable resources are introduced in PROMETHEUS. Latest estimates from various sources including IEA and EIA are used for unconventional gas resources. Overall, the updated hydrocarbon resource assumptions imply that both oil and natural gas resource base increase by 13% from the previous Reference levels with implications on the evolution of world energy prices; when re-

[75] Schenk, C.J., 2012, An estimate of undiscovered conventional oil and gas resources of the world, 2012: U.S. Geological Survey Fact Sheet 2012–3042, 6 p

sources gradually turn into reserves, competitive conditions in international energy markets will change. This generates downward pressure on prices due to expanding supply base, despite higher extraction costs compared to conventional gas resources.

TABLE 8: ASSUMPTIONS FOR GLOBAL HYDROCARBON RESERVES AND RESOURCES USED BY PROMETHEUS

	Reserves	Remaining Recoverable Resources	Resources to Production ratio in 2013
Oil (in Gbl)	**1700** *(1479)*	**1483** *(1336)*	98
of which unconventional	400 *(350)*	700 *(436)*	
Gas (in Gtoe)	**190** *(171)*	**612** *(540)*	275
of which unconventional	10 *(5)*	*414 (342)*	

Note: Numbers in parentheses indicate assumptions/estimations used in the EU Reference Scenario 2013.

4.4 Note on discount rates used in the PRIMES model for the EU Reference Scenario 2016

4.4.1 Overview of discount rates within a modelling approach

The PRIMES model explicitly considers the time dimension and performs dynamic projections. Actors are simulated to take decisions in which they consider the time dimension of money flows. Following microeconomic theory, they are also assumed to have preferences[76] about the time dimension of revenues and costs, in the sense that they have to discount an amount defined at future time to make it equivalent to an amount available at present time. For example, the costs of energy efficiency or a renewable energy generation investment incur in the first year, while monetary savings or revenues accumulate over the lifetime of the investment. To do cost-effectiveness comparisons, one has to aggregate the stream of money over time as a present value, which inevitably uses a discount rate.

The PRIMES model mimics decentralised decisions of the actors so that each actor can apply his individual discount factor, in contrast with other models which formulate central planning optimisation and assume that the central planner applies a uniform discount factor on behalf of all actors.

The central planning approach can be characterised as normative, whereas the descriptive approaches, as PRIMES follows, use market-based discount factors differing by agent.

PRIMES follows a descriptive approach because it aims at assessing policy impacts as close as possible to reality in order to avoid under- or over- estimation of the costs and difficulties of transformation towards meeting targets and transition objectives (i.e. transition towards a low carbon economy). As it is known, the transitions are capital intensive (e.g. energy efficiency investment, renewables and other clean energy technologies, electric vehicles, and infrastructure). The model simulates individual decision making as appropriate by type of investment. The decision reflects a private perspective, subject to uncertainties, risk taking behaviours and limited access to funding. Some of the investments (e.g. infrastructure, public transport) are taken by entities which are state-owned or subject to regulation by the state. Also for these cases, PRIMES uses discounted present values mimicking the practices followed by these entities in reality.

Other models may have different aims, as for example to evaluate what should be the “optimum” system from

[76] In economics, time preference is the relative valuation placed on a good at an earlier date compared with its valuation at a later date. In mathematical terms, the decision maker uses a discount factor, say d (a rate measured as a percentage), so as to be indifferent when to choose between a present amount F and a future amount $F \cdot (1+d)^{-t}$ available with certainty time t. The time preference has nothing to do with inflation and is subjective. In addition to pure time preference, a discount factor also reflects risk and opportunity costs. Future earnings are obviously more risky compared to those available at present with certainty. The amounts that are presently equivalent to uncertain future earnings depend on risk aversion or risk prone behaviour, which is also subjective.

a social perspective. To do this they use a social discount rate, which is much lower than private discount rates, for all present value calculations. Obviously a social discount rate renders capital intensive decisions more attractive than a calculation using private discount rates. Therefore, the approach based on social discount rates finds transitions less costly and easier than approaches using private discount rates. Even in a no policy scenario the social discount rate approach would project a lot of energy efficiency and renewable energy investment that a private discount rate approach would find uneconomic without incentives. The social discount rate approach suggests that if the investments were undertaken they would entail negative costs for the society. If not undertaken in reality, then the only explanation would point to barriers and imperfections which influence the assessment of the decision-maker. For a critique of this reasoning see [17].

Generally, the social discount rate approach tends to underestimate the intensity of policies which may enable the transition. For the same reasons, this approach can be misleading for policy making aiming at promoting clean technology diffusion.

The approach followed by PRIMES (and other models, e.g. NEMS in the US DOE/EIA) using private discount rates postulates that fundamentally private discount rates differ from social ones, and only the former can realistically mimic individual decision making. The discount rates reflect opportunity costs of funding capital intensive investment and these costs differ fundamentally between private entities/persons and the state. Access to capital, risk behaviours, finite horizon for individuals versus overlapping generation prospect for the state and others are among the causes of this difference. In addition, risk premium factors expressing barriers, imperfections and other failures are part of the private discount rates and push them upwards.

State-owned entities also include risk premiums in real-world. Hence a model such as PRIMES uses higher discount rates than social ones also for these entities.

Modelling behaviours should not be confused with cost-benefit assessments of public policy. For example, consider a cost-benefit analysis of a policy which uses public money to subsidise energy efficiency investments of individuals. If the state wants to assess whether it is worth funding energy efficiency compared to other destinations of subsidies, the cost-benefit analyses correctly has to use a social discount rate. This is because public funds are at stake and the beneficiary is the society as a whole. The same logic applies to cost-benefit analysis (see [65]) of a public infrastructure investment, a regional development plan, etc.

But if the state wants to assess whether the amount of subsidies is sufficient to incite the targeted amount of energy savings, then the analysis has to use private discount rates to estimate the individual behaviours in the undertaking of energy efficiency investment. Using a social discount rate for this purpose would obviously be misleading.

The same holds for assessing costs of regulatory policies via scenario analysis. The investment decision and cost figures of each scenario projection must be generated using simulation of individual behaviours, which as explained has to use private discount rates. Assessing transition scenarios which have different distributions over time of investments and benefits requires in addition calculating present values, in which it is appropriate to use a social discount rate for discounting costs and benefits occurring in the future.

The approach of PRIMES never leads to negative costs of clean energy investments just because the private discount rates account for the imperfections. Hence, to enable transitions which do not happen in a business-as-usual scenario, policies have to apply to offset the effect of the imperfections or to remove the imperfections, when possible, as a minimum step towards enabling transitions.

Capital-budgeting decisions are simulated by the PRIMES model in all sectors, both in demand and supply of energy. The simulation mimics the appraisal undertaken by a decision-maker of whether purchasing of equipment or investing in energy savings or infrastructure is worth the funding.

The decision involves comparison among alternative options, e.g. technologies, which have different proportions of upfront costs and variable operating expenditures (including fuel costs). As the cost structure, in terms of CAPEX and OPEX, differ across the various options, the decision maker has to do arbitration over time. Therefore, the decision maker's time preferences (his discount factor) influences his choices. The time preference is inherently subjective and the decision maker appraises whether the upfront spending is worth the funding, compared to other options of using the funds, while taking into account uncertainty surrounding the investment options and the scarcity of funding.

Therefore the value of the discount factor is influenced by many factors, such as the interest rates prevailing in capital markets, the degree of access to such markets for fund raising, and mostly by the value that the actor associates to own funding resources, such as equity capital or savings of individuals.

Therefore private discount factors can be defined as reflecting opportunity costs of raising funds by the actor on a private basis. Obviously, the opportunity costs of raising funds differ by sector and by type of actor, being very different by income class. They also vary with the degree of risk associated to the decision options. In contrast, social discount rates[77] are defined as opportunity costs of raising funds by the state or the society; in this sense social discount rates are defined following a different perspective than private ones.

In addition, the value of discount factors may be influenced by policies when for example actors use high discount rates due to market distortions and non-market barriers. Many examples of policies influencing discount rates can be conceived in sectors such as energy efficiency, renewables and even nuclear or CCS investment.

The state may apply support schemes to mitigate risks and reduce the individual discount rates, such as feed-in-tariffs (FIT), contracts for differences (CfD), power purchase agreements (PPA), sovereign guarantees on investment, reduced taxation, subsidies on interest rates, and generally innovative financing mechanisms. Policies may also transfer risk hedging from individuals to institutions, the latter being able to manage risk collectively and thus more efficiently; examples are the energy service companies (ESCO), the policies obliging utilities to save energy at the premises of their customers, the loans by development banks, etc. All these policies are modelled in PRIMES as reductions of individual discount factors.

4.4.2 Summary of the modelling of capital budgeting decisions in PRIMES

An investment choice always involve upfront costs and variable-operating expenditures or revenues which take place over time (e.g. annually). The decision is based on a comparison of different investment options.

The PRIMES model uses different capital budgeting methods in the various sub-models. Examples are as follows:

In the standard version of the power sector model, the choice of power capacity expansion investment options is based on comparison of equivalent annuity costs (EAC). This is included in an inter-temporal minimization of costs which guide investment choices within stylised generator portfolios. In the model version which represents market imperfections, expected Net Present Value of investment (NPV), which include risk aversion factors, is calculated for each capacity expansion option so as either to invest by selecting among the options or to decide not to invest at all.

In the sub-model which calculates investment based on feed-in tariffs or on contracts for differences (CfDs) the model uses a method based on Internal Rate of Return (IRR) calculation by type of investment project from which it derives the probability of investment implementation. Instead of assuming a single threshold value for acceptable IRR, the model uses a frequency distribution of threshold values depending on the IRRs

[77] If social discount rates are used in simulations of private investment decisions, the modeller implicitly assumes that the economy has no funding scarcity and perfect capital markets allow unlimited liquidity.

in order to capture heterogeneity of actors and different investment circumstances.

- In the sub-models which calculate tariffs for using infrastructure subject to regulation as a natural monopoly (power grids, gas network, recharging infrastructure for vehicles, etc.), PRIMES follows the NPV method and uses the regulated rate of return as discount factor.
- In the sub-models which include investment options for energy savings (e.g. insulation of buildings, control systems in industry, etc.) PRIMES calculates equivalent annuity costs of the energy saving investment and compares annual capital costs to economised annual expenditures due to lower energy consumption. The model calculates a payback period which is considered in relation to a frequency distribution of threshold values reflecting heterogeneity of consumers and installations.
- In the demand sub-models which include technology choice by type of equipment or vehicle, the formulations calculate equivalent annuity costs for each option and also formulate a frequency distribution of technology choices based on relative EACs so as to reflect heterogeneity of consumers.

TABLE 9: WACC BY SECTOR FROM A RECENT SURVEY OF EUROPEAN FIRMS

	Number of Firms	*Beta (β)*	*Cost of Equity*	*E/(D+E)*	*Cost of Debt*	*After-tax Cost of Debt*	*D/(D+E)*	*Cost of Capital*
Metals	232	1.08	11.4%	66%	5.8%	4.9%	34%	9.2%
Construction and Materials	407	1.29	12.9%	61%	6.0%	5.1%	39%	9.8%
Chemicals	385	1.13	11.8%	86%	6.2%	5.3%	14%	10.9%
Equipment Goods	1677	1.27	12.7%	83%	6.0%	5.1%	17%	11.4%
Food	288	1.26	12.7%	71%	5.8%	4.9%	29%	10.4%
Paper	95	1.12	11.7%	64%	5.8%	4.9%	36%	9.3%
Other Industries	326	1.05	11.2%	69%	5.8%	5.0%	31%	9.3%
Energy	295	1.41	13.7%	54%	6.5%	5.5%	46%	9.9%
Power	98	1.14	11.8%	52%	5.8%	4.9%	48%	8.5%
Renewables	49	1.06	11.3%	48%	6.3%	5.3%	52%	8.1%
Utilities	100	0.84	9.8%	56%	6.1%	5.2%	44%	7.8%
Private Transport	100	1.31	13.0%	56%	5.8%	4.9%	44%	9.5%
Public Transport	6	0.84	9.8%	57%	5.8%	4.9%	43%	7.7%
Services	2474	1.46	14.1%	60%	5.9%	5.0%	40%	10.5%

- Source: Survey performed at the Stern School of Business at New York University (see [12]). Data for Europe. Weighted averages calculated by the author for more aggregated sectors than the original data. Data downloaded in 2015.

4.4.3 Methodology for defining values of discount rates

The model follows different approaches by sector:

A. Decisions by firms generally follow the approach of the weighted average cost of capital (WACC) to define discount rates.

The WACC expresses the unit cost of capital for a firm depending on the source of funding, with each type of source using a different interest/discount rate. The main distinction is between equity capital (E) and borrowed capital (D). The former is valued at a subjective discount rate r_e and the latter at a market-based lending rate r_d. A simple WACC formula is as follows:

$$WACC = \frac{E}{E+D} r_e + \frac{D}{E+D} r_d$$

To determine the discount rate on equity the model follows the methodology of the capital asset pricing method (CAPM) which is:

$$R_e = R_f + \beta \cdot (R_m - R_f) \iff \beta = \frac{R_e - R_f}{R_m - R_f}$$

In the above formula, R_f is the risk-free interest rate, R_m is the benchmark or specific market rate of return on capital (expressing the usual practice of the sector)

and β is a subjective ratio expressing risk premium of equity relative to risk free options over the usual risk premium of the sector expressed by the difference of the market specific rate and the risk-free rate. Obviously $\beta > 1$ indicates a risk averse behaviour which implies high WACC values compared to risk prone behaviours using $\beta < 1$. Technology- or project-specific risk premium values can also be reflected by using a value of β higher than one.

An alternative formulation for estimating the unit capital cost of equity (COE) is to decompose R_e as follows:

$$COE = R_e = R_f + ERP + SP + IRP + CSRP$$

In the above R_f is the risk-free rate, ERP the equity risk premium, SP the size risk premium, IRP the industry risk premium and CSRP the company-specific risk premium.

Surveys of equity costs for various firms indicate that the values used in practice differ by country and over time reflecting country-specific and risks specific to economic context. The equity costs depend on the sectorial and general economic context rather than on the conditions of drawing funds from the banking system. The lending conditions influence the capitalization ratio. The surveys of WACC (cost of capital) over firms generally confirm that capital intensive sectors generally use lower capital cost rates than labour-intensive sectors. The capital cost rates are higher in small scale businesses compared to large scale ones and they are higher in technologically emerging sectors or applications. The capital cost rates are lower for firms holding dominant positions in markets or when they are state-owned or supported by the state (e.g. utilities, public transport), compared to firms operating in market competition conditions. Based on these considerations, the PRIMES model applies different WACC rates by business sector, by type of technology (mature versus emerging), by scale level (e.g. industrial or decentralised versus utility scale) and for companies subject to regulation by the state. The survey shown in Table 9 refers to general purpose investment. In the PRIMES model, the cost of capital rates apply for energy-related investment in the industrial and services sectors. Therefore, additional considerations specific to energy consumption are necessary to determine cost of capital rates for these sectors in the PRIMES model. For other sectors represented in PRIMES, such as energy supply, power generation, grids, transport sectors, the cost of capital rates refer to the entire investment of the sector.

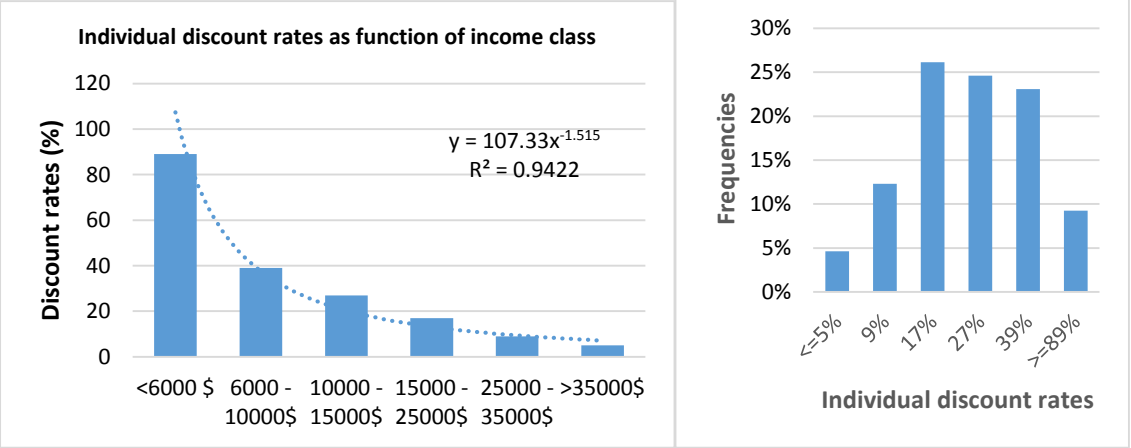
B. Decisions by individuals using a subjective discount rate to annualize investment (upfront) costs following the equivalent annuity cost method.

Literature collected as part of PRIMES modelling research has shown numerous statistical surveys which estimate the subjective discount rate that individuals implicitly use when making a choice between equipment varieties having different upfront costs and different variable operating costs.

A pioneering research[78], back in the '70s, has used a large sample of data based on surveys of purchasing of air-conditioning systems by individuals; the sample included a variety of air conditioning types with different purchasing costs and different energy efficiency rates. Using the sample, the author econometrically estimated the median value of the discount rate that implicitly individuals use to make their choices. He founds a median value between 24 and 26% for the discount rate and points out to the fact that this value substantially exceeds values used in engineering calculations to determine the so called life-cycle costs for evaluating the trade-off between energy efficiency and higher initial capital costs.

[78] Probably the first paper of this kind was the one by Jerry A. Hausman, Professor at MIT, USA Boston, paper published as "Individual discount rates and the purchase and utilization of energy-using durables", The Bell Journal of Economics (Vol. 10, No 1, spring issue), 1979.

FIGURE 79: ILLUSTRATION OF DEPENDENCE OF INDIVIDUAL DISCOUNT RATES ON INCOME



Source: Author's calculations compiling data from literature

The low rates used in engineering calculations suffer from two shortcomings: from a positive standpoint they are too low to forecast accurately consumer behaviour and thus can be misleading for policy making purposes, while from a normative standpoint they are too low to suggest how individuals should make their choice of equipment. The lower bound of the individual discount rate (within the confidence interval based on the sample population) was found equal to 15%, which is also much higher than values used in engineering calculations. The author compares the estimated values to the interest rate of 18% applied on credit cards at that time and finds logical that individuals value cash scarcity (opportunity costs of raising funding from a private perspective) at a rate above the rate prevailing in the credit market.

From a public policy perspective, one may see the difference between the individual and the social discount rates as a non-price market barrier, a sort of market imperfection. Therefore, in circumstances with strong barriers, policies based on efficiency standards and labelling are better placed to incite energy-efficient choice of appliances than pure price-based policies, precisely because of offsetting factors causing high individual discount rates.

The results of econometric estimations published in the literature suggest that the implicit discount rate is inversely strongly correlated with income and can be as low as 3.6% (i.e. close to market interest rates) for high income classes. But it can well be a two digit number (i.e. much above market interest rates) for low and medium-to-low income classes.

Economic theory suggests that discount rates should decrease as income rises, even with perfect capital markets, since the marginal income tax rate rises with income and the gains from using efficient appliances are untaxed.

A histogram of individual discount rates depending on income level is shown in Figure 79. The median value of the discount rates is 24% and the income elasticity is -1.5, which indicate a remarkably high increase of the discount rate for low income percentiles.

The differentiation of discount rates has been confirmed by numerous studies and publications surveying purchasing behaviours for a large variety of equipment types. To illustrate these findings, many authors proposed terms such as "energy efficiency gap" or "energy efficiency paradox" to describe the implications of using high individual discount rates rather than engineering-oriented or social ones.

Kenneth Train[79], as well as Sanstad, Blumstein and Stoft[80] summarised the findings of many surveys of the '80s and '90s of consumer behaviour for a large number of equipment. All surveys confirmed the strong inverse correlation of individual discount rates and income. The estimations confirmed the large variation of

[79] "Discount rates in consumers' energy-related decisions: a review of the literature", Energy, Vol. 10, No 12, pp. 1243-1253, 1985

[80] "How high are option values in energy-efficiency investment?" Energy Policy, Vol. 23, Mo 9, pp. 739-743, 1995

individual discount rates mainly as inverse function of income per household:

- 14% - 56% for heating equipment
- 5%-90% for cooling equipment
- 5%-30% for automobiles
- 4%-88% for insulation of houses
- 15%-45% for double glazing and other similar measures in buildings
- 15%-62% for cooking and water heating equipment
- 4%-51% for boilers (difference with heating equipment, see first bullet)
- 35%-100% for refrigerators and
- 20%-40% for small black appliances.

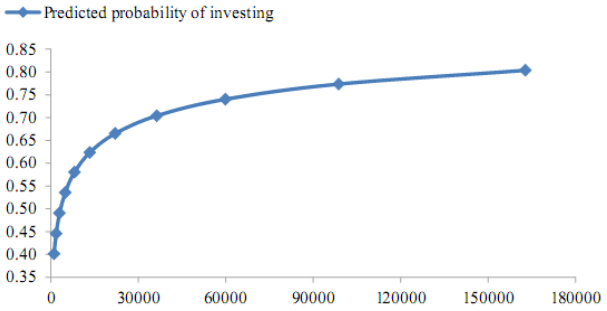
A statistical estimation for the implicit discount rates used in vehicle choices, specifically for energy savings, is provided by [12]. The median value of the discount rate, estimated for a US sample, is 21% (with standard deviation 6.5 percentage points). The median value differentiates by income class, the maximum difference being 4 percentage points. There is significant uncertainty regarding the discount factor for car choices. The same author proposes discount factors between 18% and 16% for car choices when using a different econometric estimation methodology.

The surveys[81] also revealed that beside income, which is the main explanatory factor of variance of discount rates, the range is also influenced by the age of the persons and the ownership of the property.

A similar approach is based on the concept of hurdle rates which express the minimum rate of return on a project or investment required by the decision maker to compensate for risk associated to future gains. Several econometric studies based on surveys provided evidence that hurdle rates effectively used by individuals and small firms to make investment decisions on energy efficiency are set at levels much above interest rates considered by large firms for equity capital in the context of capital asset pricing methods.

A more recent survey carried out by Ameli and Brandt for the OECD([2]) followed by a literature survey ([3]) confirm that "behavioural" discount rates explain the underinvestment in clean energy technologies and that the probability of investing in an energy efficiency project significantly decreases for low income classes (estimated from a large sample, by [2]). This finding supports the idea that one of the main factors explaining the high behavioural discount factors is the perception of opportunity costs of raising funding, which obviously differ by income class.

FIGURE 80: PROBABILITY OF INVESTING IN ENERGY EFFICIENCY AS A FUNCTION OF INCOME (X AXE) - ILLUSTRATION



This is further confirmed by a more general purpose statistical analysis reported in [26], which finds a strong negative correlation of individual discount rates and personal income. The income dimension is found to provide the highest correlation with discount rates than any other explanatory factor, such gender, age, education, etc. Another recent statistical survey, reported by [54], also finds strong inverse correlation of individual discount rates and income.

Extensive literature surveyed by [51] shows that households use high implicit discount rates (50 or even 200%) also because of imperfections, such as lack of information, uncertainties lack of sufficient funding, agency costs, transaction and hidden costs. The literature proposes (see [3]) to associate the imperfections or barriers with specificities of energy-efficient investments. Longer payback periods and greater risks and uncertainties imply higher subjective discount rates. According to the reviewed literature, the typology of

[81] The following references include data from surveys and econometric estimations of individual discount rates: [11],[14], [17], [20], [26], [28], [29], [33], [36], [41], [48], [58], [72]

possible causes can be summarised as follows:

- lack of information about cost and benefits of efficiency improvements
- lack of knowledge about how to use available information
- uncertainties about the technical performance of investments
- lack of sufficient capital to purchase more expensive but efficient products (or capital market imperfections)
- income level and consequently savings resources; high transaction costs for obtaining reliable information
- hidden costs, for example related to comfort, side payments and possibly temporary relocation,
- risk averse attitudes associated with possible financial failure of the investment
- Ownership status versus user status.

This justifies the practice of several economic models, including PRIMES, which mimic the effects of policy instruments, mainly campaigns and labelling programs, by using lowered discount rates when these policies are implemented.

Modern behavioural economics propose models which deviate from classical microeconomics (e.g. bounded rationality model[82], loss aversion model[83]) which are asserted to explain the persistence of high hurdle rates (equivalently discount rates) in choices for energy-efficiency investments, with initial investments being given asymmetrically greater weight than future savings.

But, despite the different explanatory approaches there is no doubt in the literature about the persistence of high hurdle and discount rates at levels much above engineering and social rates. Until today, there has been no statistical survey finding low hurdle or discount rates for individuals making selection of energy efficient investment or equipment.

It is useful to clarify that several surveys of public policies funding energy efficiency find that in practice regulators and authorities use much lower discount rates, than the subjective ones (see [21], [44] and [74]). The difference is that in these cases the discount rates are used to calculate whether or not is it worth to allocate public money as a support to an energy efficiency project (example house refurbishment). This is reasonable from a public perspective, because as appropriate discount rates close to social rates must be used for spending public money, to reflect opportunity costs of drawing funds by the public. This is a different aim than in the modelling which has the objective of mimicking, simulating, individual behaviours, in order to identify the size of incentives (such as prices or taxes) for increasing energy efficiency. To do this mimicking accurately, the model has to reflect the opportunity costs of drawing funds from a private perspective, which implies using subjective discount rates higher than social ones. This is also the conclusion of [27] which on behalf of the Australian government suggests a method for cost benefit analyses.

All these arguments advocate in favour of maintaining high values of discount and hurdle rates for individuals in the PRIMES modelling. The use of low discount rates, based on lending rates or social discount rates, has been criticized in the surveyed literature, which points out that transaction and hidden costs exist in reality, as for example for retrofit investments being illiquid and risky in most cases. A recent survey report [31] mentions “The default subjective discount rates used in PRIMES for mimicking decision behaviour lie within the huge range of what literature provides”. A quite

[82] Bounded rationality is the idea in decision-making, rationality of individuals is limited by the information they have, the cognitive limitations of their minds and the finite time they have to make a decision. According to this theory, the decision maker is a satisfier, seeking a satisfactory solution rather than the optimal one. Nested decision making models, in which the first level nests refer to seemingly non-economic choices (e.g. colour, convenience, and modernity) imply biased selection of lower level nests, which involve economic considerations and thus the selection can deviate from economic optimality.

[83] In economics and decision theory, loss aversion refers to people's tendency to strongly prefer avoiding losses to acquiring gains. Most studies suggest that losses are twice as powerful, psychologically, as gains. This point of view can be represented also by classical microeconomic theory by assuming strong risk aversion.

similar approach is followed by the NEMS model in the US DOE/EIA as recommended by Sanstad and McMahon[84]. The approach of NEMS is also evaluated in [50] confirming the relevance of using high implicit discount rates for modelling households' decisions.

C. Discount factors used to evaluate tariffs of using infrastructure regulated as a natural monopoly.

The model[85] uses discount rates based on surveys of actually applied regulated rates of return by state and regulatory agencies in various countries and for different types of infrastructure. The surveys indicate that the regulated rates of return on assets of natural monopolies are set significantly above social discount rates and are based on the WACC method. The main difference from private practices is that the state agencies or regulators do not accept high risk premium factors on equity capital, in contrast to private practices. This is justified on the basis that the natural monopoly business has by definition lower risks compared to business subject to competition.

4.4.4 Values of discount rates used in the model

Discount rates for investment decisions in power generation

To determine discount rate values reflecting reality one has to start from a risk-free (or low risk) discount rate. According to business surveys, the common practice in industry is to take a value of 4%-5%.

Business surveys indicate that equity risk premium (which is added on top of risk free discount rate) is usually defined at 6-9% plus a country- or project-specific risk which can vary between -1% up to 6%. Assuming a capitalization structure consisting of 65% borrowed funds at 5.5% interest rate and 35% equity capital valued at 9% cost of equity rate (large, capital intensive business), the minimum level of WACC would be:

$$\begin{aligned} &WACC \\ &= 65\% \cdot 5.5\% \ (debt) \\ &+ 35\% \cdot (4\% + 2.5\% + 2.5\% + 2\%) \ (equity) \\ &= 7.5\% \end{aligned}$$

Where 4% is the risk-free rate, 2.5% the equity risk premium, 2.5% the industry risk premium and 2% the company-specific risk premium.

The minimum WACC is used in the model as a proxy of the rate of return a regulator would agree to award to regulated natural monopoly infrastructures. This value corresponds to common practice of regulators in Europe and in the USA (it is verified that in practice regulated rates of return on capital vary between 7% and 8%). In the model it applies to infrastructure for calculating tariffs of service[85].

Large energy utilities operating in competitive markets would add 1-2 percentage points as a company-specific risk premium and small or medium size companies would add 1-3 percentage points as a size-related risk premium. Therefore, the WACC ranges between 8% and 12% for power sector generation and trade companies operating in competitive markets. Adding country- or project- specific risk premiums would make the WACC vary between 8 and at least 18%. Relevant surveys can be seen in references [1] and [19], among others.

The basic discount rate in competitive power, gas, coal and gas markets used in the model is 8.5% based on the WACC calculation shown below:

$$\begin{aligned} &WACC \\ &= 65\% \cdot 5.5\% \ (debt) \\ &+ 35\% \cdot (4\% + 3.5\% + 3.5\% + 3\%) \ (equity) \\ &= 8.5\% \end{aligned}$$

[84] "Aspects of Consumers' and Firms' Energy Decision-Making: A Review and Recommendations for the National Energy Modelling System (NEMS)", Lawrence Berkeley National Laboratory, April, 2008

[85] The tariffs of using infrastructure are calculated using the following formula:

$$P = \frac{RAB + \sum_{t=1}^{T} \frac{C_t}{(1 + d \pm r)^t}}{\sum_{t=1}^{T} \frac{D_t}{(1 + d \pm r)^t}}$$

RAB is the regulated asset basis (roughly the cumulative cost of investment), C_t are the annual operating variable and fixed costs, D_t denotes the expected future use of the infrastructure (measured as a volume indicator), T is the time horizon, d is the regulated discount rate expressing the allowed rate of return on capital and r expresses either a discount on return on capital (if it is deduced) targeted by the regulator or a bonus (when it is added) used as an incentive for technology or coverage improvement.

Where 4% is the risk-free rate, 3.5% the equity risk premium, 3.5% the industry risk premium and 3% the company-specific risk premium (see section 3A for definitions). The cost of equity rate is assumed 14% for companies exposed to competition and 11% for companies protected as regulated monopolies.

TABLE 10: DISCOUNT RATES IN ENERGY SUPPLY SECTORS

Assumptions for EU Reference Scenario 2016	*Discount rates*
Regulated monopolies and grids	7.5%
Companies in competitive energy supply markets	8.5%
RES investment under feed-in-tariff	7.5%
Investment under contract for differences	7.5%
RES investment under feed-in premium, RES obligation, Quota systems with certificates	8.5%
RES investment in competitive markets	8.5%
Risk premium specific to immature or less accepted technologies	1-3 %
Risk premium specific to investment surrounded by high regulatory or political uncertainty	No
Country-specific risk premiums	No

Note: the assumptions shown in the table are similar to those of the EU Reference Scenario 2013

Power purchase agreements (PPA) has been applied since many years as a way of supporting generation investment. Other forms of PPA are the feed-in-tariff systems applied to support investment in renewables and the Contracts for Differences which can be concluded between private entities or with the state. The feature of these support schemes guaranteeing stream of revenues for the investor implies lowering risk premium factors. They also ease collecting funding and thus borrowing interest rates are also lower than without revenue guarantee. Therefore power projects supported by feed-in tariffs or CfD are considered in the model less risky than investment in competitive markets and the starting level of the WACC is 7.5%.

A WACC applied to an investment project where upfront investment expenditures is recovered by a stream of annual revenues (as in the case of RES support schemes) can be also seen as the hurdle rate, i.e. the minimum IRR rendering investment financially feasible. The hurdle rate reflects the perspective of the investor and obviously includes risk premium factors as the WACC does.

Country-specific risk premium are considered in business practices to reflect regulatory uncertainty, revenue risks or monetary uncertainties, which are specific by country. It is reported that for countries experiencing deficits in renewables accounts and having practiced retrospective changes in FIT contracts, the country risk premium can be 5-6% (as add-on) and so minimum IRR becomes in these cases close to 15%. By nature country-specific risks are short-term views of uncertainties and are less practised for long-term planning of investment.

Other renewable support schemes may involve higher uncertainty about future stream of revenues. Feed-in-premium schemes depend on price volatility in wholesale markets and therefore 1-3 percentage points of risk premium are added following common practice. Similarly, renewable policies applying RES obligations on load serving entities or the quota systems with certificates imply higher risk premium, than feed-in-tariffs, as investors' revenues will depend on procurement conditions depending on private entities (the load serving entities) or on volatile certificate prices. We consider adding 1-3 percentage points as risk premium.

Compared to an IRR of 7.5% assumed for RES investment covered by guaranteed stream revenues, the model assumes an IRR of 8.5% for RES investment supported by feed-in-premium, RES obligations or quota systems with certificates. Similarly, the model applies an IRR of 8.5% for RES investment without financial support.

Investment in power projects covered by contracts for differences (e.g. Hinckley nuclear project in the UK and investment in renewables also based on CfD) theoretically enjoy similar certainty as RES projects under feed-in tariffs. Auctioning to determine the level of feed-in-tariffs or of CfD do not alter the guarantee of revenues that enjoy feed-in-tariffs and CfD in which the

price level is defined administratively.

Project-specific risk premium is a common practice for immature renewables and for projects subject to uncertain social acceptance (or surrounded by high political or regulatory uncertainty). The hurdle rate of investment in yet immature RES is increased by 1-3 percentage points above the rates used for mature RES. Of course, the addition applies as long the immaturity persists.

Although practices in reality, the model does not assume additional risk premium for project surrounded by high regulatory or political uncertainty, such as nuclear or CCS.

The model does not apply country-specific risk premiums. This is justified on the basis that the aim of the modelling is to project long term market trends and thus it ignores short term financial instabilities that would suggest country risk premiums in the EU different from zero.

Table 10 summarises the discount rate values used in business sectors of PRIMES for EU Reference Scenario 2016.

Discount rates for energy-related investment decisions by non-energy firms

The WACC for industry and services is used only for energy-related investment in these sectors, and not for general productive investment, which is out of the scope of the PRIMES model.

For energy-related investment of energy-intensive industries the model applies the minimum level of WACC, equal to 7.5%.

The reason is that energy costs are a very significant component in energy intensive industries and therefore these industries pay attention to select the most cost-efficient investments. For this reason the model does not apply risk premium factors related to market competition.

For other industries, which are not energy-intensive, the model applies a WACC of 9%, which is equal to the rate assumed for all purpose investment in these sectors. The non-differentiation of WACC rates by type of investment in these sectors is justified by the fact that energy costs represent a small share in total costs.

In the services sector energy costs are also a small fraction of total costs and therefore a WACC for all purposes investment applies. Energy-related investment decisions compare advanced efficient solutions, which have high upfront costs, to conventional ones. The former however are usually less known to the decision maker, who because he perceives uncertainty concerning technical performance, applies a risk premium. To capture this, the model uses a default value of WACC equal to 11% for energy-related investment.

TABLE 11: DISCOUNT RATES OF FIRMS IN ENERGY DEMAND SECTORS

Assumptions for EU Reference Scenario 2016	Discount rate
Energy intensive industries	7.5%
Non energy intensive industries	9%
Services sectors	11%
Public transport (road and conventional rail)	7.5%
Public transport (advanced technologies, e.g. high speed rail)	8.5%
Business transport sectors (aviation, trucks, maritime)	9.5%
Country risks	No

Note: the assumptions shown in the table are significantly lower than those used for the EU Reference Scenario 2013

For the business activities of the transport sector, the model applies the minimum WACC rate of 7.5% to the cases of regulated business, such as public road transport and conventional rail, which is dominated at large extent by state-owned enterprises. For more advanced transport technologies in public transport, such as high speed rail, the models uses a higher value of WACC, namely 8.5%, to reflect risk premium of investment in such technologies. The WACC values are used to calculate ticket prices in the public transport sectors and for investment decisions in vehicles or rolling stock.

For the private business activities in transport, such as trucks, aviation and maritime, the model uses a WACC

value of 9.5% which is within the range uses for industrial and services sectors. These WACC values are used in investment decisions for new vehicles, aircrafts and vessels. For the choice of private cars and motorcycles, the model applies the discount rates of decisions by individuals, which are discusses in the next section.

Discount rates for investment decisions by households

The choice of discount rate values employed for investment decisions by households is based on the literature reporting empirical statistical findings of surveys which calculate implicit discount rates used for energy efficient equipment choice and investment. When the implicit discount rates are specified by income class or other classification of consumers, a weighted average discount rate has been calculated.

TABLE 12: DEFINITION OF DISCOUNT RATES OF INDIVIDUALS IN ENERGY DEMAND SECTORS

Assumptions for EU Reference Scenario 2016		
	Default discount rates	***Modified discount rates due to EE policies***
Private cars	11%	11%
Households for renovation of houses and for heating equipment	14.75%	12%
Households for choice of appliances	13.5%	9.5%

Note: the discount rate assumptions are significantly lower in EU Reference Scenario 2016 compared to EU Reference Scenario 2013

Based on the literature, the discount rate values differ by type of decision and type of equipment. For instance surveys have found lower implicit discount rate values for choice of cars than for housing equipment. Surveys have also identified that for heating systems and for thermal integrity expenditures specifically for new-built houses (i.e. choices undertaken when building the house) the individual discount rates are much lower than in similar choices when renovating existing houses. The reason is that it is more uncertain to undertake refurbishment investment than incorporating efficient technologies in new houses taking also into account that the efficiency choices for new houses will last longer than for existing houses. For this reason the model applies lower discount rates (than the default values shown in the first column of) for new buildings concerning thermal integrity and heating systems.

It is assumed that the default discount rates values are influenced downwards by policies, which focus on barriers and imperfections considered among the causes explaining the initially high discount rate values. Such policies are included in the Reference Scenario; examples are the energy labelling and certain measures included in Energy Efficiency Directive and the promotion of energy service companies. They increase awareness of individuals about the benefits of advanced efficient solutions. They also support involvement of large companies such as utilities or energy service companies to leveraging individual choices, thus helping individuals perceiving lower financial and technical risks in the undertaking of efficiency investment. Table 12 indicates in separate columns the discount rates used as default values and the discount rates used when representing the effects of policies targeting removal of barriers obstructing rational energy efficiency choices.

4.4.5 Costs reporting

Once having ran the model for a scenario, which means after simulating behaviours and market clearing which are using the discount rates shown in the previous section, the PRIMES model calculates total energy system costs for reporting purposes. In other words, the modelling framework includes two distinct stages[86]: a) a first stage models decision-making behaviour of agents, hence investment and technology choices; b) a second stage, calculates total costs for the entire energy system in order to support comparisons across scenarios. There is no doubt that for the first stage a subjective discount rate by agent type has to be used.

[86] A two stage approach is also recommended by [59]. They also argue in favour of using a lower discount rate in second stage than in the first, for which they suggest using a behavioural discount rate. A similar approach is recommended also by [69] who based on a survey finds that this is a common practice in many studies assessing energy efficiency and renewable energy policies.

TABLE 13: SUMMARY OF COST CONCEPTS USED TO CALCULATE TOTAL ENERGY SYSTEM COSTS

	Final energy consumers	Energy supply sectors	Total energy system costs
CAPEX	Investment expenditures for purchasing equipment, vehicles and appliances and for thermal integrity and other energy saving purposes in the premises of the consumers	Investment expenditures for power generation plants, power grids, gas networks, refineries, primary fuel extraction, etc.	CAPEX incurred directly for final energy consumers
OPEX	Purchasing of fuels, distributed heat and electricity (including CAPEX of energy supply sectors), as well as other annual expenditures for operation and maintenance	Purchasing of fuels and annual operating and maintenance expenditures	OPEX incurred directly for final energy consumers
Profits or deficits of financial balance	Not applicable	Applicable to energy supply sectors ad network operators depending on scenario assumptions about market distortions	included indirectly in costs for purchasing energy commodities by end consumers
Taxes, subsidies and auction revenues	Applicable for both CAPEX and OPEX	Applicable for both CAPEX and OPEX	Energy tax payments included. Payments to acquire auctioned ETS allowances not included, reflecting continued free allocation as well as the use of revenues to reduce cost impacts (indirect costs, modernisation and innovation fund) as well as further recycling in the economy.

Note: Total CAPEX for the entire energy system is the sum of CAPEX incurred for end-consumers and CAPEX incurred for energy suppliers, public transport providers, network operators, etc.

In this section, we discuss what discount rates to use in the second stage and how the calculations are defined.

In an energy system there are demanders and suppliers of energy. For energy system analysis and in order to assess the cost impacts from a macroeconomic perspective, the crucial element is the amount that end use sectors (households and firms, in services and industry, transport and agriculture) are required to pay in order to get the energy services they need. Energy services are defined by how energy is used, for example, if the energy supports heating, cooling, entertainment, mobility and transportation, industrial production, i.e., uses that enable utility and activity for final energy consumers. Energy services are delivered by using energy commodities purchased by end-consumers, which depend on energy efficiency at the consumption level. The end-users undertake investment for purchasing equipment (e.g. boilers, vehicles, etc.), for insulating buildings and for installing energy saving systems. From an accounting perspective, the investment expenditures of end-users of energy are capital expenditures (CAPEX). Part of investment expenditure for equipment purchasing correspond to energy purposes. For example the additional cost of a highly efficient vehicle (on top of cost of a conventional vehicle) incurs for energy purposes. Only such additional investment costs are accounted for in energy-related investment of end-users. In addition, the final energy consumers incur annual variable and fixed costs which include the purchasing of energy commodities from energy supplying and trading sectors, the maintenance costs of equipment and other annual costs (e.g. assurance costs, vehicle taxes, etc.). These annual costs are operating expenditures (OPEX).

Energy supply and trading sectors fully recover their total costs (CAPEX and OPEX) from revenues paid by end-consumers. Therefore the total energy system cost only includes the CAPEX and OPEX incurred by end-consumers, with their OPEX already incorporating the CAPEX and OPEX costs incurred by the supply

and trading sectors. The PRIMES model determines the prices of supply and trading sectors in a manner that fully recovers total supply costs using the WACC that represents the real unit cost of capital experienced by a firm operating in energy supply sectors.

The PRIMES report aggregates CAPEX and OPEX of end-consumers to show a single total cost figure with annual periodicity. To do this, also the CAPEX figures related to investments by final energy demand consumers need to be annualised following the equivalent annuity cost method which involves use of a discount factor over the lifespan of the investment. The annualised equivalent cost expresses the cost incurred for the end-consumer for owning an asset until the end of its lifetime. As such it expresses the gradual accumulation of resources to be able to replace the asset as the present value of the annuity payments for capital is by definition equal to the investment (upfront) expenditure (see formulas of equivalent annuity cost method in Annex I). The choice of discount rate for the CAPEX cost reporting by final energy demand consumers can reflect different perspectives, but should reflect in any case the perspective of the private investor faced with real world investment constraints

In the past, the PRIMES model has used for this cost reporting the opportunity costs of raising funds as perceived by the end-consumers when making the investment choices, using the default discount rates by end-consumer for investment decisions in all scenarios even if in a scenario policy assumptions led to reduced discount rates for the investment decision. The reason of this choice was to maintain comparability of total costs across scenarios. This approach has the drawback that high perceived discount rates may be the result of market failures (such as lack of information, split incentives) which are accounted for as a cost even if addressed by policies.

An alternative approach could be to base the cost reporting of the CAPEX by final energy demand consumers on true payments for capital costs. This implies that the CAPEX has to be annualised using lending rates for the part of capital borrowed from banks and equity rates for the rest. It has the drawback that it does not reflect the fact that there are also opportunity costs associated with higher debt rates (i.e. risk averseness as well as reduced incentives to make other investments). In addition, detailed information would need to be collected to identify the borrowing rates faced by different end-users. Furthermore, equity rates are subjective and therefore assumptions must be made about their values. Finally, a dilemma similar to that of the approach using discount rates that take into account opportunity costs arises. Policies may enable reduction of equity discount rates and if this differs by scenario, comparability of costs is lost across scenarios.

In conclusion, comparability across the scenarios is of key importance and implies that the discount rates used in the cost accounting must not vary between scenarios. Considering the draw-backs of both approaches listed above it is proposed to account the costs associated with CAPEX for final energy demand consumers using a lower rate that is more in line with the WACC used for the supply and industry sector. This would mean that high perceived discount rates, which may be the result of market failures not related to financing (such as lack of information, split incentives), would no longer be accounted for as a cost, and from a cost accounting perspective would treat demand side sector and supply side sectors in a similar manner.

Hence, as simplification a flat discount rate of 10% is used for annualising CAPEX of end-consumers in the cost reporting of PRIMES and the reporting discount rates used for the Reference Scenario are kept unchanged in all scenarios.

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5 Glossary

Aviation: EU Reference Scenario 2016 distinguishes aviation activity into flights within the EU and international extra-EU destinations. Flights within the EU include domestic transport activity (within the boundaries of one single EU Member State) and international intra-EU (both origin and destination of the flight is within the EU28). The international extra-EU air transport activity includes all remaining flights. Energy consumption and CO_2 emissions in aviation reflects sales of fuels at the point of refuelling, irrespective of airplane destination. They approximately correspond to all outgoing domestic and international flights.

Biofuels: Biofuels include ethanol, biodiesel, bio-kerosene, bio-heavy and biogas.

Carbon capture and storage (CCS): Carbon capture and geological storage is a technique for trapping carbon dioxide emitted from large point sources, compressing it, and transporting it to a suitable storage site where it is injected into the ground.

Carbon intensity: The amount of CO_2 emitted per unit of energy consumed or produced (t of CO_2/tonne of oil equivalent (toe) or MWh).

CO_2 Emissions to GDP: The amount of CO_2 emitted per unit of GDP (carbon intensity of GDP - t of CO_2/million Euro).

Cogeneration thermal plant: A system using a common energy source to produce both electricity and steam for other uses, resulting in increased fuel efficiency (see also: CHP).

Combined Cycle Gas Turbine plant (CCGT): A technology which combines gas turbines and steam turbines, connected to one or more electrical generators at the same plant. The gas turbine (usually fuelled by natural gas or oil) produces mechanical power, which drives the generator, and heat in the form of hot exhaust gases. These gases are fed to a boiler, where steam is raised at pressure to drive a conventional steam turbine, which is also connected to an electrical generator. This has the effect of producing additional electricity from the same fuel compared to an open cycle turbine.

Combined Heat and Power (CHP): This means cogeneration of useful heat and power (electricity) in a single process. In contrast to conventional power plants that convert only a limited part of the primary energy into electricity with the remainder of this energy being discharged as waste heat, CHP makes use of a greater proportion of this energy for e.g. industrial processes, district heating, and space heating. CHP therefore improves energy efficiency (see also: cogeneration thermal plant).

Efficiency for thermal electricity production: A measure of the efficiency of fuel conversion into electricity and useful heat. It is calculated as heat and electricity output divided by the calorific value of input fuel.

Efficiency indicator in freight transport (activity related): Energy efficiency in freight transport is calculated on the basis of energy use per tonne-km. Given the existence of some methodological inconsistencies between transport and energy statistics, absolute numbers (especially at the level of individual Member States) might be misleading in some cases. For that reason, the numbers given are only illustrative of the trends in certain cases.

Efficiency indicator in passenger transport (activity related): Energy efficiency in passenger transport is calculated on the basis of energy use per passenger-km travelled. Issues related to consistency of transport and energy statistics also apply to passenger transport (see also: Efficiency indicator in freight transport).

Effort Sharing Decision (ESD): The Effort Sharing Decision establishes binding annual greenhouse gas emission targets for Member States for the period 2013–2020. These targets concern emissions from most sectors not included in the EU Emissions Trading System (EU ETS), such as transport (except aviation and international maritime shipping), buildings, agriculture (except LULUCF) and waste.

Energy branch consumption: Energy consumed in refineries, electricity and steam generation and in other transformation processes.

Energy intensity: energy consumption/GDP or another indicator for economic activity.

Energy intensive industries: Iron and steel, non-ferrous metals, chemicals, non-metallic minerals, and paper and pulp industries.

Energy Service Company (ESCO): A company that implements a broad range of energy efficiency projects.

EU Emissions Trading System (EU-ETS): A scheme for greenhouse gas emissions allowance trading within the Community, established by Directive 2003/87/EC in order to promote reductions in greenhouse gas emissions in a cost-effective and economically efficient manner. Installations included in the scheme are combustion plants, oil refineries, coke ovens, iron and steel plants, and factories producing cement, glass, lime, brick, ceramics, pulp and paper. Amendments (2008/101/EC and 2009/29/EC) have enlarged its scope to include aviation and further process emissions.

Feed-in tariff: The price per unit (of electricity) that an eligible renewable electricity generator receives according to cost-based calculations for the specific resource used.

Final energy demand: Energy consumed in the transport (excluding international shipping), industrial, household, services and agriculture sectors; the latter two sectors are sometimes aggregated and named "tertiary". It excludes deliveries to the energy transformation sector (e.g. power plants) and to the energy branch. It includes electricity consumption in the above mentioned final demand sectors.

Freight transport activity: Covers goods transport by road, rail and inland navigation. Road transport activity is defined according to the territoriality principle, in line with the available statistics from Eurostat.

Fuel cells: A fuel cell is an electrochemical energy conversion device converting hydrogen and oxygen into electricity and heat with the help of catalysts. The fuel cell provides a direct current voltage that can be used to power various electrical devices including motors.

Fuel input to power generation: Fuel use in power plants and CHP plants.

Gas: Includes natural gas, blast furnace gas, coke-oven gas and gasworks gas.

Generation capacity: The maximum rated output of a generator, prime mover, or other electric power production equipment under specific conditions designated by the manufacturer.

Geothermal plant: A plant in which the prime mover is a steam turbine, which is driven either by steam produced from naturally hot water or by natural steam that derives its energy from heat in rocks or fluids beneath the surface of the earth. The energy is extracted by drilling and/or pumping.

Greenhouse Gas (GHG): Some gases in the Earth's atmosphere act a bit like the glass in a greenhouse, trapping the sun's heat and stopping it from leaking back into space. Many of these gases occur naturally, but human activity is increasing the concentrations of some of them in the atmosphere, in particular carbon dioxide (CO_2), methane (CH_4). nitrous oxide (N_2O) and fluorinated gases.

Gross Inland Consumption (or primary energy consumption): Quantity of energy consumed within the borders of a country. It is calculated as primary production + recovered products + imports +/- stock changes – exports – bunkers (i.e. quantities supplied to international sea-shipping).

Gross Inland Consumption/GDP: Energy intensity indicator calculated as the ratio of total energy consumption to GDP – (toe/million Euro).

Hydro power plant: A plant that produces energy through the use of moving water. In this report, hydro excludes pumped storage plants that generate electricity during peak load periods by using water previously pumped into an elevated storage reservoir during off-peak periods when excess generating capacity is available. Energy losses in pumping are accounted for separately.

Indirect land use change (ILUC): Where land previously destined for food and feed markets is diverted to biofuel production, the non-fuel demand will still need to be satisfied either through intensification of current production or by bringing non-agricultural land into production elsewhere. The latter case constitutes indirect land-use change (ILUC) and when it involves the conversion of land with high carbon stock it can lead to significant greenhouse gas emissions.

Inland navigation: Covers inland waterways and national maritime transport, for the purpose of ensuring consistency with the energy balances. International maritime is not included in the above category as; according to Eurostat energy balances, energy needs for international shipping are allocated to bunkers.

Import dependency: Demonstrates the extent to which a country relies upon imports in order to meet its energy needs.

Land Use, Land Use Change and Forestry (**LULUCF**): The LULUCF sector covers greenhouse gas emissions into the atmosphere and removal of carbon from the atmosphere resulting from our use of soils, trees, plants, biomass and timber.

Non-fossil fuels: Nuclear and renewable energy sources.

Non-energy uses: The use of petrochemicals and other energy carriers for purposes other than energy production, such as chemical feed-stocks, lubricants and asphalt for road construction.

Nuclear power plant: A plant in which a nuclear fission chain reaction can be initiated, controlled, and sustained at a specific rate for production of energy.

Oil: Includes crude oil, feed-stocks, refinery gas, liquefied petroleum gas, kerosene, gasoline, diesel oil, fuel oil, naphtha and other petroleum products.

Peak devices: Gas turbines, internal combustion engines and other small-scale thermal power plants which are usually used to supply electricity in peak hours.

Passenger transport activity: Passenger transport activity covers road transport (buses and coaches, passenger cars and vans, powered 2-wheelers), rail transport, aviation and inland navigation. Tram and metro activity is provided together with rail in the reporting by MS.

Primary production: Total indigenous production. In PRIMES result sheets (Appendix 2) it also includes recovered products.

Renewable energy sources (RES): Energy resources which are naturally replenishing but flow-limited. These are virtually inexhaustible but limited in the amount of energy that is available per unit of time. Renewable energy resources include: biomass, waste energy, hydro, wind, geothermal, solar, wave and tidal energy.

Solar power plant: A plant producing energy with the use of radiant energy from the sun; includes solar thermal and photovoltaic (direct conversion of solar energy into electricity) plants.

Solids: Include both primary products (hard coal and lignite) and derived fuels (patent fuels, coke, tar, pitch and benzole).

Thermal power plants: Type of electricity generating plant in which the source of energy for the prime mover is heat (nuclear power plants are excluded).

Wind power plant: Typically, a group of wind turbines supplying electricity directly to a consumer, or interconnected to a common transmission or distribution system. Offshore wind includes windmills located at sea (coastal wind mills are usually included in onshore wind).

APPENDIX 1: DEMOGRAPHIC AND MACROECONOMIC ASSUMPTIONS

EU Reference scenario 2016

EU-28: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	483.7	500.2	510.0	515.9	520.7	522.4	0.3	0.2	0.1	0.1	0.0
Household size (inhabitants per household)	2.5	2.4	2.3	2.3	2.3	2.2	-0.6	-0.2	-0.2	-0.2	-0.2
Gross Domestic Product (in MEuro'13)	**11250.8**	**12895.0**	**14549.9**	**16682.3**	**19431.1**	**22526.0**	**1.4**	**1.2**	**1.4**	**1.5**	**1.5**
Household Income (in Euro'13/capita)	**13436.7**	**14993.7**	**16610.2**	**19089.5**	**22336.4**	**26163.9**	**1.1**	**1.0**	**1.4**	**1.6**	**1.6**
SECTORAL VALUE ADDED (in MEuro'13)	**10019.5**	**11533.3**	**13012.6**	**14918.5**	**17375.3**	**20140.9**	**1.4**	**1.2**	**1.4**	**1.5**	**1.5**
Industry	1622.2	1755.5	1944.8	2163.8	2404.8	2665.1	0.8	1.0	1.1	1.1	1.0
iron and steel	46.7	43.1	45.6	48.0	49.4	49.9	-0.8	0.6	0.5	0.3	0.1
non ferrous metals	32.4	22.0	23.6	24.9	26.1	26.8	-3.8	0.7	0.6	0.5	0.3
chemicals	167.9	210.3	236.7	263.4	293.1	323.6	2.3	1.2	1.1	1.1	1.0
non metallic minerals	76.8	71.0	75.2	84.7	93.3	101.3	-0.8	0.6	1.2	1.0	0.8
paper pulp	86.6	85.5	91.4	99.8	108.9	116.5	-0.1	0.7	0.9	0.9	0.7
food, drink and tobacco	226.4	234.5	259.9	291.7	328.4	366.4	0.4	1.0	1.2	1.2	1.1
engineering	626.8	723.2	826.2	942.8	1069.3	1212.0	1.4	1.3	1.3	1.3	1.3
textiles	90.1	66.6	58.4	50.3	44.7	40.3	-3.0	-1.3	-1.5	-1.2	-1.0
other industries (incl. printing)	272.4	299.3	327.7	358.2	391.8	428.3	0.9	0.9	0.9	0.9	0.9
Construction	703.1	709.1	737.4	815.9	916.4	1019.7	0.1	0.4	1.0	1.2	1.1
Tertiary	7380.0	8730.2	9976.5	11558.6	13642.3	16012.3	1.7	1.3	1.5	1.7	1.6
market services	4187.3	5015.4	5863.6	6926.2	8309.6	9909.8	1.8	1.6	1.7	1.8	1.8
non market services	1930.7	2236.9	2410.3	2655.1	3016.8	3420.7	1.5	0.7	1.0	1.3	1.3
trade	1085.3	1285.6	1502.9	1771.4	2104.9	2468.3	1.7	1.6	1.7	1.7	1.6
agriculture	184.1	192.3	199.6	205.9	210.9	213.4	0.4	0.4	0.3	0.2	0.1
Energy sector and others	314.1	338.5	353.9	380.2	411.8	443.8	0.7	0.4	0.7	0.8	0.8

Austria: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	8.0	8.4	8.8	9.3	9.6	9.7	0.4	0.5	0.5	0.3	0.1
Household size (inhabitants per household)	2.5	2.3	2.3	2.3	2.2	2.2	-0.8	-0.1	-0.1	-0.2	-0.2
Gross Domestic Product (in MEuro'13)	**256.9**	**298.1**	**344.7**	**400.1**	**469.0**	**542.5**	**1.5**	**1.5**	**1.5**	**1.6**	**1.5**
Household Income (in Euro'13/capita)	**17774.2**	**19637.1**	**21688.4**	**24047.8**	**27675.8**	**32366.6**	**1.0**	**1.0**	**1.0**	**1.4**	**1.6**
SECTORAL VALUE ADDED (in MEuro'13)	**230.8**	**269.3**	**311.5**	**361.5**	**423.8**	**490.2**	**1.6**	**1.5**	**1.5**	**1.6**	**1.5**
Industry	41.8	49.5	55.5	62.6	70.2	77.8	1.7	1.1	1.2	1.2	1.0
iron and steel	2.6	2.1	2.3	2.4	2.4	2.3	-2.2	0.7	0.5	0.1	-0.4
non ferrous metals	1.6	1.1	1.2	1.4	1.6	1.6	-4.3	1.6	1.4	1.0	0.4
chemicals	2.7	5.2	6.2	6.8	7.3	8.1	6.7	1.7	0.9	0.7	1.1
non metallic minerals	2.9	2.5	2.7	3.1	3.3	3.5	-1.7	1.0	1.3	0.7	0.6
paper pulp	2.6	2.9	3.2	3.7	4.1	4.4	1.1	1.0	1.4	1.1	0.7
food, drink and tobacco	4.9	5.4	5.8	6.5	7.4	8.4	1.0	0.8	1.1	1.3	1.2
engineering	15.5	20.0	22.7	26.0	29.9	33.7	2.6	1.2	1.4	1.4	1.2
textiles	1.5	1.1	1.0	0.9	0.8	0.7	-3.4	-1.0	-1.0	-1.0	-0.9
other industries (incl. printing)	7.9	9.3	10.4	11.8	13.4	15.1	1.6	1.2	1.3	1.3	1.2
Construction	19.7	18.1	20.9	23.1	25.0	26.2	-0.8	1.4	1.0	0.8	0.5
Tertiary	164.3	195.0	227.9	268.1	320.0	377.1	1.7	1.6	1.6	1.8	1.7
market services	86.7	107.5	125.1	146.7	177.2	212.0	2.2	1.5	1.6	1.9	1.8
non market services	42.8	48.1	55.7	63.6	72.6	81.2	1.2	1.5	1.3	1.3	1.1
trade	31.1	35.3	42.6	53.1	65.5	79.0	1.3	1.9	2.2	2.1	1.9
agriculture	3.9	4.1	4.4	4.6	4.8	4.8	0.5	0.7	0.6	0.3	0.1
Energy sector and others	5.1	6.7	7.3	7.7	8.5	9.1	2.8	0.8	0.6	1.0	0.6

Source: GEM-E3

EU Reference scenario 2016

Belgium: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	10.2	10.8	11.9	12.9	14.0	14.8	0.6	0.9	0.9	0.8	0.6
Household size (inhabitants per household)	2.4	2.3	2.3	2.3	2.2	2.2	-0.4	-0.1	-0.1	-0.2	-0.2
Gross Domestic Product (in MEuro'13)	**323.8**	**371.9**	**414.2**	**479.3**	**590.8**	**722.2**	**1.4**	**1.1**	**1.5**	**2.1**	**2.0**
Household Income (in Euro'13/capita)	**16696.4**	**18171.1**	**19141.2**	**20789.5**	**24266.5**	**28610.4**	**0.9**	**0.5**	**0.8**	**1.6**	**1.7**
SECTORAL VALUE ADDED (in MEuro'13)	**287.8**	**331.9**	**369.7**	**427.8**	**527.3**	**644.6**	**1.4**	**1.1**	**1.5**	**2.1**	**2.0**
Industry	47.4	44.6	48.7	55.1	65.9	78.0	-0.6	0.9	1.2	1.8	1.7
iron and steel	2.0	1.8	1.8	1.8	1.9	1.9	-0.9	-0.1	0.0	0.3	0.2
non ferrous metals	1.2	1.1	1.1	1.2	1.3	1.4	-0.8	0.5	0.8	0.8	0.6
chemicals	11.0	10.8	11.6	12.8	14.8	16.9	-0.2	0.7	1.0	1.4	1.3
non metallic minerals	2.7	2.3	2.5	2.9	3.4	3.8	-1.7	1.1	1.5	1.5	1.1
paper pulp	2.2	2.2	2.5	2.9	3.6	4.2	0.3	1.1	1.7	2.0	1.7
food, drink and tobacco	5.6	6.9	7.7	8.8	10.7	12.9	2.1	1.0	1.4	2.0	1.8
engineering	16.0	12.9	14.7	17.5	22.4	28.2	-2.1	1.3	1.8	2.5	2.3
textiles	2.1	1.6	1.4	1.3	1.1	1.0	-3.0	-0.9	-1.2	-1.2	-1.3
other industries (incl. printing)	4.9	5.0	5.3	5.7	6.7	7.7	0.3	0.6	0.7	1.6	1.5
Construction	15.2	18.8	21.5	24.2	28.2	32.7	2.1	1.4	1.2	1.5	1.5
Tertiary	219.4	259.9	290.5	338.6	421.7	520.6	1.7	1.1	1.5	2.2	2.1
market services	118.3	142.9	164.4	197.4	249.0	312.7	1.9	1.4	1.8	2.3	2.3
non market services	64.8	73.2	77.0	85.1	104.9	127.2	1.2	0.5	1.0	2.1	1.9
trade	34.0	41.2	46.5	53.4	65.0	78.0	1.9	1.2	1.4	2.0	1.8
agriculture	2.6	2.6	2.6	2.6	2.7	2.8	0.0	0.2	0.1	0.3	0.1
Energy sector and others	5.7	8.6	9.0	9.9	11.5	13.2	4.1	0.5	0.9	1.5	1.4

Bulgaria: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	8.2	7.4	7.0	6.5	6.1	5.8	-1.0	-0.7	-0.7	-0.6	-0.5
Household size (inhabitants per household)	2.5	2.4	2.4	2.3	2.3	2.2	-0.4	-0.2	-0.3	-0.2	-0.2
Gross Domestic Product (in MEuro'13)	**25.3**	**37.7**	**45.1**	**53.5**	**60.9**	**67.5**	**4.1**	**1.8**	**1.7**	**1.3**	**1.0**
Household Income (in Euro'13/capita)	**1858.5**	**3187.1**	**4145.6**	**5405.7**	**6683.0**	**7958.2**	**5.5**	**2.7**	**2.7**	**2.1**	**1.8**
SECTORAL VALUE ADDED (in MEuro'13)	**21.4**	**32.4**	**38.9**	**46.1**	**52.4**	**58.1**	**4.3**	**1.8**	**1.7**	**1.3**	**1.0**
Industry	2.8	5.2	6.0	7.2	8.1	9.0	6.5	1.4	1.8	1.2	1.1
iron and steel	0.2	0.1	0.1	0.1	0.2	0.2	-4.6	1.1	2.8	1.9	1.4
non ferrous metals	0.1	0.3	0.3	0.4	0.4	0.4	8.4	1.6	1.9	0.9	0.8
chemicals	0.2	0.3	0.3	0.4	0.4	0.4	3.3	1.5	0.8	0.3	0.2
non metallic minerals	0.2	0.3	0.3	0.4	0.5	0.6	6.7	0.6	2.0	1.5	1.3
paper pulp	0.1	0.2	0.3	0.4	0.4	0.5	13.0	1.7	2.5	1.5	1.3
food, drink and tobacco	1.0	1.0	1.1	1.2	1.3	1.4	-0.1	0.6	1.1	0.7	0.7
engineering	0.5	1.1	1.5	2.0	2.4	2.9	7.8	2.9	3.0	2.0	1.7
textiles	0.4	0.7	0.6	0.6	0.5	0.5	6.5	-0.6	-1.0	-0.9	-0.7
other industries (incl. printing)	0.4	1.2	1.4	1.7	1.9	2.2	12.4	1.8	2.0	1.3	1.2
Construction	1.5	2.3	2.4	2.9	3.1	3.4	4.8	0.5	1.6	0.9	0.9
Tertiary	15.6	23.2	28.6	34.0	39.0	43.4	4.1	2.1	1.7	1.4	1.1
market services	8.3	13.6	17.7	21.1	24.3	26.5	5.1	2.7	1.8	1.4	0.9
non market services	3.9	4.2	4.5	5.0	5.5	5.8	0.9	0.6	1.2	0.8	0.7
trade	1.7	3.9	4.8	6.1	7.6	9.3	8.5	2.1	2.5	2.2	2.1
agriculture	2.0	1.6	1.7	1.7	1.7	1.7	-2.3	0.4	0.6	0.0	0.0
Energy sector and others	1.6	1.7	1.9	2.0	2.2	2.3	0.7	0.8	1.0	0.7	0.5

Source: GEM-E3

EU Reference scenario 2016

Croatia: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	4.5	4.3	4.2	4.1	4.0	3.8	-0.4	-0.3	-0.3	-0.3	-0.3
Household size (inhabitants per household)	2.6	2.3	2.3	2.3	2.2	2.2	-1.2	-0.1	-0.1	-0.1	-0.1
Gross Domestic Product (in MEuro'13)	**36.5**	**46.4**	**48.9**	**55.4**	**67.3**	**78.6**	**2.4**	**0.5**	**1.3**	**2.0**	**1.6**
Household Income (in Euro'13/capita)	**4774.5**	**6413.0**	**7223.9**	**8471.5**	**10721.8**	**13045.0**	**3.0**	**1.2**	**1.6**	**2.4**	**2.0**
SECTORAL VALUE ADDED (in MEuro'13)	**30.9**	**39.7**	**41.8**	**47.4**	**57.6**	**67.3**	**2.5**	**0.5**	**1.3**	**2.0**	**1.6**
Industry	6.7	7.6	7.8	8.5	10.0	11.2	1.2	0.3	0.8	1.6	1.1
iron and steel	0.6	0.7	0.7	0.7	0.8	0.8	1.2	0.2	0.2	1.0	0.2
non ferrous metals	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.1	0.3	0.8	0.1
chemicals	0.8	0.9	0.9	1.0	1.2	1.3	1.2	0.4	1.0	1.7	1.4
non metallic minerals	0.4	0.4	0.4	0.5	0.5	0.6	1.2	0.2	0.7	1.3	0.9
paper pulp	0.5	0.6	0.6	0.7	0.8	1.0	1.2	0.5	1.1	1.8	1.4
food, drink and tobacco	1.4	1.6	1.6	1.7	2.0	2.2	1.2	0.2	0.7	1.5	1.1
engineering	0.7	0.8	0.9	1.0	1.3	1.6	1.2	0.9	1.9	2.6	1.8
textiles	0.3	0.3	0.3	0.3	0.2	0.2	1.2	-1.3	-1.6	-0.4	-0.3
other industries (incl. printing)	2.0	2.3	2.4	2.6	3.1	3.4	1.2	0.4	0.9	1.7	1.1
Construction	1.7	2.7	2.7	3.0	3.4	3.7	4.7	-0.1	1.2	1.3	0.9
Tertiary	22.1	29.0	30.9	35.5	43.7	51.9	2.8	0.6	1.4	2.1	1.7
market services	9.6	14.1	14.7	16.6	20.6	24.5	3.9	0.4	1.2	2.2	1.8
non market services	6.1	6.2	6.6	7.5	9.5	11.5	0.0	0.7	1.4	2.4	1.9
trade	4.7	6.9	7.7	9.3	11.4	13.6	3.9	1.1	1.9	2.1	1.7
agriculture	1.8	2.0	2.0	2.0	2.2	2.3	0.8	0.1	0.4	0.8	0.4
Energy sector and others	0.4	0.5	0.5	0.5	0.5	0.5	1.2	-0.1	0.2	0.3	0.0

Cyprus: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	0.7	0.8	0.9	0.9	1.0	1.0	1.7	0.9	0.3	0.5	0.7
Household size (inhabitants per household)	3.1	2.8	2.7	2.7	2.6	2.6	-0.9	-0.4	-0.1	-0.2	-0.1
Gross Domestic Product (in MEuro'13)	**13.8**	**18.2**	**18.6**	**22.4**	**29.0**	**36.6**	**2.8**	**0.2**	**1.9**	**2.6**	**2.3**
Household Income (in Euro'13/capita)	**12602.7**	**14751.9**	**14318.5**	**16185.9**	**19444.8**	**22092.1**	**1.6**	**-0.3**	**1.2**	**1.9**	**1.3**
SECTORAL VALUE ADDED (in MEuro'13)	**12.4**	**16.4**	**16.8**	**20.3**	**26.2**	**33.1**	**2.9**	**0.2**	**1.9**	**2.6**	**2.3**
Industry	1.1	1.1	1.0	1.2	1.4	1.8	-0.4	-0.7	1.4	2.2	2.0
iron and steel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.6	0.4	1.4	1.3
non ferrous metals	0.0	0.0	0.0	0.0	0.0	0.0					
chemicals	0.0	0.1	0.1	0.1	0.1	0.1	6.0	0.2	1.5	2.1	1.7
non metallic minerals	0.1	0.1	0.1	0.1	0.2	0.2	2.9	-1.4	1.0	1.9	1.8
paper pulp	0.1	0.1	0.1	0.1	0.1	0.1	2.2	0.2	1.3	1.9	1.8
food, drink and tobacco	0.5	0.4	0.3	0.4	0.5	0.6	-2.4	-0.7	1.5	2.3	2.1
engineering	0.1	0.2	0.1	0.2	0.2	0.3	1.1	-1.8	1.8	2.6	2.4
textiles	0.1	0.0	0.0	0.0	0.0	0.0	-9.3	-2.1	-0.8	0.1	0.2
other industries (incl. printing)	0.3	0.2	0.2	0.3	0.3	0.4	-1.2	-0.2	1.5	2.4	2.1
Construction	1.2	1.5	1.2	1.4	1.7	2.1	1.8	-1.7	1.1	2.3	2.1
Tertiary	9.8	13.6	14.3	17.4	22.7	28.8	3.3	0.5	2.0	2.7	2.4
market services	5.4	7.7	8.2	10.3	13.5	17.3	3.5	0.7	2.2	2.7	2.5
non market services	2.6	3.5	3.2	3.6	4.6	5.6	3.2	-1.0	1.1	2.5	2.1
trade	1.3	2.0	2.5	3.2	4.3	5.5	4.0	2.5	2.5	2.9	2.5
agriculture	0.5	0.4	0.3	0.3	0.4	0.4	-2.5	-1.2	-0.4	0.8	0.6
Energy sector and others	0.2	0.3	0.3	0.3	0.3	0.4	4.9	-1.4	0.8	1.4	1.3

Source: GEM-E3

EU Reference scenario 2016

Czech Republic: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	10.3	10.5	10.7	10.8	10.9	11.1	0.2	0.2	0.1	0.1	0.1
Household size (inhabitants per household)	2.6	2.3	2.2	2.2	2.2	2.1	-1.3	-0.2	-0.2	-0.2	-0.1
Gross Domestic Product (in MEuro'13)	**112.3**	**156.7**	**180.8**	**215.6**	**254.6**	**297.2**	**3.4**	**1.4**	**1.8**	**1.7**	**1.6**
Household Income (in Euro'13/capita)	**5717.8**	**7573.1**	**8453.2**	**10341.9**	**12506.3**	**14900.3**	**2.8**	**1.1**	**2.0**	**1.9**	**1.8**
SECTORAL VALUE ADDED (in MEuro'13)	**103.0**	**141.4**	**163.1**	**194.6**	**229.7**	**268.2**	**3.2**	**1.4**	**1.8**	**1.7**	**1.6**
Industry	17.0	32.6	36.7	43.2	50.5	59.1	6.7	1.2	1.6	1.6	1.6
iron and steel	1.9	0.8	0.9	0.9	1.0	1.1	-8.2	0.7	0.9	0.8	0.6
non ferrous metals	0.5	0.2	0.2	0.2	0.2	0.2	-9.1	0.5	0.7	0.8	0.8
chemicals	0.9	1.8	2.0	2.2	2.5	2.8	7.3	1.0	1.2	1.3	1.1
non metallic minerals	1.5	1.7	1.8	1.9	2.1	2.3	1.3	0.5	1.0	0.8	0.7
paper pulp	0.6	1.3	1.3	1.5	1.6	1.8	7.6	0.5	1.0	1.0	0.9
food, drink and tobacco	3.8	3.4	3.7	4.2	4.7	5.2	-1.1	0.8	1.1	1.1	1.0
engineering	5.5	16.3	19.2	24.0	29.5	36.4	11.4	1.6	2.3	2.1	2.1
textiles	0.8	0.9	0.9	0.8	0.7	0.7	1.0	-0.3	-0.8	-0.7	-0.6
other industries (incl. printing)	2.9	6.3	6.8	7.4	8.2	8.7	8.2	0.8	0.9	1.0	0.6
Construction	8.6	10.4	11.1	12.6	14.0	15.1	1.9	0.7	1.3	1.1	0.8
Tertiary	72.1	90.7	107.3	130.0	155.8	184.3	2.3	1.7	1.9	1.8	1.7
market services	41.2	51.0	61.9	76.0	92.3	110.2	2.1	2.0	2.1	2.0	1.8
non market services	20.2	21.7	23.9	27.2	30.9	34.7	0.8	0.9	1.3	1.3	1.2
trade	9.4	15.7	19.2	24.4	30.1	36.9	5.3	2.0	2.4	2.1	2.1
agriculture	2.7	2.3	2.4	2.5	2.5	2.5	-1.4	0.3	0.2	0.3	0.0
Energy sector and others	5.3	7.6	8.1	8.8	9.4	9.6	3.8	0.5	0.9	0.6	0.3

Denmark: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	5.3	5.5	5.8	6.1	6.3	6.4	0.4	0.4	0.5	0.3	0.2
Household size (inhabitants per household)	2.2	2.1	2.1	2.1	2.1	2.1	-0.6	0.0	0.0	0.0	0.0
Gross Domestic Product (in MEuro'13)	**232.9**	**247.0**	**289.3**	**350.2**	**414.6**	**499.2**	**0.6**	**1.6**	**1.9**	**1.7**	**1.9**
Household Income (in Euro'13/capita)	**19431.5**	**21689.4**	**25329.2**	**29680.2**	**34594.5**	**41895.8**	**1.1**	**1.6**	**1.6**	**1.5**	**1.9**
SECTORAL VALUE ADDED (in MEuro'13)	**202.6**	**212.7**	**249.2**	**301.5**	**357.0**	**429.9**	**0.5**	**1.6**	**1.9**	**1.7**	**1.9**
Industry	27.0	24.3	27.6	32.6	37.7	44.4	-1.1	1.3	1.7	1.5	1.7
iron and steel	0.4	0.2	0.2	0.2	0.2	0.2	-7.3	1.4	0.6	0.4	0.4
non ferrous metals	0.2	0.1	0.1	0.1	0.1	0.1	-8.1	0.8	1.1	0.7	1.0
chemicals	3.1	4.9	5.7	6.9	8.2	9.9	4.6	1.4	2.0	1.7	1.9
non metallic minerals	1.3	0.8	0.9	1.0	1.1	1.3	-4.7	1.1	1.2	1.0	1.2
paper pulp	1.6	0.9	1.0	1.1	1.2	1.4	-5.3	0.7	1.1	1.0	1.3
food, drink and tobacco	5.1	3.7	4.3	5.1	6.0	7.1	-3.2	1.5	1.8	1.6	1.7
engineering	9.6	9.3	10.4	12.1	13.8	16.1	-0.3	1.1	1.6	1.3	1.5
textiles	0.7	0.3	0.3	0.3	0.2	0.2	-7.0	-0.7	-1.2	-1.3	-1.3
other industries (incl. printing)	4.8	4.1	4.7	5.7	6.7	8.1	-1.7	1.5	1.9	1.7	1.8
Construction	11.6	9.7	11.2	12.9	14.6	16.8	-1.8	1.5	1.4	1.3	1.4
Tertiary	154.2	168.2	199.3	244.1	291.9	354.7	0.9	1.7	2.0	1.8	2.0
market services	78.4	87.7	105.9	129.7	155.1	188.2	1.1	1.9	2.0	1.8	2.0
non market services	48.2	52.3	59.8	71.5	83.8	100.0	0.8	1.4	1.8	1.6	1.8
trade	23.7	25.1	30.4	39.6	49.7	63.2	0.6	2.0	2.7	2.3	2.4
agriculture	4.0	3.0	3.2	3.3	3.3	3.3	-2.8	0.6	0.2	0.0	0.0
Energy sector and others	9.8	10.6	11.1	12.0	12.9	13.9	0.7	0.5	0.8	0.7	0.8

Source: GEM-E3

EU Reference scenario 2016

Estonia: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	1.4	1.3	1.3	1.2	1.2	1.1	-0.5	-0.4	-0.6	-0.4	-0.3
Household size (inhabitants per household)	2.4	2.1	2.1	2.1	2.1	2.1	-1.3	-0.1	-0.1	-0.1	-0.1
Gross Domestic Product (in MEuro'13)	**10.7**	**15.2**	**20.5**	**24.0**	**27.6**	**30.6**	**3.6**	**3.0**	**1.6**	**1.4**	**1.1**
Household Income (in Euro'13/capita)	**3869.7**	**6050.2**	**8593.6**	**11154.8**	**13796.1**	**16328.6**	**4.6**	**3.6**	**2.6**	**2.1**	**1.7**
SECTORAL VALUE ADDED (in MEuro'13)	**9.5**	**13.3**	**17.9**	**21.0**	**24.1**	**26.8**	**3.4**	**3.0**	**1.6**	**1.4**	**1.1**
Industry	1.3	2.1	2.7	3.1	3.4	3.7	4.4	2.8	1.3	1.0	0.8
iron and steel	0.0	0.0	0.0	0.0	0.0	0.0	31.5	4.2	2.7	2.4	2.0
non ferrous metals	0.0	0.0	0.0	0.0	0.0	0.0	16.7	1.8	0.3	0.2	-0.2
chemicals	0.1	0.1	0.1	0.1	0.1	0.1	4.2	1.5	0.5	0.4	0.2
non metallic minerals	0.1	0.1	0.1	0.2	0.2	0.2	0.7	2.5	1.6	1.3	1.0
paper pulp	0.1	0.1	0.2	0.2	0.2	0.2	6.8	2.3	1.2	1.0	0.8
food, drink and tobacco	0.3	0.3	0.4	0.4	0.5	0.5	-0.9	2.9	1.2	1.1	0.8
engineering	0.3	0.6	0.9	1.1	1.3	1.4	9.8	3.8	1.9	1.4	0.9
textiles	0.2	0.1	0.1	0.1	0.1	0.1	-1.5	0.5	-0.6	-0.8	-1.0
other industries (incl. printing)	0.4	0.6	0.8	0.9	1.0	1.1	4.9	2.5	1.0	0.9	0.8
Construction	0.6	0.8	1.0	1.1	1.3	1.3	2.7	2.4	1.2	0.9	0.6
Tertiary	7.0	9.7	13.2	15.8	18.4	20.7	3.3	3.2	1.8	1.6	1.2
market services	3.7	5.5	8.0	9.8	11.6	13.2	4.1	3.8	2.0	1.7	1.3
non market services	1.8	2.1	2.6	2.8	3.1	3.4	1.6	2.1	1.0	1.0	0.7
trade	1.3	1.6	2.2	2.7	3.2	3.7	2.1	3.1	2.0	1.7	1.4
agriculture	0.4	0.4	0.5	0.5	0.5	0.5	1.2	0.9	0.1	0.1	0.1
Energy sector and others	0.5	0.7	0.9	1.0	1.0	1.0	3.4	2.1	0.7	0.2	0.1

Finland: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	5.2	5.4	5.6	5.9	6.1	6.2	0.3	0.5	0.5	0.3	0.2
Household size (inhabitants per household)	2.3	2.3	2.2	2.2	2.2	2.2	-0.1	-0.1	0.0	-0.1	-0.1
Gross Domestic Product (in MEuro'13)	**157.3**	**186.8**	**199.1**	**225.6**	**269.7**	**318.0**	**1.7**	**0.6**	**1.3**	**1.8**	**1.7**
Household Income (in Euro'13/capita)	**15404.5**	**19352.3**	**20492.8**	**22372.8**	**26424.1**	**31356.9**	**2.3**	**0.6**	**0.9**	**1.7**	**1.7**
SECTORAL VALUE ADDED (in MEuro'13)	**139.6**	**162.6**	**173.3**	**196.3**	**234.7**	**276.7**	**1.5**	**0.6**	**1.3**	**1.8**	**1.7**
Industry	23.5	28.5	29.0	31.9	36.7	41.6	2.0	0.2	1.0	1.4	1.3
iron and steel	1.0	0.8	0.8	0.9	0.9	1.0	-2.5	0.3	0.6	0.7	0.8
non ferrous metals	0.6	0.4	0.4	0.4	0.5	0.5	-3.7	0.3	0.6	0.9	0.8
chemicals	1.8	2.4	2.5	2.6	2.9	3.2	3.2	0.1	0.7	1.0	0.9
non metallic minerals	1.0	1.0	1.0	1.2	1.3	1.5	-0.2	0.3	1.0	1.4	1.2
paper pulp	4.4	3.7	3.5	3.7	4.0	4.3	-1.7	-0.5	0.5	0.9	0.7
food, drink and tobacco	2.1	2.6	2.6	3.0	3.6	4.2	2.5	0.0	1.3	1.8	1.5
engineering	7.9	12.2	12.8	14.3	16.7	19.1	4.5	0.5	1.1	1.5	1.4
textiles	0.6	0.4	0.4	0.3	0.3	0.3	-3.4	-1.0	-1.1	-1.0	-1.2
other industries (incl. printing)	5.1	5.0	4.9	5.4	6.4	7.4	-0.2	-0.2	1.0	1.6	1.5
Construction	9.5	10.9	11.3	12.7	14.8	17.0	1.4	0.3	1.2	1.5	1.4
Tertiary	102.6	118.3	128.2	146.4	177.4	211.6	1.4	0.8	1.3	1.9	1.8
market services	53.2	62.9	68.3	77.9	95.0	114.2	1.7	0.8	1.3	2.0	1.9
non market services	34.6	34.7	36.3	40.5	47.9	55.8	0.0	0.4	1.1	1.7	1.5
trade	11.6	15.9	19.0	23.5	29.8	37.0	3.2	1.8	2.2	2.4	2.2
agriculture	4.1	4.7	4.6	4.6	4.7	4.7	1.4	-0.1	-0.1	0.2	0.0
Energy sector and others	4.0	4.9	4.8	5.3	5.9	6.6	1.9	0.0	0.9	1.1	1.1

Source: GEM-E3

EU Reference scenario 2016

France: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	57.3	61.5	64.4	67.0	69.2	70.7	0.7	0.5	0.4	0.3	0.2
Household size (inhabitants per household)	2.4	2.3	2.3	2.3	2.2	2.2	-0.3	-0.1	-0.1	-0.1	-0.1
Gross Domestic Product (in MEuro'13)	**1811.8**	**2024.3**	**2266.3**	**2594.3**	**3077.6**	**3667.9**	**1.1**	**1.1**	**1.4**	**1.7**	**1.8**
Household Income (in Euro'13/capita)	**17350.9**	**19136.3**	**20648.4**	**22828.3**	**26337.9**	**30899.2**	**1.0**	**0.8**	**1.0**	**1.4**	**1.6**
SECTORAL VALUE ADDED (in MEuro'13)	**1628.0**	**1819.6**	**2037.2**	**2332.0**	**2766.5**	**3297.2**	**1.1**	**1.1**	**1.4**	**1.7**	**1.8**
Industry	184.8	187.1	207.9	230.2	265.9	309.8	0.1	1.1	1.0	1.5	1.5
iron and steel	4.0	4.1	4.1	3.9	3.7	3.6	0.4	0.0	-0.6	-0.4	-0.2
non ferrous metals	2.8	2.3	2.5	2.6	2.7	2.7	-1.9	0.9	0.5	0.2	0.0
chemicals	17.9	21.5	22.4	23.7	25.7	27.8	1.9	0.4	0.6	0.8	0.8
non metallic minerals	8.2	7.0	7.7	8.7	10.0	11.4	-1.6	1.0	1.3	1.4	1.4
paper pulp	8.8	8.7	9.9	11.1	12.9	15.1	0.0	1.3	1.1	1.6	1.5
food, drink and tobacco	32.8	31.8	35.1	39.3	45.3	53.3	-0.3	1.0	1.1	1.4	1.6
engineering	68.3	64.1	75.4	88.2	107.3	130.3	-0.6	1.6	1.6	2.0	2.0
textiles	8.7	5.6	4.1	3.3	2.8	2.6	-4.3	-3.1	-2.3	-1.6	-0.7
other industries (incl. printing)	35.4	41.9	46.6	49.5	55.6	63.0	1.7	1.1	0.6	1.2	1.3
Construction	110.2	111.0	116.0	125.3	141.2	159.1	0.1	0.4	0.8	1.2	1.2
Tertiary	1299.6	1490.1	1679.7	1943.0	2324.7	2792.9	1.4	1.2	1.5	1.8	1.9
market services	716.8	845.0	972.5	1134.7	1369.1	1662.4	1.7	1.4	1.6	1.9	2.0
non market services	371.6	411.1	447.4	502.0	591.2	694.7	1.0	0.8	1.2	1.6	1.6
trade	179.3	200.8	225.6	271.4	329.2	400.6	1.1	1.2	1.9	1.9	2.0
agriculture	32.6	33.2	34.3	34.8	35.2	35.2	0.2	0.3	0.2	0.1	0.0
Energy sector and others	33.3	31.4	33.6	33.6	34.7	35.4	-0.6	0.7	0.0	0.3	0.2

Germany: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	82.2	81.8	80.6	79.7	77.7	74.5	0.0	-0.1	-0.1	-0.3	-0.4
Household size (inhabitants per household)	2.2	2.0	2.0	2.0	2.0	2.0	-0.9	0.0	0.0	0.0	0.0
Gross Domestic Product (in MEuro'13)	**2370.2**	**2607.8**	**2973.4**	**3251.2**	**3531.3**	**3901.4**	**1.0**	**1.3**	**0.9**	**0.8**	**1.0**
Household Income (in Euro'13/capita)	**17397.3**	**18336.4**	**21286.1**	**24131.0**	**27539.4**	**32457.1**	**0.5**	**1.5**	**1.3**	**1.3**	**1.7**
SECTORAL VALUE ADDED (in MEuro'13)	**2095.0**	**2336.2**	**2663.8**	**2912.6**	**3163.6**	**3495.1**	**1.1**	**1.3**	**0.9**	**0.8**	**1.0**
Industry	445.1	507.7	562.7	602.1	624.1	652.8	1.3	1.0	0.7	0.4	0.5
iron and steel	13.5	12.1	13.4	14.2	14.3	14.2	-1.1	1.0	0.6	0.1	-0.1
non ferrous metals	10.9	6.4	7.0	7.3	7.5	7.7	-5.2	1.0	0.3	0.3	0.2
chemicals	43.3	58.4	67.6	75.3	81.9	88.1	3.0	1.5	1.1	0.8	0.7
non metallic minerals	17.1	15.1	15.8	16.6	16.9	17.2	-1.3	0.5	0.5	0.2	0.2
paper pulp	18.5	19.2	22.1	23.7	24.6	24.8	0.4	1.4	0.7	0.4	0.1
food, drink and tobacco	45.7	40.7	43.4	47.8	51.3	54.8	-1.2	0.7	1.0	0.7	0.7
engineering	227.1	279.5	313.5	334.0	344.0	359.7	2.1	1.2	0.6	0.3	0.4
textiles	9.5	7.4	6.0	4.8	3.9	3.4	-2.5	-2.0	-2.2	-2.0	-1.5
other industries (incl. printing)	62.2	68.9	73.9	78.4	79.5	82.9	1.0	0.7	0.6	0.1	0.4
Construction	129.2	106.7	117.0	121.9	126.8	131.6	-1.9	0.9	0.4	0.4	0.4
Tertiary	1459.8	1655.6	1910.8	2110.7	2330.2	2622.2	1.3	1.4	1.0	1.0	1.2
market services	883.2	997.4	1172.1	1335.0	1502.5	1715.2	1.2	1.6	1.3	1.2	1.3
non market services	382.5	428.0	482.5	507.8	543.2	601.7	1.1	1.2	0.5	0.7	1.0
trade	185.1	211.5	236.7	247.6	264.0	284.7	1.3	1.1	0.5	0.6	0.8
agriculture	12.9	18.6	19.5	20.3	20.6	20.5	3.7	0.5	0.4	0.1	0.0
Energy sector and others	60.9	66.2	73.3	77.8	82.5	88.5	0.8	1.0	0.6	0.6	0.7

Source: GEM-E3

EU Reference scenario 2016

Greece: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	10.9	11.2	10.7	10.1	9.6	9.1	0.3	-0.5	-0.6	-0.5	-0.5
Household size (inhabitants per household)	2.8	2.7	2.6	2.5	2.4	2.3	-0.6	-0.1	-0.4	-0.6	-0.3
Gross Domestic Product (in MEuro'13)	**189.8**	**232.2**	**207.3**	**224.5**	**267.7**	**295.9**	**2.0**	**-1.1**	**0.8**	**1.8**	**1.0**
Household Income (in Euro'13/capita)	**12198.5**	**15238.8**	**13465.1**	**15065.9**	**18100.4**	**19915.0**	**2.3**	**-1.2**	**1.1**	**1.9**	**1.0**
SECTORAL VALUE ADDED (in MEuro'13)	**166.2**	**204.0**	**182.2**	**197.3**	**235.3**	**260.0**	**2.1**	**-1.1**	**0.8**	**1.8**	**1.0**
Industry	20.4	18.8	17.6	18.8	22.0	24.1	-0.8	-0.7	0.6	1.6	0.9
iron and steel	0.4	0.6	0.6	0.6	0.6	0.6	3.4	0.1	-0.1	-0.2	-0.2
non ferrous metals	0.6	0.6	0.6	0.7	0.7	0.8	0.5	0.0	0.4	1.1	0.2
chemicals	0.7	1.7	1.7	1.7	2.0	2.2	9.4	-0.3	0.5	1.6	0.7
non metallic minerals	1.6	1.6	1.2	1.3	1.6	1.9	-0.2	-2.7	0.9	2.1	1.5
paper pulp	1.5	0.9	0.8	0.9	0.9	0.9	-5.2	-0.8	0.6	0.7	-0.1
food, drink and tobacco	10.9	6.9	6.9	7.9	9.8	11.5	-4.5	0.0	1.3	2.3	1.6
engineering	2.8	3.2	3.3	3.4	3.8	3.8	1.6	0.3	0.2	1.0	0.2
textiles	1.9	1.1	0.8	0.7	0.6	0.6	-5.3	-3.2	-1.9	-0.5	-1.3
other industries (incl. printing)	2.7	2.2	1.7	1.8	1.9	1.9	-2.0	-2.5	0.2	0.9	0.0
Construction	11.1	7.1	5.0	5.3	6.5	7.6	-4.4	-3.5	0.6	2.1	1.7
Tertiary	130.1	171.3	153.7	167.6	200.7	222.1	2.8	-1.1	0.9	1.8	1.0
market services	74.1	98.4	91.3	100.9	121.9	136.8	2.9	-0.7	1.0	1.9	1.2
non market services	31.8	41.4	32.6	34.7	40.7	43.3	2.7	-2.4	0.6	1.6	0.6
trade	18.2	24.9	23.6	26.1	31.8	35.9	3.2	-0.6	1.0	2.0	1.2
agriculture	7.6	6.6	6.1	5.9	6.3	6.1	-1.5	-0.7	-0.4	0.6	-0.3
Energy sector and others	4.6	6.8	5.9	5.6	6.1	6.2	3.9	-1.4	-0.4	0.8	0.1

Hungary: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	10.2	10.0	9.8	9.7	9.5	9.3	-0.2	-0.2	-0.1	-0.2	-0.2
Household size (inhabitants per household)	2.5	2.6	2.6	2.6	2.6	2.6	0.5	-0.2	0.0	0.0	0.0
Gross Domestic Product (in MEuro'13)	**83.0**	**100.6**	**117.1**	**145.0**	**168.9**	**192.3**	**1.9**	**1.5**	**2.2**	**1.5**	**1.3**
Household Income (in Euro'13/capita)	**4425.3**	**5332.1**	**6118.2**	**7657.2**	**9101.8**	**10623.2**	**1.9**	**1.4**	**2.3**	**1.7**	**1.6**
SECTORAL VALUE ADDED (in MEuro'13)	**72.0**	**84.9**	**98.9**	**122.4**	**142.6**	**162.3**	**1.7**	**1.5**	**2.2**	**1.5**	**1.3**
Industry	12.5	17.4	20.4	25.1	28.3	31.4	3.3	1.6	2.1	1.2	1.1
iron and steel	0.4	0.2	0.2	0.3	0.4	0.4	-6.6	1.6	2.9	1.6	1.5
non ferrous metals	0.7	0.3	0.3	0.3	0.3	0.3	-9.1	0.5	0.9	0.3	0.2
chemicals	1.7	1.9	2.0	2.4	2.7	3.0	1.1	1.0	1.8	1.2	0.9
non metallic minerals	0.6	0.6	0.7	0.9	1.0	1.1	1.5	1.3	2.0	1.3	1.1
paper pulp	0.4	0.6	0.7	0.8	0.9	1.0	2.9	1.2	2.1	1.3	1.1
food, drink and tobacco	2.8	2.1	2.3	2.8	3.3	3.6	-3.2	1.3	2.0	1.3	1.2
engineering	4.7	9.0	11.0	13.9	15.7	17.7	6.7	2.1	2.4	1.2	1.2
textiles	0.8	0.4	0.4	0.3	0.3	0.3	-6.3	-1.2	-1.2	-1.6	-1.4
other industries (incl. printing)	1.3	2.4	2.7	3.2	3.6	3.9	5.9	1.3	1.8	1.2	0.8
Construction	4.0	3.6	3.9	5.0	5.9	6.8	-1.3	1.1	2.4	1.6	1.5
Tertiary	50.1	60.1	70.5	87.8	103.6	119.0	1.8	1.6	2.2	1.7	1.4
market services	27.0	33.3	39.5	49.8	59.7	69.4	2.1	1.7	2.3	1.8	1.5
non market services	13.9	15.2	17.2	20.3	22.7	25.0	0.9	1.3	1.7	1.1	1.0
trade	6.5	8.5	10.4	14.0	17.3	20.5	2.8	2.0	3.0	2.1	1.7
agriculture	2.8	3.1	3.3	3.8	4.0	4.2	0.9	0.9	1.3	0.5	0.5
Energy sector and others	5.4	3.9	4.0	4.5	4.8	5.1	-3.2	0.3	1.1	0.7	0.5

Source: GEM-E3

EU Reference scenario 2016

Ireland: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	3.8	4.5	4.9	4.9	5.1	5.4	1.9	0.8	0.0	0.3	0.6
Household size (inhabitants per household)	3.0	2.8	2.6	2.6	2.5	2.5	-0.8	-0.5	-0.2	-0.2	-0.2
Gross Domestic Product (in MEuro'13)	**129.8**	**165.2**	**207.7**	**244.5**	**289.0**	**335.7**	**2.4**	**2.3**	**1.6**	**1.7**	**1.5**
Household Income (in Euro'13/capita)	**16147.2**	**17917.9**	**18870.4**	**24236.0**	**30182.9**	**35615.5**	**1.0**	**0.5**	**2.5**	**2.2**	**1.7**
SECTORAL VALUE ADDED (in MEuro'13)	**121.2**	**151.1**	**190.0**	**223.6**	**264.3**	**306.9**	**2.2**	**2.3**	**1.6**	**1.7**	**1.5**
Industry	28.8	33.0	40.5	46.9	54.1	62.0	1.4	2.1	1.5	1.4	1.4
iron and steel	0.1	0.1	0.1	0.1	0.1	0.1	-1.8	1.1	1.0	0.7	0.1
non ferrous metals	0.1	0.1	0.1	0.1	0.1	0.1	-2.8	0.3	0.3	0.5	0.4
chemicals	11.4	15.3	17.4	19.7	22.3	25.6	2.9	1.3	1.3	1.2	1.4
non metallic minerals	1.1	0.5	0.5	0.6	0.7	0.7	-8.6	1.6	1.1	1.1	0.8
paper pulp	0.9	0.6	0.7	0.7	0.7	0.8	-3.5	0.4	0.2	0.7	0.6
food, drink and tobacco	4.0	6.6	9.4	10.7	12.4	14.2	5.2	3.6	1.3	1.5	1.4
engineering	6.7	4.6	6.2	8.3	10.3	11.9	-3.7	3.1	2.9	2.3	1.5
textiles	0.3	0.1	0.1	0.1	0.1	0.1	-5.8	-0.3	-1.0	-1.1	-0.8
other industries (incl. printing)	4.3	5.2	6.0	6.6	7.5	8.4	1.8	1.5	1.0	1.2	1.2
Construction	3.9	2.9	3.4	4.0	4.6	5.3	-3.2	1.8	1.7	1.4	1.2
Tertiary	86.6	112.2	142.3	168.2	200.5	234.2	2.6	2.4	1.7	1.8	1.6
market services	47.8	66.4	88.5	109.9	136.3	163.6	3.3	2.9	2.2	2.2	1.8
non market services	21.7	27.9	31.0	32.2	34.0	36.1	2.6	1.1	0.4	0.5	0.6
trade	12.8	15.6	19.6	22.8	26.8	30.8	2.0	2.3	1.5	1.6	1.4
agriculture	5.2	2.3	3.1	3.2	3.4	3.7	-7.9	3.0	0.5	0.6	0.7
Energy sector and others	1.9	3.0	3.8	4.5	5.1	5.6	4.9	2.3	1.7	1.1	1.0

Italy: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	56.9	59.2	62.1	64.2	66.3	67.0	0.4	0.5	0.3	0.3	0.1
Household size (inhabitants per household)	2.6	2.5	2.4	2.4	2.3	2.3	-0.5	-0.1	-0.2	-0.2	-0.2
Gross Domestic Product (in MEuro'13)	**1564.2**	**1622.0**	**1675.0**	**1884.5**	**2193.8**	**2556.5**	**0.4**	**0.3**	**1.2**	**1.5**	**1.5**
Household Income (in Euro'13/capita)	**16438.2**	**16668.8**	**16666.7**	**18272.5**	**20780.9**	**24145.2**	**0.1**	**0.0**	**0.9**	**1.3**	**1.5**
SECTORAL VALUE ADDED (in MEuro'13)	**1396.6**	**1453.2**	**1500.7**	**1688.4**	**1965.5**	**2290.4**	**0.4**	**0.3**	**1.2**	**1.5**	**1.5**
Industry	260.4	238.8	238.2	254.3	280.4	312.5	-0.9	0.0	0.7	1.0	1.1
iron and steel	5.7	5.6	5.4	5.4	5.6	5.7	-0.1	-0.4	0.0	0.2	0.2
non ferrous metals	4.0	2.6	2.8	2.9	3.0	3.0	-4.4	0.7	0.4	0.3	0.1
chemicals	17.2	17.2	18.1	19.9	22.7	26.0	0.0	0.5	0.9	1.3	1.4
non metallic minerals	14.6	12.7	12.7	14.7	16.9	19.0	-1.3	0.0	1.4	1.4	1.2
paper pulp	11.6	10.6	10.3	11.3	12.7	14.2	-0.9	-0.3	0.9	1.2	1.2
food, drink and tobacco	29.6	26.5	26.8	30.7	36.5	42.0	-1.1	0.1	1.4	1.7	1.4
engineering	99.1	99.6	100.8	108.5	119.6	135.2	0.1	0.1	0.7	1.0	1.2
textiles	31.4	24.3	21.3	18.5	17.0	15.8	-2.5	-1.3	-1.4	-0.9	-0.7
other industries (incl. printing)	47.0	39.6	40.0	42.4	46.5	51.6	-1.7	0.1	0.6	0.9	1.0
Construction	85.1	87.4	75.9	84.4	100.7	118.9	0.3	-1.4	1.1	1.8	1.7
Tertiary	1022.7	1100.8	1160.6	1321.6	1553.4	1824.1	0.7	0.5	1.3	1.6	1.6
market services	603.5	667.2	698.8	814.7	977.1	1171.8	1.0	0.5	1.5	1.8	1.8
non market services	227.1	251.6	261.2	277.1	309.1	340.4	1.0	0.4	0.6	1.1	1.0
trade	163.2	154.6	174.0	202.0	238.1	281.6	-0.5	1.2	1.5	1.7	1.7
agriculture	28.9	27.5	26.5	27.7	29.1	30.2	-0.5	-0.4	0.4	0.5	0.4
Energy sector and others	28.5	26.1	26.0	28.0	31.0	34.9	-0.9	-0.1	0.7	1.0	1.2

Source: GEM-E3

EU Reference scenario 2016

Latvia: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	2.4	2.1	1.9	1.7	1.5	1.5	-1.2	-1.0	-1.4	-0.7	-0.4
Household size (inhabitants per household)	2.6	2.4	2.4	2.3	2.3	2.2	-0.5	-0.2	-0.3	-0.2	-0.1
Gross Domestic Product (in MEuro'13)	**13.2**	**18.9**	**26.5**	**31.4**	**35.9**	**40.0**	**3.6**	**3.5**	**1.7**	**1.4**	**1.1**
Household Income (in Euro'13/capita)	**3177.9**	**5613.3**	**8635.7**	**11829.5**	**14662.4**	**17118.5**	**5.9**	**4.4**	**3.2**	**2.2**	**1.6**
SECTORAL VALUE ADDED (in MEuro'13)	**11.5**	**16.9**	**23.8**	**28.1**	**32.2**	**35.8**	**4.0**	**3.5**	**1.7**	**1.4**	**1.1**
Industry	1.7	2.3	3.3	3.8	4.1	4.2	3.2	3.5	1.5	0.6	0.3
iron and steel	0.1	0.1	0.1	0.1	0.1	0.1	-3.0	0.0	4.5	1.2	0.2
non ferrous metals	0.0	0.0	0.0	0.0	0.0	0.0	0.3	2.3	1.5	0.8	0.4
chemicals	0.1	0.1	0.1	0.2	0.2	0.2	4.6	2.7	1.9	0.5	0.3
non metallic minerals	0.1	0.1	0.2	0.2	0.3	0.3	9.6	4.5	1.4	0.6	0.4
paper pulp	0.1	0.1	0.2	0.2	0.2	0.2	2.9	2.8	1.5	0.8	0.6
food, drink and tobacco	0.6	0.5	0.8	0.9	0.9	0.9	-1.2	3.6	1.3	0.6	0.3
engineering	0.2	0.3	0.5	0.7	0.8	0.8	4.8	4.9	2.2	1.4	0.9
textiles	0.2	0.1	0.1	0.1	0.1	0.1	-2.0	1.3	-0.6	-1.2	-1.3
other industries (incl. printing)	0.5	0.9	1.3	1.4	1.5	1.5	6.1	3.5	1.3	0.3	0.2
Construction	0.7	0.9	1.4	1.7	1.9	2.0	1.9	4.9	1.8	1.0	0.7
Tertiary	8.5	13.0	18.2	21.7	25.3	28.7	4.3	3.4	1.8	1.6	1.3
market services	4.0	6.9	9.9	12.0	14.2	16.1	5.7	3.6	2.0	1.7	1.3
non market services	2.5	2.6	3.5	3.8	4.1	4.2	0.3	3.2	0.9	0.6	0.3
trade	1.7	2.7	3.7	4.7	5.8	7.2	4.9	3.4	2.2	2.3	2.2
agriculture	0.6	0.8	1.1	1.2	1.2	1.3	3.7	2.4	1.2	0.2	0.1
Energy sector and others	0.5	0.6	0.8	0.8	0.9	0.8	2.5	2.2	0.6	0.2	-0.3

Lithuania: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	3.5	3.1	2.8	2.4	2.2	2.1	-1.1	-1.0	-1.8	-0.9	-0.4
Household size (inhabitants per household)	2.8	2.6	2.5	2.4	2.4	2.3	-0.4	-0.6	-0.3	-0.2	-0.2
Gross Domestic Product (in MEuro'13)	**18.9**	**29.0**	**39.9**	**42.8**	**46.1**	**52.6**	**4.4**	**3.3**	**0.7**	**0.8**	**1.3**
Household Income (in Euro'13/capita)	**3448.1**	**5925.5**	**9038.0**	**11768.3**	**14104.9**	**17031.6**	**5.6**	**4.3**	**2.7**	**1.8**	**1.9**
SECTORAL VALUE ADDED (in MEuro'13)	**17.0**	**26.0**	**35.9**	**38.4**	**41.4**	**47.2**	**4.4**	**3.3**	**0.7**	**0.8**	**1.3**
Industry	2.4	4.5	5.6	5.9	6.2	6.9	6.2	2.4	0.4	0.5	1.2
iron and steel	0.0	0.0	0.0	0.0	0.0	0.0	6.4	5.1	0.3	0.2	0.6
non ferrous metals	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	1.9	-1.0	-0.4	0.4
chemicals	0.3	0.6	0.7	0.7	0.7	0.7	8.7	1.5	-0.1	0.1	0.4
non metallic minerals	0.1	0.2	0.2	0.2	0.3	0.3	4.1	3.7	0.8	0.5	0.8
paper pulp	0.1	0.2	0.3	0.3	0.3	0.4	7.1	2.6	1.2	1.1	1.7
food, drink and tobacco	0.9	1.2	1.5	1.5	1.6	1.8	2.4	2.6	0.2	0.4	1.1
engineering	0.3	0.7	0.9	1.0	1.1	1.3	8.9	3.0	0.9	1.1	1.6
textiles	0.5	0.4	0.4	0.4	0.4	0.3	-1.9	0.8	-0.6	-1.0	-0.6
other industries (incl. printing)	0.4	1.2	1.6	1.7	1.8	2.1	12.2	2.3	0.7	0.7	1.5
Construction	0.9	1.5	2.2	2.4	2.5	2.8	5.7	3.9	0.6	0.6	0.8
Tertiary	12.7	18.6	26.2	28.3	30.9	35.6	3.9	3.5	0.8	0.9	1.4
market services	5.7	9.0	13.1	14.3	15.8	18.0	4.8	3.8	0.9	1.0	1.3
non market services	3.4	4.1	5.2	5.4	5.5	6.3	1.7	2.6	0.3	0.2	1.3
trade	2.9	4.6	6.9	7.7	8.6	10.4	4.8	4.0	1.1	1.2	1.9
agriculture	0.8	0.9	1.0	1.0	0.9	0.9	0.5	1.8	-0.3	-0.7	-0.2
Energy sector and others	0.9	1.4	1.8	1.8	1.8	1.9	4.3	2.3	0.1	0.3	0.6

Source: GEM-E3

EU Reference scenario 2016

Luxembourg: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	0.4	0.5	0.6	0.8	0.9	1.1	1.5	2.5	2.2	1.7	1.2
Household size (inhabitants per household)	2.6	2.5	2.4	2.4	2.4	2.3	-0.5	-0.1	-0.1	-0.2	-0.2
Gross Domestic Product (in MEuro'13)	**31.9**	**41.1**	**51.7**	**68.3**	**91.4**	**116.9**	**2.6**	**2.3**	**2.8**	**3.0**	**2.5**
Household Income (in Euro'13/capita)	**26500.5**	**26554.8**	**23976.7**	**25582.3**	**29529.6**	**34959.0**	**0.0**	**-1.0**	**0.7**	**1.4**	**1.7**
SECTORAL VALUE ADDED (in MEuro'13)	**28.7**	**37.1**	**46.7**	**61.7**	**82.6**	**105.6**	**2.6**	**2.3**	**2.8**	**3.0**	**2.5**
Industry	2.8	2.1	2.5	3.1	3.8	4.7	-2.5	1.5	2.1	2.3	2.0
iron and steel	0.3	0.2	0.2	0.2	0.2	0.2	-4.6	0.7	1.3	0.2	-0.5
non ferrous metals	0.1	0.0	0.0	0.0	0.0	0.0	-13.7	0.8	1.2	0.8	0.5
chemicals	0.1	0.1	0.2	0.2	0.3	0.3	4.5	1.7	2.4	2.7	2.3
non metallic minerals	0.2	0.2	0.2	0.2	0.2	0.2	-3.8	1.3	1.1	1.0	0.4
paper pulp	0.2	0.1	0.1	0.1	0.1	0.1	-7.5	0.7	1.1	1.1	1.2
food, drink and tobacco	0.4	0.3	0.3	0.4	0.5	0.6	-3.8	1.6	2.3	2.4	2.1
engineering	0.9	0.6	0.7	0.9	1.2	1.6	-3.4	2.0	2.5	2.8	2.4
textiles	0.1	0.2	0.2	0.1	0.1	0.1	3.7	-1.2	-0.7	-0.4	-0.1
other industries (incl. printing)	0.5	0.5	0.6	0.8	1.1	1.4	0.8	2.0	2.8	3.0	2.5
Construction	1.7	2.2	2.4	2.8	3.2	3.5	2.5	1.1	1.3	1.5	0.8
Tertiary	23.9	32.5	41.5	55.5	75.2	97.0	3.1	2.5	3.0	3.1	2.6
market services	16.2	22.9	29.5	39.4	53.1	67.9	3.5	2.6	2.9	3.0	2.5
non market services	4.0	5.5	6.5	8.3	10.9	13.6	3.2	1.6	2.5	2.7	2.2
trade	3.7	4.0	5.3	7.7	11.1	15.4	0.8	3.0	3.7	3.7	3.4
agriculture	0.2	0.1	0.1	0.1	0.1	0.1	-4.5	0.3	0.7	1.0	0.4
Energy sector and others	0.4	0.3	0.3	0.3	0.4	0.4	-1.9	0.3	0.8	0.9	0.8

Malta: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	0.4	0.4	0.4	0.5	0.5	0.5	0.9	0.6	0.4	0.1	0.1
Household size (inhabitants per household)	2.9	2.8	2.7	2.6	2.6	2.6	-0.3	-0.6	-0.1	-0.1	-0.1
Gross Domestic Product (in MEuro'13)	**5.6**	**6.8**	**8.3**	**10.1**	**12.2**	**14.3**	**1.8**	**2.1**	**1.9**	**1.9**	**1.6**
Household Income (in Euro'13/capita)	**8967.5**	**9702.1**	**10642.3**	**12783.3**	**15770.2**	**18750.5**	**0.8**	**0.9**	**1.8**	**2.1**	**1.7**
SECTORAL VALUE ADDED (in MEuro'13)	**4.8**	**5.9**	**7.3**	**8.8**	**10.7**	**12.5**	**2.1**	**2.1**	**1.9**	**1.9**	**1.6**
Industry	1.0	0.8	0.9	1.1	1.2	1.3	-2.7	1.8	1.5	1.4	0.8
iron and steel	0.0	0.0	0.0	0.0	0.0	0.0					
non ferrous metals	0.0	0.0	0.0	0.0	0.0	0.0					
chemicals	0.0	0.1	0.1	0.1	0.2	0.2	15.1	0.8	1.4	1.4	0.8
non metallic minerals	0.0	0.0	0.0	0.0	0.0	0.0	2.0	1.3	1.2	1.2	0.9
paper pulp	0.1	0.1	0.1	0.1	0.1	0.1	-1.0	2.4	1.5	1.3	1.0
food, drink and tobacco	0.1	0.1	0.1	0.1	0.2	0.2	-3.3	1.7	1.4	1.3	1.0
engineering	0.4	0.3	0.3	0.4	0.5	0.5	-4.0	2.5	1.8	1.7	1.0
textiles	0.1	0.0	0.0	0.0	0.0	0.0	-12.4	1.2	0.3	-0.3	-0.5
other industries (incl. printing)	0.2	0.2	0.2	0.2	0.3	0.3	-2.8	1.3	1.3	1.2	0.6
Construction	0.3	0.3	0.3	0.3	0.4	0.4	0.9	1.1	0.9	1.0	0.7
Tertiary	3.4	4.7	5.9	7.3	8.9	10.6	3.3	2.3	2.1	2.1	1.7
market services	1.9	2.9	3.8	4.8	6.1	7.3	4.2	2.6	2.5	2.4	1.9
non market services	0.8	1.1	1.3	1.5	1.6	1.8	3.5	2.0	0.9	1.2	0.9
trade	0.6	0.6	0.7	0.9	1.1	1.3	-0.4	1.7	2.1	2.1	1.9
agriculture	0.1	0.1	0.1	0.1	0.1	0.1	-1.0	0.2	0.2	0.4	0.4
Energy sector and others	0.1	0.1	0.1	0.1	0.1	0.2	3.3	0.3	0.9	0.9	0.3

Source: GEM-E3

EU Reference scenario 2016

Netherlands: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	15.9	16.6	17.2	17.6	17.6	17.4	0.4	0.3	0.2	0.0	-0.2
Household size (inhabitants per household)	2.4	2.3	2.3	2.2	2.1	2.0	-0.1	-0.2	-0.3	-0.4	-0.5
Gross Domestic Product (in MEuro'13)	**536.9**	**613.3**	**667.8**	**738.3**	**836.4**	**966.2**	**1.3**	**0.9**	**1.0**	**1.3**	**1.5**
Household Income (in Euro'13/capita)	**16737.0**	**16912.3**	**18169.3**	**20301.2**	**23676.5**	**28678.3**	**0.1**	**0.7**	**1.1**	**1.5**	**1.9**
SECTORAL VALUE ADDED (in MEuro'13)	**473.7**	**547.8**	**596.5**	**659.4**	**747.0**	**863.0**	**1.5**	**0.9**	**1.0**	**1.3**	**1.5**
Industry	60.3	66.7	75.5	83.2	91.8	103.7	1.0	1.2	1.0	1.0	1.2
iron and steel	0.7	1.0	1.0	1.1	1.1	1.2	4.1	0.3	0.9	0.1	0.2
non ferrous metals	0.5	0.4	0.4	0.5	0.5	0.6	-1.4	0.7	1.0	1.2	1.6
chemicals	8.4	11.5	13.3	14.7	16.1	17.9	3.3	1.4	1.0	0.9	1.0
non metallic minerals	2.8	2.3	2.4	2.6	2.8	3.2	-1.9	0.7	0.7	0.8	1.1
paper pulp	3.7	3.4	3.7	4.0	4.4	5.0	-1.0	0.7	0.8	1.1	1.3
food, drink and tobacco	13.0	14.3	16.0	17.6	19.4	22.2	1.0	1.1	0.9	1.0	1.4
engineering	18.3	18.6	22.2	24.8	27.5	30.9	0.1	1.8	1.1	1.0	1.1
textiles	1.5	1.2	1.0	0.8	0.6	0.5	-2.0	-1.8	-2.8	-2.1	-1.1
other industries (incl. printing)	11.8	14.0	15.4	17.1	19.3	22.3	1.7	1.0	1.1	1.2	1.5
Construction	32.9	29.3	31.7	32.8	34.4	36.9	-1.2	0.8	0.3	0.5	0.7
Tertiary	359.7	421.9	458.8	512.5	588.2	687.1	1.6	0.8	1.1	1.4	1.6
market services	197.0	220.8	248.1	279.0	320.5	374.2	1.1	1.2	1.2	1.4	1.6
non market services	100.1	123.1	123.3	136.6	157.1	184.3	2.1	0.0	1.0	1.4	1.6
trade	54.2	68.2	77.0	86.7	100.3	118.1	2.3	1.2	1.2	1.5	1.6
agriculture	8.8	9.8	10.4	10.2	10.3	10.6	1.1	0.6	-0.2	0.1	0.3
Energy sector and others	20.7	30.0	30.4	31.0	32.7	35.4	3.8	0.2	0.2	0.5	0.8

Poland: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	38.3	38.2	38.4	37.5	36.2	34.8	0.0	0.1	-0.2	-0.3	-0.4
Household size (inhabitants per household)	3.2	2.8	2.6	2.5	2.4	2.3	-1.2	-0.7	-0.6	-0.5	-0.4
Gross Domestic Product (in MEuro'13)	**252.9**	**370.6**	**492.5**	**622.7**	**726.3**	**793.5**	**3.9**	**2.9**	**2.4**	**1.6**	**0.9**
Household Income (in Euro'13/capita)	**4198.3**	**5949.1**	**7908.4**	**10396.8**	**12685.0**	**14484.5**	**3.5**	**2.9**	**2.8**	**2.0**	**1.3**
SECTORAL VALUE ADDED (in MEuro'13)	**230.6**	**326.4**	**433.8**	**548.4**	**639.7**	**698.9**	**3.5**	**2.9**	**2.4**	**1.6**	**0.9**
Industry	25.1	56.0	78.4	102.1	121.9	135.0	8.4	3.4	2.7	1.8	1.0
iron and steel	1.1	0.9	1.1	1.3	1.4	1.4	-2.3	2.7	1.6	0.6	0.2
non ferrous metals	0.3	0.3	0.4	0.5	0.6	0.6	-0.8	1.8	2.4	1.5	1.1
chemicals	2.2	3.8	5.4	6.5	7.4	7.8	5.7	3.4	2.0	1.3	0.5
non metallic minerals	0.9	3.6	4.7	5.9	6.9	7.6	14.2	2.8	2.3	1.6	0.9
paper pulp	1.9	2.7	3.5	4.7	5.9	6.6	3.7	2.7	2.9	2.2	1.2
food, drink and tobacco	5.9	10.5	13.7	17.2	19.8	21.2	6.0	2.7	2.3	1.4	0.7
engineering	5.0	17.5	26.9	38.0	48.5	56.7	13.4	4.4	3.5	2.5	1.6
textiles	2.0	2.1	2.4	2.4	2.3	2.1	0.3	1.3	0.2	-0.6	-0.8
other industries (incl. printing)	7.1	14.7	20.4	25.6	29.2	30.9	7.6	3.3	2.3	1.3	0.6
Construction	18.2	26.4	33.9	41.7	46.2	49.2	3.8	2.5	2.1	1.0	0.6
Tertiary	172.0	225.6	299.3	377.9	442.4	484.0	2.8	2.9	2.4	1.6	0.9
market services	81.5	104.0	138.5	178.7	212.5	235.2	2.5	2.9	2.6	1.7	1.0
non market services	36.7	46.0	59.3	73.7	84.3	89.5	2.3	2.6	2.2	1.3	0.6
trade	43.2	63.4	87.5	110.1	129.7	143.3	3.9	3.3	2.3	1.7	1.0
agriculture	10.9	12.2	14.1	15.3	15.9	16.0	1.2	1.4	0.9	0.4	0.1
Energy sector and others	15.3	18.4	22.2	26.7	29.2	30.6	1.8	1.9	1.9	0.9	0.5

Source: GEM-E3

EU Reference scenario 2016

Portugal: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	10.2	10.6	10.1	9.8	9.4	8.8	0.3	-0.4	-0.4	-0.4	-0.6
Household size (inhabitants per household)	2.8	2.6	2.5	2.5	2.4	2.4	-0.6	-0.3	-0.3	-0.2	-0.2
Gross Domestic Product (in MEuro'13)	**168.7**	**180.7**	**187.2**	**217.4**	**240.2**	**258.5**	**0.7**	**0.4**	**1.5**	**1.0**	**0.7**
Household Income (in Euro'13/capita)	**10275.6**	**11267.0**	**11977.0**	**14524.1**	**16787.8**	**19179.1**	**0.9**	**0.6**	**1.9**	**1.5**	**1.3**
SECTORAL VALUE ADDED (in MEuro'13)	**144.3**	**158.3**	**164.0**	**190.4**	**210.4**	**226.5**	**0.9**	**0.4**	**1.5**	**1.0**	**0.7**
Industry	21.9	21.3	21.8	24.0	25.4	26.2	-0.3	0.2	0.9	0.6	0.3
iron and steel	0.2	0.3	0.3	0.3	0.3	0.4	2.8	1.7	0.7	0.5	0.3
non ferrous metals	0.2	0.1	0.1	0.1	0.2	0.2	-3.1	1.6	0.8	0.5	0.3
chemicals	1.2	1.3	1.3	1.5	1.5	1.6	0.0	0.7	0.8	0.6	0.6
non metallic minerals	1.9	1.6	1.6	1.9	2.0	2.0	-1.2	0.0	1.2	0.6	0.3
paper pulp	1.5	1.6	1.6	1.8	1.9	1.9	0.2	0.0	1.1	0.5	0.2
food, drink and tobacco	2.9	3.3	3.5	3.9	4.3	4.6	1.3	0.4	1.2	0.9	0.7
engineering	5.1	5.8	6.3	7.3	7.9	8.3	1.3	0.9	1.4	0.8	0.4
textiles	4.5	3.1	2.8	2.6	2.3	2.0	-3.6	-0.9	-0.9	-1.1	-1.4
other industries (incl. printing)	4.4	4.2	4.2	4.6	5.0	5.3	-0.5	-0.1	1.1	0.8	0.5
Construction	14.2	9.9	9.3	10.4	11.1	11.5	-3.6	-0.6	1.2	0.6	0.4
Tertiary	104.7	122.2	127.9	150.2	167.5	181.8	1.6	0.5	1.6	1.1	0.8
market services	49.3	62.6	64.7	76.9	86.6	96.2	2.4	0.3	1.7	1.2	1.1
non market services	32.0	34.3	33.8	38.4	41.4	43.3	0.7	-0.1	1.3	0.8	0.5
trade	19.7	21.7	25.7	31.3	36.0	39.0	1.0	1.7	2.0	1.4	0.8
agriculture	3.8	3.6	3.6	3.6	3.5	3.3	-0.5	0.0	0.0	-0.3	-0.6
Energy sector and others	3.4	4.9	5.0	5.8	6.4	7.0	3.6	0.2	1.5	1.1	0.8

Romania: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	22.5	20.3	19.7	19.0	18.4	17.9	-1.0	-0.3	-0.4	-0.3	-0.3
Household size (inhabitants per household)	3.2	2.9	2.7	2.6	2.5	2.4	-1.1	-0.7	-0.4	-0.4	-0.5
Gross Domestic Product (in MEuro'13)	**86.6**	**129.9**	**163.0**	**195.4**	**225.3**	**260.5**	**4.1**	**2.3**	**1.8**	**1.4**	**1.5**
Household Income (in Euro'13/capita)	**1868.6**	**4088.1**	**5247.0**	**6586.0**	**7893.5**	**9466.6**	**8.1**	**2.5**	**2.3**	**1.8**	**1.8**
SECTORAL VALUE ADDED (in MEuro'13)	**77.3**	**115.7**	**145.2**	**174.0**	**200.7**	**232.0**	**4.1**	**2.3**	**1.8**	**1.4**	**1.5**
Industry	16.4	27.7	36.5	43.9	49.4	54.2	5.4	2.8	1.9	1.2	0.9
iron and steel	0.9	1.4	1.5	1.6	1.6	1.6	3.9	0.8	0.5	0.2	0.1
non ferrous metals	0.5	0.8	0.8	0.8	0.9	0.9	5.3	-0.3	0.4	0.2	0.1
chemicals	0.4	0.5	0.6	0.7	0.8	0.8	2.4	1.9	1.6	0.9	0.5
non metallic minerals	0.6	0.7	0.8	0.9	1.0	1.1	1.7	1.6	1.4	1.2	1.1
paper pulp	0.4	0.7	0.9	1.1	1.2	1.4	5.3	2.4	1.8	1.3	1.3
food, drink and tobacco	4.0	7.2	8.8	10.6	11.8	13.3	6.0	2.0	1.9	1.0	1.2
engineering	4.7	9.5	14.5	18.7	22.1	25.1	7.4	4.3	2.5	1.7	1.3
textiles	2.8	2.8	3.1	3.1	2.8	2.3	-0.2	1.1	0.0	-1.0	-1.8
other industries (incl. printing)	2.3	4.2	5.5	6.5	7.3	7.7	6.1	2.7	1.7	1.1	0.6
Construction	4.4	11.9	13.3	15.2	17.3	20.8	10.4	1.2	1.3	1.3	1.9
Tertiary	50.8	68.8	86.7	105.4	124.4	147.0	3.1	2.3	2.0	1.7	1.7
market services	30.0	40.9	52.9	66.2	80.2	97.4	3.1	2.6	2.3	1.9	2.0
non market services	15.8	14.0	16.5	19.0	20.7	22.3	-1.2	1.6	1.4	0.9	0.8
trade	2.9	6.5	9.0	11.4	14.3	17.9	8.4	3.3	2.3	2.3	2.3
agriculture	6.1	7.4	8.3	8.9	9.2	9.4	1.9	1.2	0.6	0.3	0.2
Energy sector and others	5.7	7.3	8.7	9.5	9.7	9.9	2.5	1.8	0.8	0.2	0.3

Source: GEM-E3

EU Reference scenario 2016

Slovakia: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	5.4	5.4	5.4	5.3	5.1	4.9	0.0	0.0	-0.2	-0.4	-0.5
Household size (inhabitants per household)	3.2	2.8	2.6	2.6	2.5	2.5	-1.2	-0.7	-0.3	-0.2	-0.1
Gross Domestic Product (in MEuro'13)	**43.1**	**68.9**	**89.0**	**116.7**	**134.5**	**142.7**	**4.8**	**2.6**	**2.7**	**1.4**	**0.6**
Household Income (in Euro'13/capita)	**4939.8**	**7456.7**	**9529.3**	**13112.9**	**16174.4**	**18526.7**	**4.2**	**2.5**	**3.2**	**2.1**	**1.4**
SECTORAL VALUE ADDED (in MEuro'13)	**40.6**	**62.6**	**81.0**	**106.1**	**122.3**	**129.7**	**4.4**	**2.6**	**2.7**	**1.4**	**0.6**
Industry	4.8	13.0	15.9	20.1	22.7	23.6	10.4	2.0	2.4	1.2	0.4
iron and steel	0.7	0.8	0.9	1.0	1.0	0.9	1.3	0.9	1.0	0.4	-0.6
non ferrous metals	0.4	0.2	0.3	0.3	0.3	0.3	-4.3	1.6	1.3	0.5	-0.5
chemicals	0.4	0.6	0.6	0.7	0.8	0.8	5.0	0.7	1.6	0.7	0.1
non metallic minerals	0.4	0.6	0.7	0.9	1.0	1.0	4.4	2.1	2.4	0.8	0.2
paper pulp	0.4	0.5	0.6	0.7	0.8	0.8	2.9	1.0	2.1	1.0	0.2
food, drink and tobacco	0.5	1.0	1.4	1.8	2.0	2.0	7.4	3.2	2.4	1.2	0.0
engineering	1.2	6.0	7.7	10.4	12.2	13.3	17.2	2.6	2.9	1.7	0.9
textiles	0.6	0.7	0.7	0.7	0.6	0.5	1.1	-0.3	0.0	-1.0	-1.7
other industries (incl. printing)	0.8	2.6	3.0	3.7	4.0	3.9	12.8	1.3	2.1	0.8	-0.4
Construction	3.6	5.7	7.0	9.2	10.4	10.9	4.5	2.2	2.8	1.3	0.5
Tertiary	29.8	40.9	54.5	72.4	84.4	90.5	3.2	2.9	2.9	1.6	0.7
market services	16.6	20.6	28.8	38.3	44.8	48.4	2.1	3.4	2.9	1.6	0.8
non market services	6.9	8.9	10.4	13.1	14.4	14.0	2.5	1.6	2.3	0.9	-0.3
trade	5.3	9.6	13.3	18.5	22.7	25.7	6.2	3.3	3.3	2.1	1.3
agriculture	1.2	1.8	2.1	2.4	2.6	2.4	4.3	1.4	1.6	0.5	-0.5
Energy sector and others	2.3	3.1	3.6	4.4	4.7	4.7	2.9	1.4	2.1	0.7	-0.1

Slovenia: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	2.0	2.0	2.1	2.1	2.1	2.1	0.3	0.2	0.0	0.0	0.0
Household size (inhabitants per household)	2.9	2.5	2.5	2.4	2.3	2.3	-1.3	-0.2	-0.3	-0.3	-0.2
Gross Domestic Product (in MEuro'13)	**28.5**	**37.1**	**40.9**	**48.0**	**54.9**	**62.1**	**2.7**	**1.0**	**1.6**	**1.3**	**1.3**
Household Income (in Euro'13/capita)	**8233.5**	**10348.2**	**10426.0**	**12543.6**	**14797.7**	**17307.0**	**2.3**	**0.1**	**1.9**	**1.7**	**1.6**
SECTORAL VALUE ADDED (in MEuro'13)	**24.5**	**32.4**	**35.7**	**41.9**	**47.9**	**54.2**	**2.8**	**1.0**	**1.6**	**1.3**	**1.3**
Industry	4.8	6.3	6.8	8.1	9.3	10.7	2.8	0.8	1.8	1.4	1.4
iron and steel	0.1	0.2	0.2	0.2	0.2	0.2	6.2	1.2	1.2	0.7	0.4
non ferrous metals	0.1	0.1	0.1	0.1	0.1	0.1	2.6	0.9	1.3	1.5	1.5
chemicals	0.5	1.0	1.1	1.2	1.3	1.5	6.5	1.0	1.2	0.8	0.9
non metallic minerals	0.3	0.3	0.3	0.3	0.3	0.4	-0.6	0.1	1.2	0.9	0.7
paper pulp	0.2	0.3	0.3	0.4	0.4	0.4	4.0	0.6	1.3	0.4	0.4
food, drink and tobacco	0.6	0.5	0.5	0.6	0.7	0.8	-2.8	0.7	2.0	1.2	1.2
engineering	1.5	2.6	3.0	3.8	4.7	5.8	5.8	1.3	2.6	2.0	2.1
textiles	0.4	0.3	0.2	0.2	0.2	0.1	-4.8	-2.1	-1.3	-1.2	-0.7
other industries (incl. printing)	1.2	1.1	1.1	1.2	1.3	1.4	-0.5	-0.1	1.0	0.7	0.6
Construction	1.9	2.1	2.0	2.2	2.5	2.8	1.2	-0.6	1.1	1.2	1.3
Tertiary	17.1	23.0	26.0	30.6	35.1	39.6	3.1	1.2	1.7	1.4	1.2
market services	9.0	12.5	14.2	17.2	20.2	23.3	3.3	1.3	1.9	1.6	1.4
non market services	4.4	5.7	5.9	6.5	6.9	7.2	2.6	0.4	0.9	0.6	0.5
trade	2.8	4.0	5.0	6.1	7.1	8.2	3.5	2.2	2.0	1.7	1.4
agriculture	0.8	0.8	0.8	0.8	0.9	0.9	0.0	0.2	0.3	0.2	0.1
Energy sector and others	0.8	1.0	1.0	1.0	1.0	1.1	1.6	0.0	0.5	0.5	0.5

Source: GEM-E3

EU Reference scenario 2016

Spain: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	40.0	46.5	45.7	44.5	44.7	45.6	1.5	-0.2	-0.3	0.0	0.2
Household size (inhabitants per household)	2.9	2.7	2.6	2.6	2.6	2.6	-0.7	-0.1	-0.1	-0.1	-0.1
Gross Domestic Product (in MEuro'13)	**892.6**	**1092.9**	**1207.1**	**1446.9**	**1675.2**	**1853.8**	**2.0**	**1.0**	**1.8**	**1.5**	**1.0**
Household Income (in Euro'13/capita)	**12896.5**	**13605.1**	**15622.6**	**19315.1**	**22389.5**	**24395.6**	**0.5**	**1.4**	**2.1**	**1.5**	**0.9**
SECTORAL VALUE ADDED (in MEuro'13)	**812.5**	**998.0**	**1102.2**	**1321.3**	**1529.7**	**1692.8**	**2.1**	**1.0**	**1.8**	**1.5**	**1.0**
Industry	134.3	130.1	141.4	164.5	186.9	207.5	-0.3	0.8	1.5	1.3	1.0
iron and steel	6.2	4.6	4.7	5.3	5.8	6.1	-2.9	0.2	1.1	0.9	0.5
non ferrous metals	3.9	2.6	2.6	2.8	3.0	3.0	-3.8	0.1	0.7	0.5	0.2
chemicals	13.1	14.2	15.3	17.7	20.0	21.7	0.8	0.7	1.5	1.2	0.9
non metallic minerals	10.6	8.1	8.1	9.8	10.8	11.6	-2.7	0.0	1.9	1.0	0.7
paper pulp	7.6	7.7	7.8	8.4	9.0	9.1	0.1	0.1	0.8	0.6	0.1
food, drink and tobacco	20.0	24.6	28.0	31.4	34.4	37.2	2.1	1.3	1.2	0.9	0.8
engineering	44.6	41.3	47.3	60.6	73.9	86.1	-0.8	1.4	2.5	2.0	1.5
textiles	8.9	5.8	4.8	4.0	3.4	3.0	-4.2	-1.8	-1.8	-1.6	-1.2
other industries (incl. printing)	19.5	21.2	22.9	24.5	26.6	29.5	0.8	0.7	0.7	0.8	1.1
Construction	98.9	106.4	100.9	115.1	128.2	136.8	0.7	-0.5	1.3	1.1	0.7
Tertiary	558.6	736.4	834.9	1013.3	1184.7	1318.7	2.8	1.3	2.0	1.6	1.1
market services	311.7	405.2	474.4	588.3	705.3	799.8	2.7	1.6	2.2	1.8	1.3
non market services	131.5	185.5	186.0	218.9	241.6	256.0	3.5	0.0	1.6	1.0	0.6
trade	88.4	119.9	148.1	179.4	211.1	236.2	3.1	2.1	1.9	1.6	1.1
agriculture	27.4	25.8	26.4	26.7	26.7	26.7	-0.6	0.2	0.1	0.0	0.0
Energy sector and others	20.6	25.0	25.0	28.4	29.9	29.8	1.9	0.0	1.3	0.5	0.0

Sweden: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	8.9	9.3	10.2	11.0	11.8	12.5	0.5	0.9	0.8	0.6	0.6
Household size (inhabitants per household)	2.1	2.1	2.1	2.1	2.1	2.1	0.0	0.0	0.0	0.0	0.0
Gross Domestic Product (in MEuro'13)	**295.5**	**365.8**	**448.1**	**551.5**	**684.1**	**840.7**	**2.2**	**2.1**	**2.1**	**2.2**	**2.1**
Household Income (in Euro'13/capita)	**16209.6**	**18972.3**	**22010.8**	**25779.5**	**30886.3**	**36869.5**	**1.6**	**1.5**	**1.6**	**1.8**	**1.8**
SECTORAL VALUE ADDED (in MEuro'13)	**260.5**	**319.4**	**391.2**	**481.5**	**597.3**	**734.0**	**2.1**	**2.1**	**2.1**	**2.2**	**2.1**
Industry	41.0	56.3	66.2	78.5	93.8	111.9	3.2	1.6	1.7	1.8	1.8
iron and steel	2.7	2.1	2.6	3.0	3.2	3.4	-2.8	2.5	1.2	0.8	0.6
non ferrous metals	0.8	0.6	0.7	0.8	0.9	0.9	-3.4	2.1	1.3	0.7	0.6
chemicals	5.4	8.1	9.4	11.2	13.3	15.4	4.1	1.5	1.8	1.7	1.5
non metallic minerals	0.9	1.3	1.5	1.7	1.9	2.1	3.5	1.5	1.1	1.1	1.0
paper pulp	4.2	4.6	5.2	5.8	6.4	6.8	1.0	1.3	1.0	1.0	0.7
food, drink and tobacco	3.7	4.3	5.0	6.0	7.2	8.4	1.7	1.4	1.7	1.9	1.6
engineering	15.6	24.6	29.1	35.3	43.3	53.8	4.6	1.7	1.9	2.1	2.2
textiles	0.6	0.5	0.4	0.4	0.4	0.4	-2.2	-0.5	-0.6	-0.5	-0.4
other industries (incl. printing)	7.6	10.2	12.1	14.4	17.3	20.7	3.1	1.7	1.8	1.9	1.8
Construction	14.9	16.7	19.7	22.8	26.9	31.4	1.1	1.7	1.5	1.6	1.6
Tertiary	195.4	235.5	293.1	366.7	461.5	573.4	1.9	2.2	2.3	2.3	2.2
market services	98.9	118.1	146.5	185.1	235.7	297.3	1.8	2.2	2.4	2.4	2.3
non market services	67.8	74.7	91.6	110.1	134.1	163.2	1.0	2.1	1.9	2.0	2.0
trade	24.9	37.1	49.3	65.4	85.2	106.0	4.1	2.9	2.9	2.7	2.2
agriculture	4.6	5.5	5.8	6.1	6.5	6.9	1.8	0.5	0.6	0.7	0.5
Energy sector and others	9.1	10.9	12.2	13.5	15.1	17.3	1.8	1.1	1.0	1.1	1.3

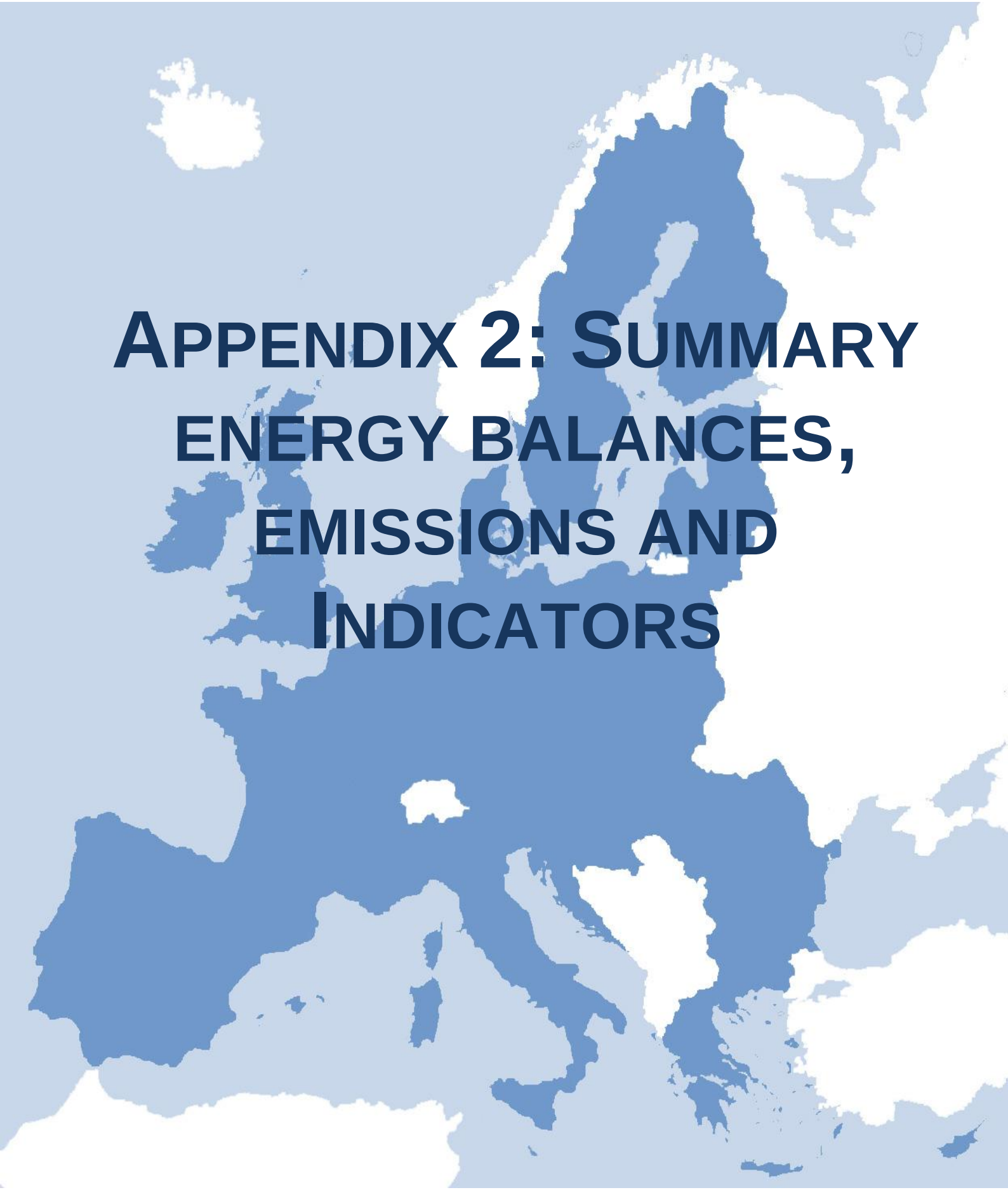
Source: GEM-E3

EU Reference scenario 2016

United Kingdom: Key Demographic and Economic Assumptions

	2000	2010	2020	2030	2040	2050	'00-'10	'10-'20	'20-'30	'30-'40	'40-'50
Population (in Million)	58.8	62.5	66.9	70.6	74.0	77.3	0.6	0.7	0.5	0.5	0.4
Household size (inhabitants per household)	2.4	2.3	2.3	2.3	2.2	2.2	-0.2	0.0	-0.2	-0.3	-0.2
Gross Domestic Product (in MEuro'13)	**1538.4**	**1810.1**	**2119.6**	**2423.0**	**2956.7**	**3582.0**	**1.6**	**1.6**	**1.3**	**2.0**	**1.9**
Household Income (in Euro'13/capita)	**16664.9**	**18684.3**	**19841.0**	**21736.6**	**25619.4**	**30055.8**	**1.2**	**0.6**	**0.9**	**1.7**	**1.6**
SECTORAL VALUE ADDED (in MEuro'13)	**1380.7**	**1618.0**	**1894.6**	**2165.8**	**2642.8**	**3201.8**	**1.6**	**1.6**	**1.3**	**2.0**	**1.9**
Industry	185.3	169.9	187.8	202.9	229.6	255.9	-0.9	1.0	0.8	1.2	1.1
iron and steel	2.5	2.3	2.3	2.2	2.2	2.1	-0.8	0.2	-0.6	-0.3	-0.3
non ferrous metals	2.6	1.4	1.3	1.2	1.2	1.2	-5.8	-0.8	-0.8	-0.3	-0.2
chemicals	24.4	26.0	30.1	32.2	35.7	39.0	0.6	1.5	0.7	1.0	0.9
non metallic minerals	5.5	5.3	5.8	5.9	6.0	6.2	-0.2	0.8	0.2	0.2	0.3
paper pulp	12.6	10.9	10.2	9.9	9.6	9.0	-1.5	-0.6	-0.3	-0.3	-0.6
food, drink and tobacco	26.4	26.8	28.8	29.0	30.5	31.4	0.1	0.7	0.1	0.5	0.3
engineering	69.2	62.2	73.2	86.3	107.1	129.5	-1.1	1.6	1.7	2.2	1.9
textiles	7.7	5.1	4.4	3.3	2.7	2.2	-4.1	-1.4	-2.9	-2.1	-1.8
other industries (incl. printing)	34.0	30.0	31.6	32.9	34.7	35.4	-1.3	0.5	0.4	0.5	0.2
Construction	93.6	102.2	108.6	119.5	139.6	162.9	0.9	0.6	1.0	1.6	1.6
Tertiary	1032.7	1289.3	1545.6	1787.9	2210.1	2710.5	2.2	1.8	1.5	2.1	2.1
market services	616.6	788.5	1002.3	1195.4	1509.7	1890.8	2.5	2.4	1.8	2.4	2.3
non market services	253.2	310.1	325.4	338.8	390.6	448.5	2.0	0.5	0.4	1.4	1.4
trade	154.7	179.7	206.6	242.4	298.1	359.5	1.5	1.4	1.6	2.1	1.9
agriculture	11.2	11.0	11.3	11.3	11.6	11.8	-0.1	0.2	0.0	0.3	0.1
Energy sector and others	69.1	56.6	52.6	55.4	63.5	72.4	-2.0	-0.7	0.5	1.4	1.3

Source: GEM-E3



APPENDIX 2: SUMMARY ENERGY BALANCES, EMISSIONS AND INDICATORS

SUMMARY ENERGY BALANCE AND INDICATORS (A)												EU28: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**484**	**492**	**500**	**505**	**510**	**513**	**516**	**518**	**521**	**522**	**522**	0.3	0.2	0.1	0.1
GDP (in 000 M€13)	**11231**	**12351**	**12895**	**13427**	**14550**	**15585**	**16682**	**17977**	**19431**	**20924**	**22526**	1.4	1.2	1.4	1.5
Gross Inland Consumption (ktoe)	**1726888**	**1824722**	**1760315**	**1666601**	**1639429**	**1593747**	**1554387**	**1520273**	**1501734**	**1488372**	**1491621**	0.2	-0.7	-0.5	-0.2
Solids	321292	318127	282994	277891	251245	219893	185491	143644	108197	80717	82831	-1.3	-1.2	-3.0	-4.0
Oil	660025	677021	612954	579805	545752	531014	513151	503555	497324	492323	487684	-0.7	-1.2	-0.6	-0.3
Natural gas	396144	445263	447394	387731	384876	387387	371311	379480	393827	394957	378649	1.2	-1.5	-0.4	0.1
Nuclear	243841	257516	236562	213043	188974	174739	187232	187748	171124	165795	163825	-0.3	-2.2	-0.1	-0.7
Electricity	2030	1412	712	1761	1501	779	175	147	23	16	-21	-9.9	7.7	-19.3	0.0
Renewable energy forms	103557	125383	179699	206371	267080	279935	297028	305699	331240	354565	378653	5.7	4.0	1.1	1.2
Energy Branch Consumption	**86261**	**91922**	**86455**	**81624**	**75821**	**70778**	**66909**	**64147**	**61392**	**59425**	**60637**	0.0	-1.3	-1.2	-0.5
Non-Energy Uses	**113106**	**116080**	**110230**	**106709**	**112515**	**115802**	**118318**	**120534**	**123089**	**123504**	**124158**	-0.3	0.2	0.5	0.2
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**944996**	**903986**	**835772**	**758585**	**756920**	**716021**	**701817**	**664400**	**645477**	**639419**	**661556**	-1.2	-1.0	-0.8	-0.3
Solids	214596	196030	164837	148196	135147	121500	101636	81393	65416	49831	61127	-2.6	-2.0	-2.8	-2.5
Oil	173901	135553	100408	78529	69728	58085	48211	36781	28798	21092	14028	-5.3	-3.6	-3.6	-6.0
Natural gas	209436	190771	159948	118438	106515	92577	78508	63594	59389	57448	53285	-2.7	-4.0	-3.0	-1.9
Nuclear	243841	257516	236562	213043	188974	174739	187232	187748	171124	165795	163825	-0.3	-2.2	-0.1	-0.7
Renewable energy sources	103222	124116	174017	200379	256556	269120	286231	294883	320751	345252	369291	5.4	4.0	1.1	1.3
Hydro	30703	26859	32312	31168	32301	32291	32592	33261	34005	35117	36215	0.5	0.0	0.1	0.5
Biomass & Waste	65583	85060	119573	132613	163441	164951	168133	169769	177890	181498	183700	6.2	3.2	0.3	0.4
Wind	1913	6058	12836	23588	39794	45356	52328	53251	59502	70648	84280	21.0	12.0	2.8	2.4
Solar and others	436	827	3775	11001	17799	22826	27799	30963	35731	41786	48934	24.1	16.8	4.6	2.9
Geothermal	4587	5312	5521	2009	3221	3695	5379	7639	13624	16203	16162	1.9	-5.2	5.3	5.7
Net Imports (ktoe)	**826349**	**979676**	**955004**	**962880**	**939241**	**936371**	**913530**	**918466**	**921057**	**916273**	**900215**	1.5	-0.2	-0.3	-0.1
Solids	98320	125363	111814	129695	116099	98394	83855	62251	42781	30886	21705	1.3	0.4	-3.2	-6.5
Oil	532226	597491	558847	556140	532001	529826	523615	525540	528066	532091	536465	0.5	-0.5	-0.2	0.1
Crude oil and Feedstocks	514686	578712	537586	515210	493628	486739	477435	475218	471474	468627	465902	0.4	-0.8	-0.3	-0.1
Oil products	17540	18779	21261	40930	38373	43088	46180	50322	56593	63464	70563	1.9	6.1	1.9	2.1
Natural gas	193432	254054	278015	269292	279116	296557	295088	319712	339699	343969	332706	3.7	0.0	0.6	0.6
Electricity	2030	1412	712	1761	1501	779	175	147	23	16	-21	-9.9	7.7	-19.3	0.0
Import Dependency (%)	46.7	52.3	52.8	55.9	55.4	56.7	56.6	58.0	58.8	58.9	57.6				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**3005548**	**3289991**	**3332773**	**3251309**	**3357685**	**3430637**	**3527528**	**3632768**	**3759812**	**3900096**	**4063737**	1.0	0.1	0.5	0.7
Nuclear energy	944993	997699	916610	867402	772986	717746	777743	789909	734053	732443	736532	-0.3	-1.7	0.1	-0.3
Solids	933855	965565	830393	846834	767262	655378	562741	441534	329407	231324	251549	-1.2	-0.8	-3.1	-3.9
Oil (including refinery gas)	181296	142772	86899	34609	21835	21271	19341	14189	13974	12188	4844	-7.1	-12.9	-1.2	-6.7
Gas (including derived gases)	514267	705961	798645	566075	580999	682078	654930	796541	925361	945456	835542	4.5	-3.1	1.2	1.2
Biomass-waste	46401	87831	145814	188813	213112	249701	283469	317350	363515	381476	391380	12.1	3.9	2.9	1.6
Hydro (pumping excluded)	357072	312372	375785	362415	375589	375481	378979	386753	395409	408337	421101	0.5	0.0	0.1	0.5
Wind	22254	70455	149278	274278	462720	527399	608460	619197	691880	821486	979998	21.0	12.0	2.8	2.4
Solar	117	1458	22502	103798	154722	192666	232129	256261	293251	353448	428535	69.1	21.3	4.1	3.1
Geothermal and other renewables	5293	5878	6847	7086	8461	8916	9736	11032	12962	13937	14254	2.6	2.1	1.4	1.9
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**683507**	**739589**	**858628**	**965588**	**1029680**	**1024954**	**1059230**	**1048526**	**1088931**	**1172707**	**1283315**	2.3	1.8	0.3	1.0
Nuclear energy	139595	136829	132606	120798	114204	105051	109905	108612	97243	94985	92824	-0.5	-1.5	-0.4	-0.8
Renewable energy	128990	162194	238638	366738	475177	518763	570572	584958	628282	707603	807313	6.3	7.1	1.8	1.8
Hydro (pumping excluded)	115841	119177	122922	127470	131473	132043	133190	134769	136576	139465	142001	0.6	0.7	0.1	0.3
Wind	12730	40485	85701	141580	207219	228221	255388	257339	279259	317881	367622	21.0	9.2	2.1	1.8
Solar	178	2292	29774	97443	135999	157808	180956	191285	210126	247395	294710	66.9	16.4	2.9	2.5
Other renewables (tidal etc.)	241	240	241	244	486	690	1038	1565	2321	2863	2979	0.0	7.3	7.9	5.4
Thermal power	414922	440565	487384	478053	440299	401140	378753	354956	363406	370119	383178	1.6	-1.0	-1.5	0.1
of which cogeneration units	92439	107819	107430	111880	83893	94199	96797	94585	97249	102766	102071	1.5	-2.4	1.4	0.3
of which CCS units	0	0	0	0	833	1083	1083	1083	1083	4123	19253	0.0	0.0	2.7	15.5
Solids fired	194525	185353	180110	176559	146098	117592	100874	76157	56565	46516	51930	-0.8	-2.1	-3.6	-3.3
Gas fired	123821	163333	215485	219628	210322	209734	208392	215198	243744	259486	269457	5.7	-0.2	-0.1	1.3
Oil fired	83315	74582	69295	53085	31168	20532	15215	9746	6399	4870	3538	-1.8	-7.7	-6.9	-7.0
Biomass-waste fired	12657	16610	21719	27908	51668	52240	53229	52811	55656	58285	57304	5.5	9.1	0.3	0.4
Hydrogen plants	0	0	13	13	13	13	13	13	13	13	1	0.0	0.3	0.0	-13.1
Geothermal heat	604	687	762	860	1030	1030	1030	1030	1030	949	949	2.4	3.1	0.0	-0.4
Avg. Load factor of net power capacity [2] (%)	47.5	48.1	42.1	36.5	35.5	36.6	36.5	38.1	38.2	36.8	34.9				
Efficiency of gross thermal power generation (%)	37.2	38.1	38.6	40.2	40.4	41.3	42.2	45.5	48.2	50.4	49.7				
% of gross electricity from CHP	11.3	12.5	12.6	12.2	10.2	11.3	11.8	12.6	12.8	13.4	13.1				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.2	0.2	0.2	0.2	0.2	1.0	4.8				
% of carbon free (RES, nuclear) gross electricity generation	45.8	44.9	48.5	55.5	59.2	60.4	64.9	65.5	66.3	69.5	73.1				
Fuel Inputs to Thermal Power Generation (GWh_e)	**388346**	**430899**	**416477**	**351894**	**338506**	**336440**	**311420**	**298374**	**292514**	**269130**	**257873**	0.7	-2.1	-0.8	-0.9
Solids	223608	229335	197694	200223	177079	151231	128800	98447	73185	50653	55102	-1.2	-1.1	-3.1	-4.2
Oil (including refinery gas)	40868	32485	20566	7340	5019	5161	4854	3615	3443	3008	1202	-6.6	-13.2	-0.3	-6.7
Gas (including derived gases)	105105	137667	151968	100069	98665	115545	109049	122997	136215	135488	119532	3.8	-4.2	1.0	0.5
Biomass & Waste	14651	26766	41420	43077	55812	62571	66786	71382	77740	78446	80502	11.0	3.0	1.8	0.9
Geothermal heat	4114	4645	4828	1184	1932	1932	1932	1932	1932	1535	1535	1.6	-8.8	0.0	-1.1
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**1067893**	**1101207**	**997999**	**908897**	**860655**	**827287**	**812542**	**794962**	**766464**	**751827**	**739877**	-0.7	-1.5	-0.6	-0.5
Refineries	735106	756042	667606	609584	583466	567623	549181	535961	524774	514629	505706	-1.0	-1.3	-0.6	-0.4
Biofuels and hydrogen production	709	3279	13086	16149	20833	20399	20357	20773	21627	23064	24181	33.8	4.8	-0.2	0.9
District heating	15899	17445	19101	16261	16360	15945	16332	17862	22656	25010	24413	1.9	-1.5	0.0	2.0
Derived gases, cokeries etc.	316179	324441	298206	266904	239996	223320	226673	220366	197406	189124	185577	-0.6	-2.1	-0.6	-1.0

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												EU28: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**5964**	**6295**	**6449**	**6735**	**7152**	**7509**	**7880**	**8201**	**8507**	**8796**	**9053**	0.8	1.0	1.0	0.7
Public road transport	549	541	528	546	570	587	604	622	636	653	667	-0.4	0.8	0.6	0.5
Private cars and motorcycles	4466	4721	4843	5001	5255	5457	5676	5849	6003	6156	6279	0.8	0.8	0.8	0.5
Rail	450	464	499	540	591	644	693	739	788	833	878	1.0	1.7	1.6	1.2
Aviation [3]	458	528	539	608	693	776	860	944	1031	1104	1177	1.7	2.5	2.2	1.6
Inland navigation	42	42	40	40	43	44	46	48	49	51	52	-0.3	0.5	0.7	0.6
Freight transport activity (Gtkm)	**2295**	**2612**	**2556**	**2704**	**2981**	**3220**	**3457**	**3631**	**3802**	**3937**	**4051**	1.1	1.5	1.5	0.8
Heavy goods and light commercial vehicles	1589	1853	1809	1915	2109	2277	2446	2564	2672	2763	2835	1.3	1.5	1.5	0.7
Rail	405	416	394	428	482	533	580	619	662	695	724	-0.3	2.0	1.9	1.1
Inland navigation	300	343	354	361	389	411	432	449	467	480	492	1.7	1.0	1.0	0.7
Energy demand in transport (ktoe) [4]	**341525**	**364526**	**359402**	**358062**	**350945**	**344898**	**341463**	**343372**	**347354**	**351233**	**355025**	0.5	-0.2	-0.3	0.2
Public road transport	8775	8725	8834	9040	9281	9298	9281	9361	9431	9542	9649	0.1	0.5	0.0	0.2
Private cars and motorcycles	206270	212102	211618	204765	190035	179668	174380	172933	172584	172413	172419	0.3	-1.1	-0.9	-0.1
Heavy goods and light commercial vehicles	67279	79273	76918	78507	81943	83785	85822	87786	89517	90948	92230	1.3	0.6	0.5	0.4
Rail	8168	7668	7129	7395	7863	8317	8637	8864	9044	9042	9018	-1.4	1.0	0.9	0.2
Aviation	44876	49959	49230	53303	56489	58294	57606	58516	60692	63134	65483	0.9	1.4	0.2	0.6
Inland navigation	6156	6798	5673	5051	5334	5536	5737	5912	6086	6155	6225	-0.8	-0.6	0.7	0.4
By transport activity															
Passenger transport	266294	275041	273897	271237	260066	251683	245768	245422	247427	249871	252399	0.3	-0.5	-0.6	0.1
Freight transport	75231	89484	85505	86825	90878	93215	95695	97950	99926	101361	102626	1.3	0.6	0.5	0.4
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.2	0.4	0.9	1.2	1.5	1.9	2.3				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.2	0.9	3.7	4.6	6.1	6.2	6.2	6.3	6.3	6.5	6.6				
ENERGY EFFICIENCY															
Primary energy consumption	**1613782**	**1708642**	**1650085**	**1559892**	**1526914**	**1477945**	**1436069**	**1399738**	**1378645**	**1364869**	**1367462**	0.2	-0.8	-0.6	-0.2
Final Energy Demand	**1129427**	**1186370**	**1155879**	**1133457**	**1133797**	**1106322**	**1081368**	**1065407**	**1067769**	**1077083**	**1085865**	0.2	-0.2	-0.5	0.0
by sector															
Industry	330627	327576	283437	284539	295323	283441	269765	254648	249035	249929	251839	-1.5	0.4	-0.9	-0.3
Energy intensive industries	215899	215115	182721	182408	188942	178705	166614	153614	146961	144793	143583	-1.7	0.3	-1.2	-0.7
Other industrial sectors	114728	112461	100716	102131	106381	104736	103150	101034	102073	105136	108256	-1.3	0.5	-0.3	0.2
Residential	288564	307594	313829	299747	298155	292956	288051	286693	287594	289786	291562	0.8	-0.5	-0.3	0.1
Tertiary	166677	183368	196770	188333	186487	182048	179075	177599	180629	182925	184234	1.7	-0.5	-0.4	0.1
Transport[5]	343558	367831	361842	360838	353833	347877	344477	346468	350511	354443	358230	0.5	-0.2	-0.3	0.2
by fuel															
Solids	61977	53988	50512	47694	45711	42313	34285	25558	18469	15208	13392	-2.0	-1.0	-2.8	-4.6
Oil	487065	502509	455207	437598	405293	390260	373318	365300	358889	355261	352635	-0.7	-1.2	-0.8	-0.3
Gas	267588	281191	273366	265879	264623	251208	241000	233980	234095	235978	236649	0.2	-0.3	-0.9	-0.1
Electricity	217644	239548	244471	241010	250682	257237	265172	274372	285235	296767	307340	1.2	0.3	0.6	0.7
Heat (from CHP and District Heating)	46044	52425	52875	49062	50935	52357	54346	54510	56136	56253	56700	1.4	-0.4	0.7	0.2
Renewable energy forms	49109	56708	79448	92104	116178	112396	112458	110598	113098	115086	115912	4.9	3.9	-0.3	0.2
Other	0	0	0	111	375	550	787	1089	1847	2530	3237	0.0	0.0	7.7	7.3
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	154	148	137	124	113	102	93	85	77	71	66	-1.2	-1.9	-1.9	-1.7
Industry (Energy on Value added, index 2000=100)	100	93	80	77	75	68	62	55	51	49	47	-2.2	-0.6	-2.0	-1.4
Residential (Energy on Private Income, index 2000=100)	100	97	94	87	79	72	66	60	56	52	48	-0.6	-1.7	-1.8	-1.6
Tertiary (Energy on Value added, index 2000=100)	100	99	100	91	83	75	69	63	59	55	51	0.0	-1.9	-1.9	-1.5
Passenger transport (toe/Mpkm) [6]	39	37	36	33	30	27	25	24	23	22	21	-0.8	-1.8	-1.8	-0.8
Freight transport (toe/Mtkm)	33	34	33	32	30	29	28	27	26	26	25	0.2	-0.9	-1.0	-0.4
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**5326.4**	**5349.2**	**4875.0**	**4583.4**	**4275.3**	**4050.9**	**3731.6**	**3514.6**	**3358.5**	**3194.6**	**3008.8**	-0.9	-1.3	-1.4	-1.1
of which ETS sectors (2013 scope) GHG emissions		2501.2	2175.1	2016.7	1887.0	1768.7	1558.8	1394.9	1269.0	1124.0	955.2		-1.4	-1.9	-2.4
of which ESD sectors (2013 scope) GHG emissions		2847.9	2699.9	2566.7	2388.3	2282.2	2172.8	2119.7	2089.5	2070.6	2053.7		-1.2	-0.9	-0.3
CO_2 Emissions (energy related)	**3992.2**	**4127.1**	**3782.3**	**3524.1**	**3281.3**	**3099.4**	**2844.3**	**2647.2**	**2498.8**	**2341.6**	**2175.5**	-0.5	-1.4	-1.4	-1.3
Power generation/District heating	1406.3	1486.8	1344.0	1177.9	1058.7	994.3	865.4	758.5	671.0	541.4	393.4	-0.5	-2.4	-2.0	-3.9
Energy Branch	167.3	170.7	155.2	148.6	132.7	121.7	112.1	104.8	98.7	94.0	91.3	-0.7	-1.6	-1.7	-1.0
Industry	691.0	634.1	511.8	505.6	501.5	441.9	375.8	316.4	275.6	260.9	252.7	-3.0	-0.2	-2.8	-2.0
Residential	468.0	484.2	466.9	422.7	384.0	376.7	360.8	351.0	338.7	332.6	326.2	0.0	-1.9	-0.6	-0.5
Tertiary	257.9	271.6	267.9	245.8	220.7	201.7	183.2	170.0	164.0	159.8	155.4	0.4	-1.9	-1.8	-0.8
Transport	1001.7	1079.8	1036.6	1023.4	983.7	963.1	946.9	946.5	950.9	953.0	956.5	0.3	-0.5	-0.4	0.1
CO_2 Emissions (non energy and non land use related)	**277.3**	**282.4**	**237.3**	**238.8**	**247.9**	**244.6**	**223.8**	**215.0**	**207.4**	**200.4**	**177.1**	-1.5	0.4	-1.0	-1.2
Non-CO2 GHG emissions	**1057.0**	**939.6**	**855.4**	**820.5**	**746.1**	**706.9**	**663.6**	**652.4**	**652.3**	**652.7**	**656.3**	-2.1	-1.4	-1.2	-0.1
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**92.5**	**92.9**	**84.7**	**79.6**	**74.3**	**70.4**	**64.8**	**61.0**	**58.3**	**55.5**	**52.3**	-0.9	-1.3	-1.4	-1.1
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.39	0.37	0.33	0.30	0.26	0.24	0.20	0.17	0.15	0.12	0.08	-1.6	-2.3	-2.5	-4.5
Final energy demand (t of CO_2/toe)	2.14	2.08	1.98	1.94	1.84	1.79	1.73	1.67	1.62	1.58	1.56	-0.8	-0.7	-0.7	-0.5
Industry	2.09	1.94	1.81	1.78	1.70	1.56	1.39	1.24	1.11	1.04	1.00	-1.5	-0.6	-2.0	-1.6
Residential	1.62	1.57	1.49	1.41	1.29	1.29	1.25	1.22	1.18	1.15	1.12	-0.9	-1.4	-0.3	-0.6
Tertiary	1.55	1.48	1.36	1.31	1.18	1.11	1.02	0.96	0.91	0.87	0.84	-1.3	-1.4	-1.4	-1.0
Transport	2.92	2.94	2.86	2.84	2.78	2.77	2.75	2.73	2.71	2.69	2.67	-0.2	-0.3	-0.1	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**7.5**	**8.7**	**12.4**	**16.1**	**21.0**	**22.4**	**24.3**	**25.3**	**27.2**	**29.2**	**31.2**				
RES-H&C share	9.0	10.3	14.0	17.4	22.2	23.1	24.7	26.2	28.1	29.5	30.4				
RES-E share	13.3	14.8	19.7	28.2	35.5	38.9	42.5	43.4	46.4	50.4	54.8				
RES-T share (based on ILUC formula)	0.9	1.7	5.2	6.9	11.2	12.5	14.1	15.3	16.8	19.0	21.1				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	53	57	65	85	94	92	91	86	84	83	79	2.1	3.8	-0.4	-0.7
Average Price of Electricity in Final demand sectors (€'13/MWh	0	117	136	144	153	157	161	165	165	163	163	0.0	1.2	0.5	0.1
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**1055.8**	**1282.5**	**1467.9**	**1505.9**	**1791.3**	**1920.5**	**2032.5**	**2134.3**	**2233.5**	**2309.1**	**2388.3**	3.4	2.0	1.3	0.8
as % of GDP	**9.4**	**10.4**	**11.4**	**11.2**	**12.3**	**12.3**	**12.2**	**11.9**	**11.5**	**11.0**	**10.6**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Austria: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**8**	**8**	**8**	**9**	**9**	**9**	**9**	**9**	**10**	**10**	**10**	0.4	0.5	0.5	0.2
GDP (in 000 M€13)	**257**	**279**	**298**	**316**	**345**	**373**	**400**	**433**	**469**	**506**	**543**	1.5	1.5	1.5	1.5
Gross Inland Consumption (ktoe)	**28996**	**34373**	**34604**	**32933**	**33357**	**32976**	**32675**	**32119**	**32162**	**32260**	**32029**	1.8	-0.4	-0.2	-0.1
Solids	3597	4000	3365	3333	3337	3179	2947	1892	1548	1340	1202	-0.7	-0.1	-1.2	-4.4
Oil	12173	14448	12833	12275	11750	11254	10906	10874	10764	10681	10618	0.5	-0.9	-0.7	-0.1
Natural gas	6519	8159	8215	6454	7657	7515	7598	8112	8166	8233	7783	2.3	-0.7	-0.1	0.1
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	-118	229	200	1061	439	334	280	233	156	176	206	0.0	8.2	-4.4	-1.5
Renewable energy forms	6825	7537	9991	9810	10173	10693	10943	11008	11527	11830	12220	3.9	0.2	0.7	0.6
Energy Branch Consumption	**1306**	**1566**	**1504**	**1593**	**1493**	**1410**	**1341**	**1268**	**1229**	**1213**	**1193**	1.4	-0.1	-1.1	-0.6
Non-Energy Uses	**1718**	**1717**	**1850**	**2037**	**2202**	**2306**	**2382**	**2443**	**2494**	**2522**	**2513**	0.7	1.8	0.8	0.3
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**9776**	**10012**	**12114**	**11277**	**11443**	**11167**	**10936**	**10620**	**10946**	**11176**	**11534**	2.2	-0.6	-0.5	0.3
Solids	293	0	0	0	0	0	0	0	0	0	0	-51.8	-100.0	0.0	0.0
Oil	1092	1003	1036	813	673	344	112	38	0	0	0	-0.5	-4.2	-16.4	-100.0
Natural gas	1533	1404	1486	1270	1146	674	458	157	49	0	0	-0.3	-2.6	-8.8	-100.0
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	6859	7605	9592	9195	9624	10149	10366	10424	10897	11176	11534	3.4	0.0	0.7	0.5
Hydro	3597	3154	3299	3527	3717	3830	3832	3866	3878	3879	3937	-0.9	1.2	0.3	0.1
Biomass & Waste	3169	4214	5914	5018	5101	5029	4967	4829	5121	5201	5320	6.4	-1.5	-0.3	0.3
Wind	6	114	178	340	382	622	864	874	939	1169	1325	40.8	8.0	8.5	2.2
Solar and others	63	93	168	260	360	582	575	633	668	719	827	10.3	8.0	4.8	1.8
Geothermal	25	30	35	49	64	86	129	223	291	208	124	3.4	6.3	7.3	-0.2
Net Imports (ktoe)	**18970**	**24517**	**21577**	**21656**	**21913**	**21809**	**21738**	**21499**	**21216**	**21084**	**20495**	1.3	0.2	-0.1	-0.3
Solids	3019	3971	3358	3333	3337	3179	2947	1892	1548	1340	1202	1.1	-0.1	-1.2	-4.4
Oil	10850	13204	11510	11462	11077	10910	10793	10835	10764	10681	10618	0.6	-0.4	-0.3	-0.1
Crude oil and Feedstocks	7791	8100	7011	8001	7821	7856	7859	7889	7825	7757	7686	-1.1	1.1	0.0	-0.1
Oil products	3059	5104	4499	3461	3256	3053	2934	2946	2940	2924	2932	3.9	-3.2	-1.0	0.0
Natural gas	5253	7153	6115	5184	6511	6842	7140	7955	8118	8233	7783	1.5	0.6	0.9	0.4
Electricity	-118	229	200	1061	439	334	280	233	156	176	206	0.0	8.2	-4.4	-1.5
Import Dependency (%)	65.4	71.3	62.4	65.8	65.7	66.1	66.5	66.9	66.0	65.4	64.0				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**59874**	**64066**	**67933**	**59618**	**71621**	**75844**	**79933**	**81674**	**85747**	**89064**	**90575**	1.3	0.5	1.1	0.6
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	5727	7165	4918	4194	4940	3319	3290	90	82	30	30	-1.5	0.0	-4.0	-21.0
Oil (including refinery gas)	1702	1641	1273	208	215	77	67	64	0	0	0	-2.9	-16.3	-11.0	-100.0
Gas (including derived gases)	8864	14347	16137	6774	14078	13565	14589	19403	19937	19783	17464	6.2	-1.4	0.4	0.9
Biomass-waste	1675	2882	5088	2592	3544	3983	4060	3581	6205	6646	6824	11.8	-3.6	1.4	2.6
Hydro (pumping excluded)	41836	36677	38363	41009	43216	44533	44553	44951	45095	45105	45776	-0.9	1.2	0.3	0.1
Wind	67	1331	2064	3958	4443	7231	10050	10161	10915	13598	15410	40.9	8.0	8.5	2.2
Solar	3	21	88	871	1174	3125	3312	3414	3502	3890	5060	38.2	29.5	10.9	2.1
Geothermal and other renewables	0	2	2	11	11	11	11	11	11	11	11	0.0	21.5	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**17911**	**19092**	**21503**	**22989**	**23349**	**25329**	**26040**	**25670**	**25998**	**27160**	**28589**	1.8	0.8	1.1	0.5
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	11668	12440	13841	16437	17423	20107	21121	21282	21837	23064	24854	1.7	2.3	1.9	0.8
Hydro (pumping excluded)	11613	11632	12706	13149	13751	13751	13756	13849	13881	13881	14042	0.9	0.8	0.0	0.1
Wind	50	778	981	2412	2583	3664	4545	4545	5026	5986	6803	34.7	10.2	5.8	2.0
Solar	5	30	154	876	1090	2692	2821	2888	2930	3197	4009	40.9	21.6	10.0	1.8
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	6243	6652	7662	6552	5926	5222	4919	4389	4161	4096	3735	2.1	-2.5	-1.8	-1.4
of which cogeneration units	2632	3253	3157	3005	2841	2723	2668	3063	3473	3550	3431	1.8	-1.0	-0.6	1.3
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	1887	1660	1359	873	804	778	778	81	72	36	36	-3.2	-5.1	-0.3	-14.2
Gas fired	2816	3389	4512	4074	3527	3195	2902	3115	3046	3063	2850	4.8	-2.4	-1.9	-0.1
Oil fired	1260	1145	1139	971	815	483	423	385	8	3	0	-1.0	-3.3	-6.3	-100.0
Biomass-waste fired	280	456	650	633	778	764	813	806	1033	991	846	8.8	1.8	0.4	0.2
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	2	1	2	2	2	2	2	2	2	2	0.0	7.2	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	36.8	36.7	35.1	28.4	33.7	33.0	33.9	35.3	36.6	36.4	35.2				
Efficiency of gross thermal power generation (%)	39.9	41.3	41.3	39.7	44.0	38.7	39.2	43.1	45.9	46.3	45.3				
% of gross electricity from CHP	10.4	15.4	15.4	17.7	22.5	19.2	18.4	21.6	24.8	24.5	22.7				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	72.8	63.9	67.1	81.3	73.1	77.6	77.5	76.1	76.7	77.8	80.7				
Fuel Inputs to Thermal Power Generation (GWh_e)	**3877**	**5421**	**5713**	**2988**	**4457**	**4658**	**4828**	**4622**	**4911**	**4919**	**4616**	4.0	-2.5	0.8	-0.2
Solids	1216	1507	1019	908	1072	834	781	24	20	7	7	-1.8	0.5	-3.1	-21.1
Oil (including refinery gas)	278	262	176	60	69	25	22	21	0	0	0	-4.5	-8.9	-10.7	-100.0
Gas (including derived gases)	1961	2836	2868	1406	2479	2680	2799	3453	3468	3421	2990	3.9	-1.4	1.2	0.3
Biomass & Waste	421	814	1649	604	828	1108	1217	1114	1413	1481	1610	14.6	-6.7	3.9	1.4
Geothermal heat	0	2	1	10	10	10	10	10	10	10	10	0.0	23.4	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**11349**	**11946**	**11472**	**12554**	**11759**	**11420**	**11016**	**10831**	**10518**	**10231**	**9993**	0.1	0.2	-0.7	-0.5
Refineries	8865	9275	8040	9141	8783	8461	8204	8148	8027	7956	7885	-1.0	0.9	-0.7	-0.2
Biofuels and hydrogen production	16	50	495	571	447	437	441	461	489	521	547	41.2	-1.0	-0.1	1.1
District heating	558	613	869	678	637	625	664	731	775	687	613	4.5	-3.1	0.4	-0.4
Derived gases, cokeries etc.	1910	2009	2068	2164	1892	1897	1708	1491	1227	1066	948	0.8	-0.9	-1.0	-2.9

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)											Austria: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**96**	**101**	**107**	**112**	**119**	**125**	**130**	**135**	**140**	**145**	**149**	1.1	1.1	0.9	0.7
Public road transport	9	9	10	10	10	11	11	12	12	12	13	0.4	0.8	0.8	0.7
Private cars and motorcycles	68	72	75	78	81	83	85	88	91	94	96	1.0	0.7	0.6	0.6
Rail	12	13	15	16	18	20	21	22	23	24	24	1.9	2.1	1.4	0.8
Aviation [3]	6	7	8	9	10	11	12	13	14	15	16	2.0	2.6	2.2	1.3
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	-0.6	0.5	0.8	0.7
Freight transport activity (Gtkm)	**50**	**54**	**61**	**65**	**70**	**75**	**79**	**84**	**89**	**92**	**95**	2.0	1.3	1.3	0.9
Heavy goods and light commercial vehicles	31	33	39	43	46	48	52	55	58	59	60	2.3	1.5	1.3	0.8
Rail	17	19	20	20	22	23	25	26	28	29	31	1.8	0.9	1.4	1.1
Inland navigation	2	2	2	2	3	3	3	3	3	3	3	-0.3	0.8	1.0	0.9
Energy demand in transport (ktoe) [4]	**6787**	**8815**	**8507**	**8480**	**8050**	**7757**	**7684**	**7818**	**7924**	**7967**	**8004**	2.3	-0.6	-0.5	0.2
Public road transport	92	97	101	103	106	108	109	110	112	114	116	0.9	0.5	0.3	0.3
Private cars and motorcycles	4520	5616	5043	4708	4268	3981	3839	3825	3844	3863	3883	1.1	-1.7	-1.1	0.1
Heavy goods and light commercial vehicles	1290	2135	2387	2622	2615	2573	2604	2705	2748	2734	2728	6.3	0.9	0.0	0.2
Rail	267	242	247	249	264	273	274	274	274	271	269	-0.8	0.7	0.4	-0.1
Aviation	591	679	707	776	773	798	832	876	918	957	978	1.8	0.9	0.7	0.8
Inland navigation	28	45	22	23	24	25	26	27	28	28	29	-2.1	0.8	0.7	0.5
By transport activity															
Passenger transport	5260	6438	5894	5634	5199	4941	4836	4867	4930	4990	5034	1.1	-1.2	-0.7	0.2
Freight transport	1527	2377	2613	2846	2851	2816	2848	2950	2994	2977	2970	5.5	0.9	0.0	0.2
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.6	0.8	1.0	1.3				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.2	0.6	6.0	6.9	5.8	5.9	6.0	6.2	6.3	6.6	6.7				
ENERGY EFFICIENCY															
Primary energy consumption	**27277**	**32657**	**32754**	**30896**	**31154**	**30669**	**30293**	**29676**	**29668**	**29737**	**29517**	1.8	-0.5	-0.3	-0.1
Final Energy Demand	**23692**	**28185**	**28423**	**28425**	**28027**	**27410**	**27082**	**26817**	**26828**	**27002**	**26942**	1.8	-0.1	-0.3	0.0
by sector															
Industry	7283	8825	9195	9724	9963	9664	9530	9047	8933	9025	9041	2.4	0.8	-0.4	-0.3
Energy intensive industries	5321	6148	6212	6588	6660	6356	6222	5775	5554	5510	5395	1.6	0.7	-0.7	-0.7
Other industrial sectors	1962	2676	2983	3136	3303	3308	3308	3271	3379	3515	3646	4.3	1.0	0.0	0.5
Residential	6332	6828	6797	6669	6488	6409	6260	6325	6286	6241	6129	0.7	-0.5	-0.4	-0.1
Tertiary	3070	3449	3686	3285	3241	3293	3317	3327	3379	3459	3459	1.8	-1.3	0.2	0.2
Transport[5]	7007	9082	8744	8746	8335	8044	7975	8119	8230	8277	8312	2.2	-0.5	-0.4	0.2
by fuel															
Solids	1403	1466	1169	1135	1149	1236	1148	955	743	624	541	-1.8	-0.2	0.0	-3.7
Oil	9818	12084	10539	9934	9350	8846	8509	8440	8349	8249	8193	0.7	-1.2	-0.9	-0.2
Gas	4464	5125	5259	5142	5200	4846	4717	4498	4458	4518	4497	1.7	-0.1	-1.0	-0.2
Electricity	4432	5013	5358	5436	5775	5992	6234	6419	6678	6967	7123	1.9	0.8	0.8	0.7
Heat (from CHP and District Heating)	1020	1353	1832	2008	1909	2044	2137	2169	2212	2207	2153	6.0	0.4	1.1	0.0
Renewable energy forms	2555	3145	4266	4769	4638	4439	4326	4321	4363	4402	4386	5.3	0.8	-0.7	0.1
Other	0	0	0	2	5	8	11	14	24	35	48	0.0	0.0	7.8	7.6
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	113	123	116	104	97	89	82	74	69	64	59	0.3	-1.8	-1.7	-1.6
Industry (Energy on Value added, index 2000=100)	100	111	108	109	104	95	89	79	74	71	68	0.8	-0.3	-1.6	-1.3
Residential (Energy on Private Income, index 2000=100)	100	100	93	85	76	69	63	58	53	48	44	-0.7	-2.0	-1.9	-1.8
Tertiary (Energy on Value added, index 2000=100)	100	103	101	85	76	71	66	61	57	53	49	0.1	-2.8	-1.4	-1.5
Passenger transport (toe/Mpkm) [6]	47	54	47	43	37	33	31	29	28	28	27	0.1	-2.5	-1.8	-0.6
Freight transport (toe/Mtkm)	30	44	43	44	41	38	36	35	34	32	31	3.4	-0.4	-1.3	-0.7
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**86.1**	**96.8**	**89.0**	**82.8**	**81.8**	**78.3**	**74.6**	**70.5**	**67.8**	**65.6**	**63.4**	0.3	-0.8	-0.9	-0.8
of which ETS sectors (2013 scope) GHG emissions		38.3	35.2	32.7	33.9	32.8	31.3	27.8	25.6	24.1	22.2		-0.4	-0.8	-1.7
of which ESD sectors (2013 scope) GHG emissions		58.4	53.7	50.0	47.9	45.5	43.3	42.7	42.2	41.5	41.2		-1.1	-1.0	-0.3
CO_2 Emissions (energy related)	**65.6**	**78.6**	**71.5**	**65.7**	**65.4**	**62.6**	**60.0**	**56.1**	**53.6**	**52.1**	**50.0**	0.9	-0.9	-0.9	-0.9
Power generation/District heating	12.5	17.0	15.1	11.2	13.3	13.8	13.6	11.6	10.8	10.3	8.9	1.9	-1.2	0.2	-2.1
Energy Branch	3.3	3.7	3.8	4.1	3.6	3.4	3.1	2.9	2.6	2.4	2.4	1.3	-0.4	-1.6	-1.3
Industry	16.8	18.5	17.6	17.8	17.5	15.8	14.5	12.6	11.2	10.6	10.1	0.5	-0.1	-1.8	-1.8
Residential	8.9	8.6	7.7	6.8	6.3	5.9	5.6	5.5	5.3	5.1	4.9	-1.5	-1.9	-1.2	-0.7
Tertiary	3.9	4.4	3.2	2.0	1.8	1.7	1.6	1.6	1.6	1.6	1.6	-1.8	-5.8	-1.0	-0.1
Transport	20.2	26.5	24.1	23.9	22.9	22.0	21.6	22.0	22.1	22.1	22.1	1.8	-0.5	-0.6	0.1
CO_2 Emissions (non energy and non land use related)	**4.6**	**5.0**	**5.4**	**5.3**	**5.3**	**5.2**	**5.2**	**5.1**	**5.0**	**4.2**	**4.0**	1.6	-0.3	-0.2	-1.3
Non-CO2 GHG emissions	**15.8**	**13.2**	**12.1**	**11.7**	**11.1**	**10.5**	**9.5**	**9.3**	**9.3**	**9.3**	**9.4**	-2.7	-0.8	-1.6	0.0
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**108.2**	**121.6**	**111.8**	**104.0**	**102.8**	**98.4**	**93.8**	**88.6**	**85.2**	**82.4**	**79.6**	0.3	-0.8	-0.9	-0.8
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.17	0.21	0.17	0.13	0.14	0.14	0.13	0.11	0.10	0.09	0.08	-0.3	-1.7	-0.9	-2.5
Final energy demand (t of CO_2/toe)	2.10	2.06	1.85	1.77	1.73	1.65	1.60	1.55	1.50	1.46	1.44	-1.3	-0.7	-0.8	-0.5
Industry	2.31	2.10	1.92	1.83	1.75	1.63	1.52	1.39	1.25	1.18	1.12	-1.9	-0.9	-1.4	-1.5
Residential	1.41	1.26	1.13	1.02	0.98	0.92	0.90	0.87	0.85	0.82	0.80	-2.2	-1.4	-0.9	-0.5
Tertiary	1.26	1.27	0.88	0.60	0.55	0.52	0.48	0.48	0.46	0.45	0.45	-3.6	-4.6	-1.2	-0.3
Transport	2.88	2.91	2.76	2.73	2.74	2.73	2.71	2.70	2.69	2.67	2.65	-0.4	0.0	-0.1	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**24.6**	**23.6**	**30.5**	**34.5**	**35.2**	**36.4**	**37.3**	**37.9**	**39.3**	**40.4**	**42.0**				
RES-H&C share	20.4	22.0	29.7	37.0	36.2	34.5	34.9	36.6	38.2	39.1	40.5				
RES-E share	66.9	62.4	65.7	68.0	69.0	74.7	75.4	74.5	76.0	77.0	79.7				
RES-T share (based on ILUC formula)	6.8	4.8	10.9	11.4	12.6	14.3	15.5	16.3	17.4	19.1	20.7				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	68	68	69	58	65	70	73	70	73	72	74	0.0	-0.5	1.1	0.1
Average Price of Electricity in Final demand sectors (€'13/MWh	130	115	143	131	141	147	147	149	150	150	152	0.9	-0.1	0.5	0.2
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**21.8**	**28.6**	**32.9**	**32.2**	**38.5**	**42.4**	**45.1**	**47.8**	**50.2**	**51.9**	**53.4**	4.2	1.6	1.6	0.9
as % of GDP	**8.5**	**10.2**	**11.0**	**10.2**	**11.2**	**11.4**	**11.3**	**11.0**	**10.7**	**10.3**	**9.8**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Belgium: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**10**	**10**	**11**	**11**	**12**	**12**	**13**	**13**	**14**	**14**	**15**	0.6	0.9	0.9	0.7
GDP (in 000 M€13)	**324**	**350**	**372**	**385**	**414**	**443**	**479**	**531**	**591**	**655**	**722**	1.4	1.1	1.5	2.1
Gross Inland Consumption (ktoe)	**59302**	**59008**	**61346**	**54681**	**54655**	**50915**	**49682**	**49282**	**50609**	**51609**	**52489**	0.3	-1.1	-0.9	0.3
Solids	7922	5081	3673	3205	1985	1911	1637	1408	1255	1114	1023	-7.4	-6.0	-1.9	-2.3
Oil	24136	24721	24699	23472	22002	21809	21605	21519	21756	21873	22144	0.2	-1.1	-0.2	0.1
Natural gas	13369	14728	16999	14941	14139	17315	17262	17931	18951	19599	19828	2.4	-1.8	2.0	0.7
Nuclear	12422	12277	12367	6909	8632	1241	0	0	0	0	0	0.0	-3.5	-100.0	0.0
Electricity	372	542	47	1913	1741	2170	2211	2168	1808	1792	1794	-18.6	43.4	2.4	-1.0
Renewable energy forms	1081	1658	3560	4242	6158	6469	6966	6255	6839	7230	7700	12.7	5.6	1.2	0.5
Energy Branch Consumption	**2366**	**2403**	**2246**	**2406**	**2215**	**2117**	**2085**	**2039**	**2072**	**2093**	**2118**	-0.5	-0.1	-0.6	0.1
Non-Energy Uses	**6739**	**7516**	**8541**	**8464**	**8523**	**8620**	**8650**	**8799**	**9035**	**8954**	**9113**	2.4	0.0	0.1	0.3
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**13607**	**13718**	**15356**	**10620**	**14050**	**7018**	**6268**	**5763**	**6376**	**6752**	**7232**	1.2	-0.9	-7.8	0.7
Solids	206	57	0	0	0	0	0	0	0	0	0	-97.1	-100.0	0.0	0.0
Oil	0	6	-7	-14	-14	-14	-14	-14	-14	-14	-14	#####	7.2	0.1	0.2
Natural gas	2	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Nuclear	12422	12277	12367	6909	8632	1241	0	0	0	0	0	0.0	-3.5	-100.0	0.0
Renewable energy sources	977	1377	2996	3725	5432	5791	6282	5776	6390	6766	7246	11.9	6.1	1.5	0.7
Hydro	40	25	27	31	32	32	49	50	51	52	54	-3.8	1.7	4.5	0.4
Biomass & Waste	931	1327	2793	2944	3919	3875	4017	3408	3766	3951	4031	11.6	3.4	0.2	0.0
Wind	1	20	111	431	1032	1404	1657	1731	1923	2078	2365	54.9	25.0	4.9	1.8
Solar and others	1	3	60	313	442	469	537	556	617	646	749	50.7	22.0	2.0	1.7
Geothermal	3	3	4	6	8	11	22	30	33	39	47	3.0	5.7	11.4	3.8
Net Imports (ktoe)	**50502**	**53396**	**53753**	**52611**	**49684**	**53320**	**53202**	**53553**	**54580**	**55671**	**56615**	0.6	-0.8	0.7	0.3
Solids	7220	5150	3591	3205	1985	1911	1637	1408	1255	1114	1023	-6.7	-5.8	-1.9	-2.3
Oil	29527	32605	32752	32035	31048	30849	30869	30665	30884	31120	31710	1.0	-0.5	-0.1	0.1
Crude oil and Feedstocks	34177	32251	31004	27409	27197	27300	27476	27530	27721	27934	28264	-1.0	-1.3	0.1	0.1
Oil products	-4650	354	1749	4626	3851	3549	3393	3135	3162	3185	3445	0.0	8.2	-1.3	0.1
Natural gas	13278	14817	16791	14941	14185	17712	17801	18833	20184	21181	21634	2.4	-1.7	2.3	1.0
Electricity	372	542	47	1913	1741	2170	2211	2168	1808	1792	1794	-18.6	43.4	2.4	-1.0
Import Dependency (%)	78.1	80.1	78.0	83.2	78.0	88.4	89.5	90.3	89.5	89.2	88.7				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**82773**	**85709**	**93764**	**69728**	**73694**	**69227**	**72313**	**75899**	**86100**	**92509**	**98217**	1.3	-2.4	-0.2	1.5
Nuclear energy	48157	47595	47944	28180	35207	5071	0	0	0	0	0	0.0	-3.0	-100.0	0.0
Solids	12916	8199	4190	2975	195	296	42	24	24	0	0	-10.6	-26.4	-14.3	-100.0
Oil (including refinery gas)	797	1740	406	96	674	694	709	0	0	0	0	-6.5	5.2	0.5	-100.0
Gas (including derived gases)	19091	25143	33178	23812	17993	38531	42794	47024	53287	56838	57668	5.7	-5.9	9.1	1.5
Biomass-waste	1336	2516	5882	5914	3246	3925	4917	4093	5655	6694	7233	16.0	-5.8	4.2	1.9
Hydro (pumping excluded)	460	288	312	365	368	371	571	580	590	607	624	-3.8	1.7	4.5	0.4
Wind	16	227	1292	5009	11998	16325	19266	20134	22359	24163	27498	55.1	25.0	4.9	1.8
Solar	0	1	560	3376	4013	4013	4013	4044	4135	4157	5146	0.0	21.8	0.0	1.3
Geothermal and other renewables	0	0	0	0	0	0	0	0	49	49	49	0.0	-100.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**14674**	**14867**	**17071**	**18515**	**20998**	**21065**	**22284**	**23209**	**25368**	**27118**	**30082**	1.5	2.1	0.6	1.5
Nuclear energy	5921	5921	5921	3907	5055	3041	0	0	0	0	0	0.0	-1.6	-100.0	0.0
Renewable energy	117	274	1934	5560	8494	9922	10902	11165	11850	12380	14265	32.4	15.9	2.5	1.4
Hydro (pumping excluded)	103	105	118	119	119	119	177	180	183	188	193	1.4	0.1	4.1	0.4
Wind	14	167	912	2229	4558	5985	6907	7167	7831	8353	9331	51.8	17.5	4.2	1.5
Solar	0	2	904	3212	3818	3818	3818	3818	3818	3820	4722	0.0	15.5	0.0	1.1
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	19	19	19	0.0	0.0	0.0	0.0
Thermal power	8636	8672	9216	9048	7449	8102	11382	12044	13517	14737	15816	0.7	-2.1	4.3	1.7
of which cogeneration units	1112	1893	2575	1552	657	1536	1264	2452	2570	2712	2934	8.8	-12.8	6.8	4.3
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	2290	1450	1184	825	43	43	16	16	7	0	0	-6.4	-28.2	-9.7	-100.0
Gas fired	4392	5201	6468	6799	6270	7030	10331	11228	12566	13692	14810	3.9	-0.3	5.1	1.8
Oil fired	1581	1494	836	646	266	246	215	49	42	26	2	-6.2	-10.8	-2.1	-20.2
Biomass-waste fired	373	527	727	777	869	783	820	752	903	1019	1003	6.9	1.8	-0.6	1.0
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	61.5	63.0	60.3	41.2	38.7	36.6	36.3	36.7	38.1	38.2	36.6				
Efficiency of gross thermal power generation (%)	41.4	42.1	44.8	44.7	44.3	47.8	52.5	55.6	56.7	57.8	58.3				
% of gross electricity from CHP	6.5	8.5	16.0	17.4	8.1	18.0	17.1	27.7	25.8	32.1	34.8				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	60.4	59.1	59.7	61.4	74.4	42.9	39.8	38.0	38.1	38.6	41.3				
Fuel Inputs to Thermal Power Generation (GWh_e)	**7090**	**7677**	**8386**	**6315**	**4287**	**7816**	**7932**	**7904**	**8942**	**9449**	**9577**	1.7	-6.5	6.3	0.9
Solids	2629	1833	936	761	47	68	9	5	5	0	0	-9.8	-25.8	-15.8	-100.0
Oil (including refinery gas)	180	411	57	29	223	230	235	0	0	0	0	-10.8	14.6	0.5	-100.0
Gas (including derived gases)	3790	4612	5671	4111	2894	6250	6212	6970	7698	8079	8193	4.1	-6.5	7.9	1.4
Biomass & Waste	492	821	1722	1414	1123	1268	1476	929	1240	1370	1384	13.4	-4.2	2.8	-0.3
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**54711**	**52964**	**50595**	**41255**	**42549**	**35102**	**33895**	**33922**	**34192**	**34402**	**34758**	-0.8	-1.7	-2.2	0.1
Refineries	38602	37483	35454	31882	31698	31884	32080	32251	32587	32848	33285	-0.8	-1.1	0.1	0.2
Biofuels and hydrogen production	0	0	352	341	873	841	839	841	863	907	906	0.0	9.5	-0.4	0.4
District heating	45	29	6	15	19	17	19	20	19	19	19	-18.1	11.7	0.4	-0.2
Derived gases, cokeries etc.	16064	15452	14782	9016	9959	2360	956	811	722	629	548	-0.8	-3.9	-20.9	-2.7

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Belgium: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**137**	**145**	**154**	**158**	**169**	**178**	**186**	**194**	**203**	**212**	**220**	1.2	1.0	0.9	0.9
Public road transport	13	18	17	18	18	18	18	18	19	19	19	2.7	0.3	0.1	0.2
Private cars and motorcycles	107	109	115	117	126	132	137	141	146	151	155	0.8	0.9	0.8	0.6
Rail	9	10	12	12	13	14	15	17	18	20	21	3.1	1.1	1.7	1.7
Aviation [3]	8	8	9	10	12	14	15	17	20	22	24	0.9	2.5	2.6	2.3
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	-0.3	1.3	0.9	0.9
Freight transport activity (Gtkm)	**70**	**65**	**63**	**66**	**76**	**84**	**92**	**98**	**104**	**110**	**115**	-1.1	1.8	2.0	1.1
Heavy goods and light commercial vehicles	55	48	46	47	54	60	65	68	72	75	78	-1.7	1.6	1.8	0.9
Rail	8	8	7	8	9	11	13	14	15	16	18	-0.3	2.1	3.2	1.7
Inland navigation	8	9	9	12	13	14	15	16	17	18	19	2.2	2.9	1.6	1.4
Energy demand in transport (ktoe) [4]	**9747**	**9972**	**10593**	**10179**	**10021**	**10174**	**10420**	**10666**	**11040**	**11425**	**11687**	0.8	-0.6	0.4	0.6
Public road transport	158	204	292	290	288	281	274	271	268	265	262	6.4	-0.1	-0.5	-0.2
Private cars and motorcycles	4815	4463	5177	4757	4260	4114	4170	4172	4256	4363	4431	0.7	-1.9	-0.2	0.3
Heavy goods and light commercial vehicles	2857	3618	3413	3397	3647	3804	3954	4017	4124	4241	4352	1.8	0.7	0.8	0.5
Rail	184	186	177	181	209	233	255	268	284	300	313	-0.4	1.7	2.0	1.0
Aviation	1530	1281	1382	1389	1442	1556	1564	1722	1877	2011	2070	-1.0	0.4	0.8	1.4
Inland navigation	204	219	152	164	175	187	202	215	231	245	258	-2.9	1.4	1.5	1.2
By transport activity															
Passenger transport	6608	6016	6932	6518	6078	6045	6108	6272	6515	6760	6891	0.5	-1.3	0.1	0.6
Freight transport	3139	3956	3661	3660	3943	4129	4311	4393	4524	4664	4796	1.6	0.7	0.9	0.5
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.3	0.4	0.6	1.0	1.2	1.5	1.7				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	3.4	3.4	9.1	8.8	8.6	8.4	8.3	8.3	8.0				
ENERGY EFFICIENCY															
Primary energy consumption	**52563**	**51491**	**52805**	**46217**	**46132**	**42294**	**41032**	**40482**	**41574**	**42655**	**43376**	0.0	-1.3	-1.2	0.3
Final Energy Demand	**37766**	**36705**	**37534**	**36239**	**36408**	**35860**	**35821**	**35628**	**36391**	**37356**	**38063**	-0.1	-0.3	-0.2	0.3
by sector															
Industry	14218	11775	11688	11055	11240	10683	10221	9609	9555	9753	9884	-1.9	-0.4	-0.9	-0.2
Energy intensive industries	10700	9088	8641	8013	8025	7657	7269	6669	6474	6501	6491	-2.1	-0.7	-1.0	-0.6
Other industrial sectors	3518	2686	3047	3042	3215	3026	2952	2940	3081	3252	3392	-1.4	0.5	-0.9	0.7
Residential	8974	9299	9266	9230	9307	9398	9294	9470	9605	9827	9976	0.3	0.0	0.0	0.4
Tertiary	4827	5658	5982	5722	5790	5552	5832	5828	6135	6294	6458	2.2	-0.3	0.1	0.5
Transport[5]	9747	9973	10598	10232	10071	10228	10474	10721	11097	11483	11745	0.8	-0.5	0.4	0.6
by fuel															
Solids	3403	2019	1621	1505	1346	1353	1187	1005	876	767	699	-7.2	-1.8	-1.2	-2.6
Oil	16661	16586	15314	14610	13016	12768	12605	12731	12743	12921	13023	-0.8	-1.6	-0.3	0.2
Gas	10010	10009	11147	10465	10606	10314	10214	10019	10288	10549	10640	1.1	-0.5	-0.4	0.2
Electricity	6667	6896	7163	7033	7224	7345	7651	7901	8364	8848	9298	0.7	0.1	0.6	1.0
Heat (from CHP and District Heating)	492	428	640	567	609	677	743	788	858	899	938	2.7	-0.5	2.0	1.2
Renewable energy forms	533	767	1650	2058	3585	3368	3385	3140	3209	3311	3397	12.0	8.1	-0.6	0.0
Other	0	0	0	3	23	34	36	43	52	62	68	0.0	0.0	4.6	3.3
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	183	168	165	142	132	115	104	93	86	79	73	-1.0	-2.2	-2.4	-1.8
Industry (Energy on Value added, index 2000=100)	100	82	88	81	77	69	62	54	49	45	42	-1.3	-1.3	-2.2	-1.9
Residential (Energy on Private Income, index 2000=100)	100	98	90	84	78	73	66	60	54	49	45	-1.1	-1.4	-1.7	-1.9
Tertiary (Energy on Value added, index 2000=100)	100	107	105	97	91	81	78	70	66	61	56	0.5	-1.4	-1.4	-1.6
Passenger transport (toe/Mpkm) [6]	43	38	39	35	30	28	27	26	25	25	24	-1.1	-2.5	-1.2	-0.6
Freight transport (toe/Mtkm)	45	61	58	55	52	49	47	45	43	42	42	2.6	-1.1	-1.0	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**154.0**	**148.3**	**136.1**	**127.3**	**111.9**	**115.9**	**111.2**	**110.5**	**112.3**	**113.9**	**114.9**	-1.2	-1.9	-0.1	0.2
of which ETS sectors (2013 scope) GHG emissions		70.1	58.6	52.1	42.7	48.5	44.9	44.3	45.6	46.5	46.9		-3.1	0.5	0.2
of which ESD sectors (2013 scope) GHG emissions		78.3	77.6	75.2	69.3	67.5	66.3	66.1	66.7	67.4	68.0		-1.1	-0.4	0.1
CO_2 Emissions (energy related)	**122.7**	**114.2**	**106.4**	**97.8**	**84.6**	**90.5**	**88.4**	**88.1**	**89.8**	**91.2**	**91.6**	-1.4	-2.3	0.4	0.2
Power generation/District heating	25.1	24.0	20.4	15.8	8.7	17.1	16.7	17.5	19.2	20.0	20.2	-2.0	-8.2	6.8	1.0
Energy Branch	4.9	4.4	3.9	4.6	4.0	3.8	3.8	3.5	3.5	3.5	3.6	-2.3	0.4	-0.7	-0.2
Industry	34.5	24.8	22.1	19.7	18.6	16.2	14.3	12.8	12.0	11.7	11.4	-4.4	-1.7	-2.6	-1.1
Residential	20.3	20.5	18.9	18.4	16.8	17.2	16.9	17.1	16.9	17.0	16.9	-0.7	-1.1	0.0	0.0
Tertiary	8.7	10.6	10.2	9.5	9.0	8.3	8.3	8.1	8.2	8.2	8.2	1.6	-1.3	-0.8	-0.1
Transport	29.2	29.9	30.9	29.7	27.4	27.9	28.5	29.0	29.9	30.8	31.4	0.6	-1.2	0.4	0.5
CO_2 Emissions (non energy and non land use related)	**8.1**	**13.3**	**9.5**	**10.2**	**9.9**	**9.1**	**7.7**	**7.3**	**7.2**	**7.2**	**7.5**	1.6	0.3	-2.5	-0.1
Non-CO2 GHG emissions	**23.2**	**20.9**	**20.2**	**19.3**	**17.5**	**16.2**	**15.2**	**15.1**	**15.3**	**15.5**	**15.7**	-1.3	-1.4	-1.4	0.2
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**102.5**	**98.7**	**90.6**	**84.7**	**74.5**	**77.2**	**74.0**	**73.5**	**74.7**	**75.8**	**76.5**	-1.2	-1.9	-0.1	0.2
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.28	0.26	0.20	0.20	0.10	0.22	0.20	0.20	0.19	0.19	0.18	-3.5	-6.1	6.7	-0.5
Final energy demand (t of CO_2/toe)	2.45	2.34	2.19	2.14	1.97	1.94	1.90	1.88	1.84	1.81	1.78	-1.1	-1.0	-0.4	-0.3
Industry	2.43	2.11	1.89	1.79	1.65	1.52	1.40	1.33	1.25	1.20	1.15	-2.5	-1.3	-1.7	-1.0
Residential	2.26	2.21	2.04	2.00	1.81	1.83	1.81	1.80	1.76	1.73	1.69	-1.0	-1.2	0.0	-0.3
Tertiary	1.80	1.87	1.71	1.66	1.56	1.50	1.43	1.39	1.34	1.30	1.27	-0.5	-0.9	-0.8	-0.6
Transport	2.99	3.00	2.91	2.91	2.72	2.73	2.72	2.71	2.70	2.68	2.67	-0.3	-0.7	0.0	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**1.3**	**2.3**	**5.6**	**8.6**	**13.9**	**14.7**	**15.8**	**15.2**	**16.0**	**16.5**	**17.5**				
RES-H&C share	1.9	3.4	6.1	8.5	13.7	13.3	13.8	12.8	13.4	13.7	14.1				
RES-E share	1.1	2.4	7.1	15.2	20.1	25.2	28.5	27.7	29.9	30.8	33.4				
RES-T share (based on ILUC formula)	0.0	0.1	4.1	4.6	10.2	11.7	13.5	13.9	14.8	15.9	16.9				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	43	49	59	86	105	116	111	102	97	95	92	3.2	6.0	0.5	-0.9
Average Price of Electricity in Final demand sectors (€'13/MWh	128	116	139	141	146	154	157	160	158	156	155	0.9	0.5	0.7	-0.1
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**32.9**	**35.9**	**48.6**	**47.3**	**58.9**	**64.4**	**69.0**	**73.0**	**77.7**	**80.9**	**83.7**	4.0	1.9	1.6	1.0
as % of GDP	**10.2**	**10.3**	**13.1**	**12.3**	**14.2**	**14.5**	**14.4**	**13.8**	**13.2**	**12.3**	**11.6**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Bulgaria: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**8**	**8**	**7**	**7**	**7**	**7**	**6**	**6**	**6**	**6**	**6**	-1.0	-0.7	-0.7	-0.6
GDP (in 000 M€13)	**25**	**33**	**38**	**40**	**45**	**50**	**53**	**57**	**61**	**64**	**67**	4.1	1.8	1.7	1.2
Gross Inland Consumption (ktoe)	**18523**	**19754**	**17770**	**16469**	**16364**	**15916**	**15745**	**15576**	**15457**	**14812**	**15387**	-0.4	-0.8	-0.4	-0.1
Solids	6433	6895	6887	5983	5666	4699	4383	3897	3346	2112	2838	0.7	-1.9	-2.5	-2.1
Oil	4068	4725	3888	3732	3556	3607	3519	3519	3496	3483	3487	-0.5	-0.9	-0.1	0.0
Natural gas	2931	2804	2300	2118	2128	2169	2092	2534	2570	2393	2135	-2.4	-0.8	-0.2	0.1
Nuclear	4699	4826	3956	3776	3776	3776	3776	3776	3776	4318	4318	-1.7	-0.5	0.0	0.7
Electricity	-397	-652	-726	-1011	-920	-1000	-995	-1305	-1173	-1086	-1084	6.2	2.4	0.8	0.4
Renewable energy forms	788	1156	1465	1870	2157	2665	2969	3155	3441	3591	3693	6.4	3.9	3.2	1.1
Energy Branch Consumption	**905**	**911**	**1032**	**907**	**860**	**774**	**762**	**724**	**715**	**634**	**815**	1.3	-1.8	-1.2	0.3
Non-Energy Uses	**980**	**851**	**422**	**427**	**498**	**563**	**605**	**626**	**652**	**668**	**692**	-8.1	1.7	2.0	0.7
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**9867**	**10629**	**10531**	**9856**	**10690**	**10241**	**10545**	**10148**	**10568**	**10054**	**10918**	0.7	0.2	-0.1	0.2
Solids	4295	4178	4942	4055	4644	3675	3666	3029	3140	1929	2684	1.4	-0.6	-2.3	-1.5
Oil	68	58	61	17	20	26	29	38	39	40	42	-1.2	-10.7	4.2	1.8
Natural gas	12	384	59	125	128	132	142	172	185	188	191	17.0	8.1	1.0	1.5
Nuclear	4699	4826	3956	3776	3776	3776	3776	3776	3776	4318	4318	-1.7	-0.5	0.0	0.7
Renewable energy sources	792	1182	1512	1883	2121	2631	2932	3133	3427	3579	3683	6.7	3.4	3.3	1.1
Hydro	230	373	435	349	372	364	363	363	363	363	364	6.6	-1.5	-0.3	0.0
Biomass & Waste	562	776	975	1283	1471	1558	1625	1753	1902	1904	1897	5.7	4.2	1.0	0.8
Wind	0	0	59	98	102	434	481	487	509	628	647	0.0	5.7	16.8	1.5
Solar and others	0	0	12	118	140	240	421	485	610	644	739	0.0	28.4	11.6	2.9
Geothermal	0	33	33	34	36	35	42	44	42	39	37	0.0	1.0	1.4	-0.6
Net Imports (ktoe)	**8544**	**9276**	**7075**	**6717**	**5825**	**5844**	**5378**	**5612**	**5084**	**4965**	**4688**	-1.9	-1.9	-0.8	-0.7
Solids	2258	2553	1700	1928	1022	1023	717	868	206	183	154	-2.8	-5.0	-3.5	-7.4
Oil	3944	4943	4025	3820	3687	3747	3665	3660	3644	3644	3655	0.2	-0.9	-0.1	0.0
Crude oil and Feedstocks	5228	6145	5916	6308	6000	5833	5578	5370	5141	4925	4715	1.2	0.1	-0.7	-0.8
Oil products	-1284	-1202	-1891	-2489	-2313	-2086	-1913	-1710	-1497	-1282	-1060	3.9	2.0	-1.9	-2.9
Natural gas	2742	2458	2131	1993	2001	2040	1954	2367	2392	2212	1952	-2.5	-0.6	-0.2	0.0
Electricity	-397	-652	-726	-1011	-920	-1000	-995	-1305	-1173	-1086	-1084	6.2	2.4	0.8	0.4
Import Dependency (%)	46.0	46.7	39.6	40.5	35.3	36.3	33.8	35.6	32.5	33.1	30.0				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**40646**	**43972**	**46017**	**48843**	**48789**	**49938**	**50487**	**54352**	**53603**	**53275**	**56749**	1.2	0.6	0.3	0.6
Nuclear energy	18178	18653	15249	15662	15326	15326	15326	15326	15326	20148	20148	-1.7	0.1	0.0	1.4
Solids	16941	18458	22606	23317	22690	18563	17456	15856	13555	8180	11972	2.9	0.0	-2.6	-1.9
Oil (including refinery gas)	661	606	393	440	70	63	0	62	0	0	0	-5.1	-15.8	-100.0	0.0
Gas (including derived gases)	2178	1896	1967	3035	3873	4408	4120	8521	8243	6758	5230	-1.0	7.0	0.6	1.2
Biomass-waste	15	17	49	54	164	463	455	1063	1787	1985	2085	12.6	12.8	10.7	7.9
Hydro (pumping excluded)	2673	4337	5057	4061	4331	4235	4218	4220	4223	4223	4227	6.6	-1.5	-0.3	0.0
Wind	0	5	681	1144	1183	5050	5589	5667	5921	7307	7518	0.0	5.7	16.8	1.5
Solar	0	0	15	1129	1152	1829	3323	3636	4548	4674	5570	0.0	54.2	11.2	2.6
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**10471**	**10635**	**9943**	**11968**	**11812**	**12479**	**13488**	**13114**	**13110**	**14069**	**15293**	-0.5	1.7	1.3	0.6
Nuclear energy	3610	2765	1920	1920	1920	1920	1920	1920	1920	2400	2400	-6.1	0.0	0.0	1.1
Renewable energy	1016	1992	2697	4081	4110	5832	7032	7271	7923	8346	9019	10.3	4.3	5.5	1.3
Hydro (pumping excluded)	1016	1984	2184	2338	2338	2338	2338	2338	2338	2338	2338	8.0	0.7	0.0	0.0
Wind	0	8	488	691	703	1954	2122	2146	2197	2535	2599	0.0	3.7	11.7	1.0
Solar	0	0	25	1052	1069	1541	2572	2787	3388	3473	4082	0.0	45.6	9.2	2.3
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	5845	5878	5326	5967	5782	4726	4536	3924	3267	3323	3874	-0.9	0.8	-2.4	-0.8
of which cogeneration units	1129	1191	1017	1814	1704	1653	1518	1143	1016	1140	1146	-1.0	5.3	-1.2	-1.4
of which CCS units	0	0	0	0	0	0	0	0	0	0	990	0.0	0.0	0.0	0.0
Solids fired	5100	5100	4703	5313	4819	3501	3391	2379	1799	1590	2179	-0.8	0.2	-3.5	-2.2
Gas fired	689	737	607	626	910	1129	1043	1433	1271	1517	1478	-1.3	4.1	1.4	1.8
Oil fired	57	42	13	13	2	2	2	0	0	0	0	-13.6	-18.4	0.0	-100.0
Biomass-waste fired	0	0	3	15	51	94	101	112	197	216	217	0.0	32.3	7.1	3.9
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	39.9	42.8	47.7	42.3	43.3	42.7	40.1	44.7	44.3	41.3	39.3				
Efficiency of gross thermal power generation (%)	28.4	27.0	28.5	36.8	39.0	39.4	39.6	44.2	44.7	46.5	45.2				
% of gross electricity from CHP	7.8	6.1	8.0	12.0	12.6	9.4	8.7	8.4	9.1	9.7	10.8				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	18.5				
% of carbon free (RES, nuclear) gross electricity generation	51.3	52.3	45.7	45.1	45.4	53.9	57.3	55.0	59.3	72.0	69.7				
Fuel Inputs to Thermal Power Generation (GWh_e)	**5986**	**6689**	**7553**	**6282**	**5904**	**5128**	**4789**	**4964**	**4533**	**3127**	**3671**	2.4	-2.4	-2.1	-1.3
Solids	4928	5817	6610	5466	5223	4344	4083	3648	3142	1938	2689	3.0	-2.3	-2.4	-2.1
Oil (including refinery gas)	171	174	219	110	17	17	0	16	0	0	0	2.5	-22.6	-100.0	0.0
Gas (including derived gases)	884	697	720	692	627	658	605	1086	1059	853	632	-2.0	-1.4	-0.4	0.2
Biomass & Waste	3	2	4	15	38	110	101	214	332	337	350	1.4	25.9	10.3	6.4
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**12213**	**13505**	**11285**	**10638**	**10389**	**10237**	**9997**	**9811**	**9596**	**9932**	**9718**	-0.8	-0.8	-0.4	-0.1
Refineries	5310	6421	6041	6617	6301	6147	5887	5684	5455	5237	5026	1.3	0.4	-0.7	-0.8
Biofuels and hydrogen production	0	0	13	106	189	188	200	206	214	222	229	0.0	30.3	0.6	0.7
District heating	324	368	304	96	99	111	124	137	146	150	143	-0.6	-10.6	2.2	0.7
Derived gases, cokeries etc.	6579	6717	4927	3819	3801	3792	3787	3783	3781	4322	4321	-2.9	-2.6	0.0	0.7

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Bulgaria: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**48**	**56**	**65**	**72**	**76**	**80**	**84**	**88**	**91**	**94**	**96**	3.2	1.4	1.1	0.7
Public road transport	15	14	11	11	11	12	12	12	12	12	13	-3.1	0.6	0.4	0.4
Private cars and motorcycles	28	36	48	53	54	57	59	60	62	63	63	5.7	1.3	0.7	0.4
Rail	4	3	3	3	4	4	4	4	5	5	5	-2.5	1.6	1.6	0.9
Aviation [3]	2	4	4	5	6	8	10	11	12	14	16	8.8	4.9	4.5	2.4
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	-1.8	0.7	0.9	0.8
Freight transport activity (Gtkm)	**11**	**16**	**18**	**20**	**22**	**24**	**26**	**28**	**30**	**31**	**32**	5.7	2.0	1.6	1.1
Heavy goods and light commercial vehicles	5	11	9	10	11	12	13	13	14	15	15	7.0	2.0	1.3	0.9
Rail	6	5	3	3	4	4	5	5	5	6	6	-5.7	1.9	2.2	1.5
Inland navigation	0	1	6	6	7	8	9	9	10	11	11	34.4	2.0	1.8	1.1
Energy demand in transport (ktoe) [4]	**1841**	**2682**	**2719**	**2837**	**2882**	**2935**	**2979**	**3037**	**3099**	**3136**	**3169**	4.0	0.6	0.3	0.3
Public road transport	399	362	262	263	270	269	266	263	262	262	263	-4.1	0.3	-0.2	-0.1
Private cars and motorcycles	956	1389	1581	1628	1560	1524	1513	1517	1525	1503	1482	5.2	-0.1	-0.3	-0.1
Heavy goods and light commercial vehicles	305	652	590	646	701	724	727	748	767	782	793	6.8	1.7	0.4	0.4
Rail	78	69	52	44	49	52	55	57	60	61	60	-4.0	-0.6	1.1	0.5
Aviation	101	201	182	207	244	301	350	381	409	450	491	6.1	3.0	3.7	1.7
Inland navigation	3	10	53	49	58	64	67	71	75	78	79	34.5	0.9	1.5	0.8
By transport activity															
Passenger transport	1473	1965	2034	2106	2084	2105	2141	2172	2209	2228	2249	3.3	0.2	0.3	0.2
Freight transport	369	718	685	731	798	830	838	864	890	907	920	6.4	1.5	0.5	0.5
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.3	0.4	0.6	0.8				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	0.5	3.8	6.6	6.5	6.8	6.9	6.9	7.1	7.1				
ENERGY EFFICIENCY															
Primary energy consumption	**17543**	**18903**	**17348**	**16042**	**15867**	**15353**	**15141**	**14950**	**14805**	**14144**	**14696**	-0.1	-0.9	-0.5	-0.1
Final Energy Demand	**9106**	**10184**	**8843**	**9205**	**9481**	**9595**	**9652**	**9569**	**9719**	**9808**	**9887**	-0.3	0.7	0.2	0.1
by sector															
Industry	3967	4037	2561	2709	2794	2806	2790	2623	2631	2670	2647	-4.3	0.9	0.0	-0.3
Energy intensive industries	3124	3161	1789	1929	1935	1901	1856	1703	1687	1697	1639	-5.4	0.8	-0.4	-0.6
Other industrial sectors	843	876	772	780	860	905	934	920	944	974	1008	-0.9	1.1	0.8	0.4
Residential	2155	2117	2246	2307	2371	2400	2433	2464	2529	2528	2570	0.4	0.5	0.3	0.3
Tertiary	972	1128	1174	1179	1265	1288	1291	1280	1299	1320	1357	1.9	0.8	0.2	0.3
Transport[5]	2013	2903	2862	3011	3050	3101	3138	3202	3261	3290	3313	3.6	0.6	0.3	0.3
by fuel															
Solids	879	979	414	487	419	333	284	226	185	157	132	-7.3	0.1	-3.8	-3.7
Oil	3026	3712	3125	3134	3059	3106	3047	3027	3014	3005	3004	0.3	-0.2	0.0	-0.1
Gas	1681	1565	1058	1052	1084	1042	999	963	1018	1040	1021	-4.5	0.2	-0.8	0.1
Electricity	2085	2211	2331	2382	2506	2598	2672	2727	2817	2921	3062	1.1	0.7	0.6	0.7
Heat (from CHP and District Heating)	880	939	960	841	869	932	963	919	920	914	914	0.9	-1.0	1.0	-0.3
Renewable energy forms	555	778	956	1309	1543	1584	1687	1706	1762	1767	1746	5.6	4.9	0.9	0.2
Other	0	0	0	0	0	0	1	1	3	5	8	0.0	0.0	6.4	13.4
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	733	599	472	415	363	319	294	273	254	230	228	-4.3	-2.6	-2.1	-1.3
Industry (Energy on Value added, index 2000=100)	100	68	37	39	35	32	29	26	25	24	22	-9.4	-0.5	-1.8	-1.4
Residential (Energy on Private Income, index 2000=100)	100	72	67	67	58	53	49	46	44	41	40	-3.9	-1.4	-1.6	-1.1
Tertiary (Energy on Value added, index 2000=100)	100	91	81	76	71	65	61	56	53	51	50	-2.1	-1.3	-1.5	-1.0
Passenger transport (toe/Mpkm) [6]	30	34	30	28	27	25	24	23	23	22	22	0.0	-1.3	-1.0	-0.5
Freight transport (toe/Mtkm)	35	44	37	37	36	34	32	31	30	29	28	0.7	-0.4	-1.1	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**64.4**	**67.0**	**61.2**	**55.6**	**51.1**	**46.8**	**44.9**	**43.5**	**41.3**	**35.5**	**29.1**	-0.5	-1.8	-1.3	-2.1
of which ETS sectors (2013 scope) GHG emissions		39.4	35.6	30.0	28.4	24.7	23.1	22.1	19.9	14.4	8.1		-2.2	-2.1	-5.1
of which ESD sectors (2013 scope) GHG emissions		27.6	25.6	25.6	22.7	22.2	21.8	21.4	21.4	21.1	20.9		-1.2	-0.4	-0.2
CO_2 Emissions (energy related)	**44.3**	**49.1**	**45.9**	**40.1**	**38.2**	**34.2**	**32.3**	**31.2**	**28.9**	**23.2**	**16.8**	0.4	-1.8	-1.7	-3.2
Power generation/District heating	24.6	27.9	31.2	25.1	23.8	20.1	18.8	18.1	16.0	10.4	4.1	2.4	-2.7	-2.3	-7.3
Energy Branch	0.8	0.8	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.8	-1.8	-1.3	-0.6
Industry	10.6	9.8	3.7	4.0	4.0	3.7	3.2	2.7	2.5	2.5	2.3	-10.0	0.8	-2.2	-1.6
Residential	1.4	1.2	1.0	1.0	0.7	0.5	0.5	0.4	0.4	0.3	0.3	-3.1	-4.0	-3.6	-1.7
Tertiary	1.2	1.1	0.8	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.5	-4.0	-1.5	-1.2	-0.9
Transport	5.7	8.3	8.3	8.4	8.3	8.5	8.6	8.7	8.8	8.9	8.9	3.7	0.1	0.3	0.2
CO_2 Emissions (non energy and non land use related)	**3.5**	**4.0**	**3.0**	**3.0**	**3.1**	**3.2**	**3.2**	**3.3**	**3.4**	**3.4**	**3.3**	-1.5	0.4	0.5	0.2
Non-CO2 GHG emissions	**16.7**	**14.0**	**12.3**	**12.5**	**9.8**	**9.4**	**9.3**	**9.0**	**9.1**	**8.9**	**9.0**	-3.0	-2.2	-0.6	-0.2
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**58.5**	**60.9**	**55.6**	**50.5**	**46.4**	**42.5**	**40.8**	**39.5**	**37.6**	**32.2**	**26.4**	-0.5	-1.8	-1.3	-2.1
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.46	0.49	0.51	0.41	0.39	0.32	0.29	0.27	0.24	0.16	0.06	1.2	-2.7	-2.7	-7.7
Final energy demand (t of CO_2/toe)	2.07	2.01	1.55	1.53	1.44	1.39	1.33	1.30	1.26	1.24	1.22	-2.8	-0.7	-0.8	-0.4
Industry	2.67	2.43	1.44	1.47	1.43	1.30	1.15	1.04	0.96	0.92	0.87	-6.0	-0.1	-2.2	-1.4
Residential	0.63	0.58	0.44	0.41	0.28	0.22	0.19	0.16	0.15	0.14	0.13	-3.5	-4.5	-3.9	-2.0
Tertiary	1.24	0.97	0.69	0.61	0.55	0.53	0.47	0.45	0.43	0.40	0.37	-5.8	-2.3	-1.4	-1.2
Transport	2.85	2.88	2.88	2.80	2.73	2.74	2.73	2.72	2.71	2.69	2.68	0.1	-0.5	0.0	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**6.6**	**9.1**	**14.1**	**18.7**	**20.9**	**25.2**	**28.1**	**29.6**	**31.9**	**33.7**	**34.1**				
RES-H&C share	10.5	14.1	25.2	30.8	33.6	34.9	38.6	41.2	43.9	45.6	47.0				
RES-E share	4.0	8.5	12.3	17.4	18.1	30.5	35.2	37.6	41.6	45.2	44.3				
RES-T share (based on ILUC formula)	0.3	0.4	1.1	5.4	10.0	10.1	10.8	11.6	12.4	13.2	13.9				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	53	55	58	68	69	75	78	79	80	86	88	0.8	1.8	1.3	0.6
Average Price of Electricity in Final demand sectors (€'13/MWh	44	56	75	89	106	125	132	140	148	145	145	5.4	3.5	2.2	0.5
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**5.2**	**7.4**	**9.5**	**10.5**	**12.9**	**14.7**	**16.4**	**17.6**	**19.2**	**20.2**	**21.8**	6.2	3.0	2.4	1.4
as % of GDP	**20.7**	**22.3**	**25.3**	**26.5**	**28.5**	**29.3**	**30.6**	**30.9**	**31.5**	**31.3**	**32.2**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Croatia: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	**4**	-0.4	-0.3	-0.3	-0.3
GDP (in 000 M€13)	**36**	**45**	**46**	**45**	**49**	**52**	**55**	**61**	**67**	**73**	**79**	2.4	0.5	1.3	1.8
Gross Inland Consumption (ktoe)	**7793**	**8888**	**8561**	**8018**	**8234**	**7984**	**7793**	**7886**	**7989**	**7875**	**7980**	0.9	-0.4	-0.5	0.1
Solids	431	683	683	751	708	323	305	283	253	27	25	4.7	0.4	-8.1	-11.8
Oil	3929	4490	3699	3414	3235	3174	3138	3108	3031	3030	2983	-0.6	-1.3	-0.3	-0.3
Natural gas	2210	2370	2632	2144	2468	2651	2358	2589	2681	2519	2564	1.8	-0.6	-0.5	0.4
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	344	440	410	514	414	350	403	319	296	401	370	1.8	0.1	-0.3	-0.4
Renewable energy forms	880	906	1138	1195	1410	1487	1588	1587	1728	1899	2038	2.6	2.2	1.2	1.3
Energy Branch Consumption	**821**	**825**	**745**	**726**	**708**	**617**	**620**	**613**	**590**	**574**	**556**	-1.0	-0.5	-1.3	-0.5
Non-Energy Uses	**656**	**675**	**596**	**514**	**529**	**530**	**535**	**554**	**588**	**607**	**628**	-0.9	-1.2	0.1	0.8
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**3580**	**3799**	**4222**	**3368**	**3636**	**3511**	**3363**	**3243**	**3328**	**3355**	**3411**	1.7	-1.5	-0.8	0.1
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Oil	1345	1029	767	466	461	438	395	357	321	290	262	-5.5	-5.0	-1.5	-2.0
Natural gas	1355	1865	2215	1431	1535	1367	1159	1084	1026	922	856	5.0	-3.6	-2.8	-1.5
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	880	906	1240	1471	1640	1706	1808	1802	1981	2143	2293	3.5	2.8	1.0	1.2
Hydro	505	545	716	533	544	549	550	550	562	577	581	3.6	-2.7	0.1	0.3
Biomass & Waste	375	360	500	859	1009	985	990	964	1052	1055	1093	2.9	7.3	-0.2	0.5
Wind	0	1	12	56	56	56	107	107	166	191	225	0.0	16.6	6.7	3.8
Solar and others	0	0	5	16	23	107	152	173	191	311	384	0.0	16.0	20.8	4.7
Geothermal	0	0	7	7	8	8	9	8	8	9	10	0.0	1.3	1.4	0.6
Net Imports (ktoe)	**4134**	**5208**	**4461**	**4657**	**4605**	**4480**	**4437**	**4651**	**4669**	**4527**	**4576**	0.8	0.3	-0.4	0.2
Solids	478	624	699	751	708	323	305	283	253	27	25	3.9	0.1	-8.1	-11.8
Oil	2406	3583	2980	2955	2780	2743	2750	2758	2717	2747	2728	2.2	-0.7	-0.1	0.0
Crude oil and Feedstocks	3952	4334	3647	2979	2840	2829	2843	2848	2797	2803	2763	-0.8	-2.5	0.0	-0.1
Oil products	-1546	-751	-667	-24	-60	-86	-93	-89	-80	-56	-35	-8.1	-21.4	4.5	-4.8
Natural gas	905	562	476	713	933	1284	1199	1505	1655	1597	1708	-6.2	7.0	2.5	1.8
Electricity	344	440	410	514	414	350	403	319	296	401	370	1.8	0.1	-0.3	-0.4
Import Dependency (%)	52.9	58.4	52.1	58.0	55.9	56.1	56.9	58.9	58.4	57.4	57.3				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**10684**	**12354**	**13999**	**11995**	**14108**	**14588**	**14117**	**15761**	**16811**	**16669**	**18458**	2.7	0.1	0.0	1.3
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	1551	2328	2385	2671	2734	918	868	861	861	16	24	4.4	1.4	-10.8	-16.4
Oil (including refinery gas)	1687	1855	560	77	25	247	263	258	180	180	78	-10.4	-26.7	26.6	-5.9
Gas (including derived gases)	1571	1814	2553	2232	4017	5251	3996	5576	5528	4297	4802	5.0	4.6	-0.1	0.9
Biomass-waste	1	14	33	98	290	314	379	453	719	904	1043	41.9	24.3	2.7	5.2
Hydro (pumping excluded)	5874	6333	8329	6199	6324	6387	6393	6395	6540	6714	6758	3.6	-2.7	0.1	0.3
Wind	0	10	139	650	650	650	1243	1244	1936	2216	2620	0.0	16.7	6.7	3.8
Solar	0	0	0	68	68	821	974	974	1047	2343	3133	0.0	0.0	30.5	6.0
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**3786**	**3945**	**4216**	**4884**	**4892**	**5276**	**5518**	**5268**	**5512**	**6387**	**7338**	1.1	1.5	1.2	1.4
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	2079	2066	2220	2668	2668	3193	3559	3559	3940	4971	5775	0.7	1.9	2.9	2.5
Hydro (pumping excluded)	2079	2060	2141	2190	2190	2190	2190	2190	2236	2285	2285	0.3	0.2	0.0	0.2
Wind	0	6	79	423	423	423	682	682	970	1065	1340	0.0	18.3	4.9	3.4
Solar	0	0	0	55	55	581	686	686	734	1620	2149	0.0	0.0	28.6	5.9
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	1707	1879	1996	2216	2224	2082	1959	1709	1572	1416	1563	1.6	1.1	-1.3	-1.1
of which cogeneration units	558	515	486	298	594	943	685	812	667	798	943	-1.4	2.0	1.4	1.6
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	311	311	311	311	658	658	658	656	656	463	463	0.0	7.8	0.0	-1.7
Gas fired	781	919	1031	1706	1393	1246	1166	958	829	857	999	2.8	3.1	-1.8	-0.8
Oil fired	615	646	649	185	150	153	107	65	30	30	16	0.5	-13.6	-3.3	-9.0
Biomass-waste fired	0	3	5	13	24	26	29	29	57	66	85	0.0	17.3	1.8	5.6
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	31.0	34.4	36.6	27.3	32.1	31.0	28.7	33.6	34.2	29.4	28.4				
Efficiency of gross thermal power generation (%)	33.1	34.9	37.5	44.0	47.5	46.7	45.1	47.1	46.4	48.4	50.8				
% of gross electricity from CHP	16.8	0.0	14.3	15.5	18.9	20.0	23.7	22.9	22.8	27.5	27.9				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	55.0	51.5	60.7	58.5	52.0	56.0	63.7	57.5	60.9	73.0	73.4				
Fuel Inputs to Thermal Power Generation (GWh_e)	**1249**	**1479**	**1269**	**993**	**1280**	**1240**	**1051**	**1305**	**1350**	**959**	**1007**	0.2	0.1	-2.0	-0.2
Solids	357	537	532	612	577	211	217	224	219	4	8	4.1	0.8	-9.3	-15.3
Oil (including refinery gas)	395	447	120	14	8	71	72	69	43	43	18	-11.3	-23.4	24.2	-6.7
Gas (including derived gases)	497	490	611	350	639	898	685	926	929	724	759	2.1	0.4	0.7	0.5
Biomass & Waste	0	4	7	17	56	60	77	86	159	189	223	36.6	23.4	3.3	5.5
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**5394**	**5327**	**4409**	**3555**	**3571**	**3523**	**3479**	**3447**	**3365**	**3344**	**3275**	-2.0	-2.1	-0.3	-0.3
Refineries	5299	5210	4304	3414	3271	3236	3208	3174	3089	3064	2997	-2.1	-2.7	-0.2	-0.3
Biofuels and hydrogen production	0	0	3	70	223	208	193	193	195	200	202	0.0	56.1	-1.4	0.2
District heating	83	104	97	70	74	76	73	74	74	72	70	1.6	-2.7	-0.2	-0.2
Derived gases, cokeries etc.	12	13	4	1	2	4	5	6	6	7	6	-10.0	-5.6	7.2	1.2

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Croatia: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**27**	**31**	**34**	**36**	**39**	**41**	**43**	**45**	**48**	**50**	**51**	2.5	1.4	1.0	0.9
Public road transport	3	3	3	3	4	4	4	4	4	4	4	-0.3	1.1	0.7	0.7
Private cars and motorcycles	21	25	27	28	30	31	33	34	35	37	37	2.4	1.2	0.9	0.7
Rail	2	2	2	2	3	3	3	3	3	3	3	2.7	1.3	0.6	0.6
Aviation [3]	1	1	2	3	3	3	4	4	5	6	6	12.0	3.8	2.6	2.6
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	212.2	1.0	1.4	0.6
Freight transport activity (Gtkm)	**4**	**12**	**12**	**12**	**14**	**15**	**16**	**17**	**18**	**19**	**19**	10.2	1.5	1.6	1.0
Heavy goods and light commercial vehicles	3	9	8	8	10	10	11	12	13	14	14	12.1	1.5	1.7	1.0
Rail	2	3	3	3	3	3	3	4	4	4	4	3.9	1.4	1.2	0.6
Inland navigation	0	0	1	1	1	1	1	1	1	2	2	30.9	1.4	0.9	1.5
Energy demand in transport (ktoe) [4]	**1544**	**1921**	**2068**	**2074**	**2136**	**2117**	**2120**	**2155**	**2206**	**2236**	**2257**	3.0	0.3	-0.1	0.3
Public road transport	41	39	61	63	66	66	66	67	68	68	68	3.9	0.8	0.0	0.2
Private cars and motorcycles	1192	1192	1332	1324	1320	1273	1252	1254	1259	1258	1258	1.1	-0.1	-0.5	0.0
Heavy goods and light commercial vehicles	161	508	479	465	511	526	540	557	581	596	605	11.5	0.6	0.6	0.6
Rail	46	52	50	48	52	53	54	55	54	54	52	0.8	0.5	0.4	-0.2
Aviation	76	98	108	134	144	154	161	173	189	204	215	3.6	2.9	1.1	1.4
Inland navigation	29	33	38	39	43	44	46	50	54	57	59	2.8	1.3	0.8	1.2
By transport activity															
Passenger transport	1329	1340	1514	1535	1543	1507	1493	1507	1530	1544	1555	1.3	0.2	-0.3	0.2
Freight transport	215	581	554	540	592	609	627	648	675	692	702	9.9	0.7	0.6	0.6
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.3	0.8	1.0	1.2	1.6	1.8				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	0.1	3.5	10.7	10.2	9.5	9.4	9.3	9.5	9.4				
ENERGY EFFICIENCY															
Primary energy consumption	**7138**	**8213**	**7965**	**7504**	**7705**	**7454**	**7258**	**7332**	**7401**	**7268**	**7352**	1.1	-0.3	-0.6	0.1
Final Energy Demand	**5371**	**6343**	**6347**	**6190**	**6302**	**6189**	**6117**	**6111**	**6207**	**6327**	**6438**	1.7	-0.1	-0.3	0.3
by sector															
Industry	1378	1563	1366	1394	1395	1291	1202	1141	1156	1189	1224	-0.1	0.2	-1.5	0.1
Energy intensive industries	847	907	752	745	736	669	601	560	564	575	590	-1.2	-0.2	-2.0	-0.1
Other industrial sectors	531	656	614	649	659	622	601	580	592	614	634	1.5	0.7	-0.9	0.3
Residential	1666	1922	1893	1784	1774	1779	1778	1784	1785	1791	1788	1.3	-0.6	0.0	0.0
Tertiary	781	935	1018	934	993	998	1014	1028	1055	1107	1165	2.7	-0.2	0.2	0.7
Transport[5]	1547	1923	2070	2078	2139	2121	2124	2159	2210	2240	2261	3.0	0.3	-0.1	0.3
by fuel															
Solids	74	146	150	139	131	112	89	59	33	23	17	7.3	-1.4	-3.8	-7.9
Oil	2683	3108	2902	2755	2568	2498	2450	2430	2427	2423	2429	0.8	-1.2	-0.5	0.0
Gas	1009	1236	1288	1170	1231	1197	1156	1144	1189	1235	1228	2.5	-0.5	-0.6	0.3
Electricity	1018	1240	1364	1317	1392	1390	1413	1471	1540	1641	1762	3.0	0.2	0.1	1.1
Heat (from CHP and District Heating)	213	258	246	226	241	258	274	288	312	315	318	1.4	-0.2	1.3	0.8
Renewable energy forms	375	356	397	582	738	729	732	713	698	683	675	0.6	6.4	-0.1	-0.4
Other	0	0	0	1	2	4	5	6	7	8	8	0.0	0.0	7.4	2.7
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	214	196	184	179	168	154	141	130	119	108	101	-1.5	-0.9	-1.8	-1.6
Industry (Energy on Value added, index 2000=100)	100	97	88	93	87	77	69	61	56	55	53	-1.3	-0.1	-2.3	-1.3
Residential (Energy on Private Income, index 2000=100)	100	91	88	84	75	71	66	60	54	50	46	-1.2	-1.6	-1.3	-1.8
Tertiary (Energy on Value added, index 2000=100)	100	97	99	95	91	86	81	74	68	65	64	-0.1	-0.9	-1.2	-1.2
Passenger transport (toe/Mpkm) [6]	48	41	43	41	38	35	33	31	30	29	28	-1.2	-1.2	-1.4	-0.8
Freight transport (toe/Mtkm)	48	49	47	45	43	41	39	38	38	37	36	-0.2	-0.8	-1.0	-0.4
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**26.3**	**30.7**	**28.5**	**25.4**	**25.0**	**23.3**	**22.0**	**22.0**	**21.8**	**20.4**	**20.3**	0.8	-1.3	-1.3	-0.4
of which ETS sectors (2013 scope) GHG emissions		12.7	10.8	9.7	10.1	8.8	7.8	8.1	7.8	6.4	6.4		-0.7	-2.6	-1.0
of which ESD sectors (2013 scope) GHG emissions		17.9	17.7	15.7	14.9	14.5	14.2	13.9	14.0	14.0	14.0		-1.7	-0.5	-0.1
CO_2 Emissions (energy related)	**17.0**	**20.2**	**18.6**	**17.0**	**17.1**	**15.7**	**14.8**	**15.1**	**14.8**	**13.5**	**13.4**	0.9	-0.8	-1.4	-0.5
Power generation/District heating	4.1	5.1	4.3	3.5	4.1	3.3	2.8	3.4	3.3	1.9	1.9	0.3	-0.5	-3.6	-1.9
Energy Branch	2.0	2.0	1.8	1.7	1.7	1.5	1.5	1.4	1.3	1.3	1.2	-1.0	-0.5	-1.5	-1.0
Industry	2.9	3.5	2.8	2.9	2.7	2.3	1.9	1.6	1.4	1.4	1.3	-0.2	-0.4	-3.3	-1.8
Residential	1.9	2.4	2.1	1.7	1.7	1.7	1.8	1.8	1.8	1.8	1.8	1.0	-2.1	0.3	0.0
Tertiary	1.5	1.5	1.4	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	-0.6	-1.6	-0.1	0.2
Transport	4.5	5.7	6.2	6.0	5.7	5.6	5.7	5.7	5.9	5.9	5.9	3.1	-0.8	-0.1	0.3
CO_2 Emissions (non energy and non land use related)	**2.6**	**3.1**	**2.5**	**2.4**	**2.6**	**2.5**	**2.2**	**2.2**	**2.2**	**2.1**	**2.1**	-0.3	0.1	-1.4	-0.3
Non-CO2 GHG emissions	**6.7**	**7.4**	**7.4**	**5.9**	**5.4**	**5.2**	**5.0**	**4.7**	**4.8**	**4.8**	**4.9**	0.9	-3.1	-0.8	-0.1
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**74.2**	**86.5**	**80.4**	**71.5**	**70.5**	**65.8**	**62.1**	**62.1**	**61.4**	**57.6**	**57.4**	0.8	-1.3	-1.3	-0.4
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.30	0.32	0.25	0.23	0.23	0.18	0.16	0.17	0.15	0.09	0.08	-2.1	-0.5	-4.0	-3.1
Final energy demand (t of CO_2/toe)	2.01	2.06	1.97	1.90	1.79	1.76	1.72	1.68	1.65	1.63	1.60	-0.2	-0.9	-0.4	-0.4
Industry	2.09	2.23	2.08	2.08	1.95	1.82	1.61	1.40	1.22	1.15	1.10	-0.1	-0.6	-1.9	-1.9
Residential	1.15	1.24	1.12	0.95	0.96	0.98	0.99	1.01	1.01	1.01	0.99	-0.3	-1.5	0.3	0.0
Tertiary	1.89	1.57	1.37	1.26	1.19	1.17	1.16	1.13	1.13	1.10	1.04	-3.2	-1.4	-0.3	-0.5
Transport	2.94	2.97	2.97	2.88	2.65	2.66	2.66	2.65	2.65	2.63	2.63	0.1	-1.1	0.0	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**14.8**	**12.8**	**14.3**	**18.5**	**21.1**	**22.9**	**25.0**	**25.3**	**26.8**	**29.1**	**30.7**				
RES-H&C share	13.0	10.9	13.1	18.0	18.4	20.2	23.0	24.1	25.0	25.5	26.5				
RES-E share	36.2	32.8	34.2	39.1	38.9	43.9	47.9	46.7	50.7	57.2	59.7				
RES-T share (based on ILUC formula)	1.2	0.9	1.1	5.1	10.1	10.9	12.1	12.5	13.6	15.6	16.5				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	83	75	67	59	67	79	85	84	87	85	83	-2.1	0.0	2.4	-0.1
Average Price of Electricity in Final demand sectors (€'13/MWh	96	84	109	110	122	131	135	141	146	147	142	1.3	1.1	1.0	0.3
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**4.4**	**5.9**	**7.6**	**7.5**	**9.0**	**10.1**	**10.9**	**11.9**	**12.7**	**13.4**	**14.0**	5.5	1.7	1.9	1.2
as % of GDP	**12.2**	**12.9**	**16.4**	**16.8**	**18.4**	**19.5**	**19.7**	**19.5**	**18.9**	**18.3**	**17.8**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Cyprus: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	1.7	0.9	0.3	0.6
GDP (in 000 M€13)	**14**	**16**	**18**	**16**	**19**	**21**	**22**	**25**	**29**	**33**	**37**	2.8	0.2	1.9	2.5
Gross Inland Consumption (ktoe)	**2412**	**2539**	**2740**	**2157**	**2155**	**2084**	**2074**	**2159**	**2215**	**2286**	**2272**	1.3	-2.4	-0.4	0.5
Solids	33	36	17	0	0	0	0	0	0	0	0	-6.5	-53.4	-7.7	-1.7
Oil	2334	2446	2611	1995	1351	1256	1236	1255	1265	1301	1287	1.1	-6.4	-0.9	0.2
Natural gas	0	0	0	0	558	569	540	596	616	611	554	0.0	0.0	-0.3	0.1
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	2.8
Renewable energy forms	46	57	112	162	245	260	298	308	334	374	431	9.4	8.1	2.0	1.9
Energy Branch Consumption	**54**	**22**	**19**	**17**	**15**	**9**	**8**	**8**	**8**	**8**	**9**	-9.7	-2.4	-5.8	0.6
Non-Energy Uses	**86**	**73**	**85**	**38**	**42**	**43**	**44**	**46**	**52**	**57**	**63**	-0.1	-7.0	0.5	1.9
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**44**	**51**	**89**	**137**	**195**	**2201**	**3124**	**4205**	**4978**	**5262**	**5203**	7.2	8.2	31.9	2.6
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Oil	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Natural gas	0	0	0	0	0	1989	2872	3949	4709	4949	4832	0.0	0.0	0.0	2.6
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	44	51	89	137	195	212	251	256	268	313	370	7.2	8.2	2.6	2.0
Hydro	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Biomass & Waste	9	10	24	28	36	45	53	51	53	51	51	10.5	4.2	3.9	-0.1
Wind	0	0	3	21	36	36	40	40	41	42	79	0.0	29.7	0.9	3.5
Solar and others	36	41	61	86	118	125	152	157	164	209	228	5.6	6.8	2.5	2.0
Geothermal	0	0	1	2	5	6	7	9	10	12	12	0.0	18.9	3.9	3.3
Net Imports (ktoe)	**2565**	**2843**	**2945**	**2243**	**2203**	**149**	**-773**	**-1758**	**-2453**	**-2643**	**-2573**	1.4	-2.9	0.0	6.2
Solids	33	43	11	0	0	0	0	0	0	0	0	-10.4	-51.4	-7.7	-1.7
Oil	2531	2794	2910	2218	1592	1517	1506	1533	1561	1618	1626	1.4	-5.9	-0.6	0.4
Crude oil and Feedstocks	1160	0	0	0	0	0	0	0	0	0	0	-100.0	0.0	0.0	0.0
Oil products	1371	2794	2910	2218	1592	1517	1506	1533	1561	1618	1626	7.8	-5.9	-0.6	0.4
Natural gas	0	0	0	0	561	-1416	-2326	-3344	-4079	-4322	-4261	0.0	0.0	0.0	3.1
Electricity	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Import Dependency (%)	98.6	100.7	100.8	94.3	91.9	6.4	-32.9	-71.9	-97.2	-100.9	-97.9				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**3370**	**4376**	**5322**	**4573**	**4921**	**5281**	**5493**	**5856**	**6233**	**6843**	**7267**	4.7	-0.8	1.1	1.4
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil (including refinery gas)	3370	4376	5249	4086	423	22	23	24	24	25	25	4.5	-22.3	-25.3	0.4
Gas (including derived gases)	0	0	0	0	3440	4066	3856	4238	4463	4457	4245	0.0	0.0	1.1	0.5
Biomass-waste	0	0	35	45	59	106	172	151	174	208	226	0.0	5.4	11.3	1.4
Hydro (pumping excluded)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Wind	0	0	31	248	422	422	463	463	478	494	915	0.0	29.8	0.9	3.5
Solar	0	0	6	195	576	664	979	979	1094	1660	1856	0.0	58.4	5.4	3.3
Geothermal and other renewables	0	0	1	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	-100.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**983**	**1119**	**1498**	**1755**	**1980**	**2052**	**2213**	**2453**	**2520**	**2505**	**2760**	4.3	2.8	1.1	1.1
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	0	0	89	292	554	598	758	758	806	1023	1310	0.0	20.1	3.2	2.8
Hydro (pumping excluded)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Wind	0	0	82	158	216	216	229	229	229	230	417	0.0	10.2	0.6	3.0
Solar	0	0	7	135	338	382	529	529	577	793	894	0.0	47.4	4.6	2.7
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	983	1119	1409	1462	1426	1455	1455	1695	1714	1482	1450	3.7	0.1	0.2	0.0
of which cogeneration units	0	5	22	2	2	1	3	3	3	3	3	0.0	-21.7	5.5	-0.1
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	32.4	1.2
Gas fired	0	0	0	0	34	514	514	754	994	1234	1255	0.0	0.0	31.3	4.6
Oil fired	983	1119	1406	1452	1382	930	930	931	710	238	184	3.6	-0.2	-3.9	-7.8
Biomass-waste fired	0	0	3	10	10	10	11	11	11	11	11	0.0	12.7	0.0	0.1
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	37.2	42.1	38.9	28.5	27.4	28.8	27.8	26.8	27.8	30.8	29.7				
Efficiency of gross thermal power generation (%)	32.9	34.9	38.4	48.0	51.9	61.4	61.7	61.6	62.6	63.3	66.4				
% of gross electricity from CHP	0.0	0.3	1.0	1.7	1.6	1.0	1.0	0.9	0.8	0.8	0.8				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	0.0	0.0	1.4	10.6	21.5	22.6	29.4	27.2	28.0	34.5	41.3				
Fuel Inputs to Thermal Power Generation (GWh_e)	**881**	**1077**	**1182**	**741**	**650**	**588**	**565**	**617**	**640**	**637**	**582**	3.0	-5.8	-1.4	0.2
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil (including refinery gas)	881	1077	1178	731	79	0	0	0	0	0	0	2.9	-23.7	-100.0	0.0
Gas (including derived gases)	0	0	0	0	558	568	539	594	614	607	549	0.0	0.0	-0.3	0.1
Biomass & Waste	0	0	4	10	13	20	26	23	26	30	33	0.0	12.6	7.0	1.2
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**1178**	**0**	**15**	**17**	**41**	**37**	**32**	**34**	**36**	**41**	**46**	-35.4	10.5	-2.4	1.8
Refineries	1178	0	0	0	0	0	0	0	0	0	0	-100.0	0.0	0.0	0.0
Biofuels and hydrogen production	0	0	15	17	41	37	32	33	36	41	46	0.0	10.5	-2.4	1.8
District heating	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Derived gases, cokeries etc.	0	0	0	0	0	0	0	0	0	0	1	0.0	0.0	4.6	4.6

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)											Cyprus: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**12**	**14**	**15**	**15**	**18**	**21**	**22**	**24**	**26**	**28**	**29**	1.9	2.3	2.0	1.3
Public road transport	1	1	1	1	1	1	1	1	2	2	2	1.4	0.9	0.1	0.8
Private cars and motorcycles	4	5	6	6	7	7	7	7	8	8	9	4.0	0.9	0.8	1.1
Rail	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Aviation [3]	7	8	7	8	10	12	14	15	17	18	18	0.5	3.6	2.9	1.5
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Freight transport activity (Gtkm)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**2**	-1.6	0.7	1.3	0.8
Heavy goods and light commercial vehicles	1	1	1	1	1	1	1	1	2	2	2	-1.6	0.7	1.3	0.8
Rail	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Energy demand in transport (ktoe) [4]	**860**	**982**	**1050**	**916**	**965**	**978**	**989**	**1023**	**1043**	**1052**	**1066**	2.0	-0.8	0.2	0.4
Public road transport	32	35	37	37	38	37	36	36	37	38	39	1.5	0.3	-0.6	0.4
Private cars and motorcycles	373	444	577	490	486	458	434	430	432	437	443	4.5	-1.7	-1.1	0.1
Heavy goods and light commercial vehicles	173	197	152	125	126	127	130	132	135	136	137	-1.3	-1.8	0.3	0.3
Rail	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Aviation	282	306	284	263	315	356	390	425	439	442	447	0.1	1.0	2.1	0.7
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
By transport activity															
Passenger transport	687	785	898	791	839	851	859	891	908	917	929	2.7	-0.7	0.2	0.4
Freight transport	173	197	152	125	126	127	130	132	135	136	137	-1.3	-1.8	0.3	0.3
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.3	0.6	0.9	1.3	1.7	2.0				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	1.4	1.8	4.2	3.8	3.2	3.2	3.4	3.7	3.9				
ENERGY EFFICIENCY															
Primary energy consumption	**2326**	**2466**	**2655**	**2118**	**2113**	**2042**	**2030**	**2112**	**2163**	**2229**	**2209**	1.3	-2.3	-0.4	0.4
Final Energy Demand	**1650**	**1834**	**1926**	**1700**	**1767**	**1787**	**1786**	**1846**	**1893**	**1961**	**1977**	1.6	-0.9	0.1	0.5
by sector															
Industry	445	320	235	202	210	202	190	201	222	257	235	-6.2	-1.1	-1.0	1.1
Energy intensive industries	240	221	171	141	149	149	147	158	176	207	181	-3.3	-1.4	-0.1	1.1
Other industrial sectors	205	98	63	61	61	54	43	43	45	50	54	-11.1	-0.4	-3.5	1.2
Residential	211	322	333	323	315	310	302	303	301	302	308	4.7	-0.5	-0.4	0.1
Tertiary	134	209	309	259	278	296	305	319	328	350	367	8.7	-1.0	0.9	0.9
Transport[5]	860	983	1050	916	965	978	989	1023	1043	1052	1066	2.0	-0.8	0.2	0.4
by fuel															
Solids	32	36	17	0	0	0	0	0	0	0	0	-6.4	-53.4	-7.7	-1.7
Oil	1317	1403	1384	1226	1230	1213	1192	1209	1213	1244	1224	0.5	-1.2	-0.3	0.1
Gas	0	0	0	0	0	1	1	2	3	4	5	0.0	0.0	11.6	6.4
Electricity	258	341	420	360	390	425	443	473	503	552	583	5.0	-0.8	1.3	1.4
Heat (from CHP and District Heating)	0	0	0	1	1	1	1	1	1	1	1	0.0	25.6	-0.9	-0.1
Renewable energy forms	42	54	105	114	146	146	148	161	172	158	160	9.6	3.4	0.1	0.4
Other	0	0	0	0	0	0	0	1	2	3	5	-100.0	0.0	11.8	12.3
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	175	157	151	131	116	101	92	85	76	70	62	-1.5	-2.6	-2.2	-2.0
Industry (Energy on Value added, index 2000=100)	100	70	56	57	54	49	43	40	40	42	35	-5.6	-0.4	-2.4	-1.0
Residential (Energy on Private Income, index 2000=100)	100	129	114	116	102	92	84	75	66	60	55	1.3	-1.1	-1.9	-2.0
Tertiary (Energy on Value added, index 2000=100)	100	133	166	151	142	136	128	118	106	100	93	5.2	-1.6	-1.0	-1.6
Passenger transport (toe/Mpkm) [6]	50	51	53	44	39	34	32	31	29	27	26	0.5	-3.1	-1.9	-1.0
Freight transport (toe/Mtkm)	129	135	133	109	104	97	94	91	87	86	85	0.3	-2.5	-1.0	-0.5
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**11.3**	**10.4**	**10.3**	**8.2**	**7.3**	**7.1**	**7.0**	**7.3**	**7.6**	**7.8**	**7.5**	-0.9	-3.4	-0.4	0.4
of which ETS sectors (2013 scope) GHG emissions		6.0	5.7	4.1	3.5	3.4	3.4	3.7	3.9	4.1	3.7		-4.9	-0.4	0.5
of which ESD sectors (2013 scope) GHG emissions		4.4	4.5	4.2	3.8	3.7	3.6	3.7	3.7	3.8	3.8		-1.8	-0.5	0.2
CO_2 Emissions (energy related)	**7.2**	**8.0**	**8.1**	**6.1**	**5.4**	**5.1**	**4.9**	**5.1**	**5.2**	**5.3**	**5.1**	1.2	-4.1	-0.8	0.1
Power generation/District heating	2.8	3.5	3.8	2.4	1.6	1.3	1.3	1.4	1.4	1.4	1.3	2.9	-8.5	-2.1	0.1
Energy Branch	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-100.0	0.0	0.0	0.0
Industry	1.4	1.0	0.6	0.6	0.6	0.5	0.4	0.4	0.4	0.6	0.5	-7.6	-1.2	-2.4	0.6
Residential	0.2	0.5	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.1	0.1	4.7	-2.5	-2.7	-3.6
Tertiary	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.0	-1.9	-1.5	-0.4
Transport	2.6	3.0	3.1	2.7	2.8	2.8	2.9	3.0	3.0	3.0	3.0	1.8	-1.1	0.3	0.3
CO_2 Emissions (non energy and non land use related)	**0.9**	**0.9**	**0.6**	**0.5**	**0.6**	**0.6**	**0.6**	**0.7**	**0.8**	**0.8**	**0.7**	-3.5	-0.5	-0.2	1.1
Non-CO2 GHG emissions	**3.2**	**1.5**	**1.6**	**1.6**	**1.4**	**1.4**	**1.5**	**1.6**	**1.7**	**1.7**	**1.7**	-6.9	-1.5	0.9	0.8
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**179.4**	**166.0**	**163.7**	**131.1**	**115.9**	**113.2**	**111.0**	**116.8**	**120.5**	**124.4**	**119.4**	-0.9	-3.4	-0.4	0.4
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.85	0.80	0.71	0.52	0.32	0.25	0.23	0.24	0.23	0.21	0.18	-1.7	-7.8	-3.2	-1.3
Final energy demand (t of CO_2/toe)	2.57	2.45	2.24	2.22	2.14	2.09	2.05	2.01	1.97	1.96	1.91	-1.3	-0.4	-0.4	-0.4
Industry	3.16	3.11	2.70	2.73	2.67	2.54	2.32	2.14	1.93	2.22	2.11	-1.6	-0.1	-1.4	-0.5
Residential	1.11	1.44	1.11	1.04	0.91	0.80	0.72	0.61	0.51	0.42	0.34	0.0	-2.0	-2.3	-3.7
Tertiary	0.00	0.43	0.69	0.73	0.64	0.53	0.50	0.46	0.43	0.41	0.38	0.0	-0.9	-2.4	-1.3
Transport	3.02	3.00	2.95	2.94	2.86	2.88	2.89	2.89	2.88	2.86	2.84	-0.2	-0.3	0.1	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**2.9**	**3.1**	**5.9**	**9.1**	**14.8**	**15.7**	**18.4**	**18.9**	**20.3**	**22.2**	**25.4**				
RES-H&C share	7.9	10.0	18.2	21.8	24.1	26.4	29.6	33.5	37.6	32.9	35.3				
RES-E share	0.0	0.0	1.4	10.6	21.5	22.6	29.4	27.2	28.0	34.5	41.3				
RES-T share (based on ILUC formula)	0.0	0.0	2.0	1.3	10.2	10.2	9.9	10.9	11.4	13.3	15.0				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	114	115	154	84	112	110	112	117	108	102	94	3.1	-3.1	0.0	-0.9
Average Price of Electricity in Final demand sectors (€'13/MWh	132	146	181	204	198	184	186	181	179	162	162	3.2	0.9	-0.7	-0.7
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**1.1**	**1.9**	**2.5**	**2.4**	**3.1**	**3.3**	**3.6**	**3.9**	**4.1**	**4.3**	**4.5**	8.1	2.1	1.6	1.1
as % of GDP	**8.3**	**12.0**	**13.7**	**14.8**	**16.4**	**16.1**	**16.0**	**15.2**	**14.2**	**13.1**	**12.3**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Czech Republic: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**10**	**10**	**10**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	**11**	0.2	0.2	0.1	0.1
GDP (in 000 M€13)	**112**	**137**	**157**	**165**	**181**	**197**	**216**	**235**	**255**	**276**	**297**	3.4	1.4	1.8	1.6
Gross Inland Consumption (ktoe)	**41097**	**45124**	**44681**	**41122**	**40995**	**41473**	**41202**	**40096**	**38358**	**38863**	**40344**	0.8	-0.9	0.1	-0.1
Solids	21643	20248	18364	15061	14956	14699	13914	10211	5332	3468	5622	-1.6	-2.0	-0.7	-4.4
Oil	7881	9899	9306	8965	8821	8884	9031	9266	9434	9651	9788	1.7	-0.5	0.2	0.4
Natural gas	7500	7703	8070	7797	7190	7516	7640	7669	8037	8421	7710	0.7	-1.1	0.6	0.0
Nuclear	3506	6405	7248	6798	6798	6798	6798	8957	11116	12472	12127	7.5	-0.6	0.0	2.9
Electricity	-861	-1086	-1285	-1020	-591	-614	-652	-734	-683	-684	-658	4.1	-7.5	1.0	0.0
Renewable energy forms	1429	1955	2980	3521	3821	4189	4471	4725	5121	5535	5753	7.6	2.5	1.6	1.3
Energy Branch Consumption	**1768**	**1796**	**2068**	**1808**	**1770**	**1756**	**1719**	**1572**	**1277**	**1203**	**1526**	1.6	-1.5	-0.3	-0.6
Non-Energy Uses	**2093**	**2948**	**2783**	**2447**	**2583**	**2684**	**2783**	**2879**	**2960**	**3058**	**3057**	2.9	-0.7	0.7	0.5
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**30536**	**32861**	**31570**	**27296**	**27864**	**28743**	**27970**	**25925**	**22869**	**22676**	**24708**	0.3	-1.2	0.0	-0.6
Solids	25049	23570	20730	16524	16915	17416	16384	12135	6529	4550	6722	-1.9	-2.0	-0.3	-4.4
Oil	386	591	290	223	222	212	195	0	0	0	0	-2.8	-2.7	-1.3	-100.0
Natural gas	169	154	202	191	181	177	171	163	162	162	153	1.8	-1.1	-0.6	-0.5
Nuclear	3506	6405	7248	6798	6798	6798	6798	8957	11116	12472	12127	7.5	-0.6	0.0	2.9
Renewable energy sources	1426	2142	3101	3560	3748	4139	4421	4670	5060	5492	5706	8.1	1.9	1.7	1.3
Hydro	151	205	240	208	218	213	220	234	253	297	333	4.7	-0.9	0.1	2.1
Biomass & Waste	1275	1933	2770	3106	3195	3582	3806	3982	4306	4590	4674	8.1	1.4	1.8	1.0
Wind	0	2	29	44	65	71	75	78	85	143	153	76.2	8.5	1.5	3.6
Solar and others	0	3	62	202	267	270	314	367	405	447	530	0.0	15.8	1.6	2.7
Geothermal	0	0	0	0	2	3	6	10	12	14	15	0.0	0.0	12.6	4.3
Net Imports (ktoe)	**9414**	**12641**	**11447**	**13826**	**13131**	**12730**	**13233**	**14171**	**15489**	**16188**	**15635**	2.0	1.4	0.1	0.8
Solids	-4721	-3270	-2968	-1463	-1960	-2717	-2470	-1923	-1197	-1082	-1100	-4.5	-4.1	2.3	-4.0
Oil	7512	9649	8974	8742	8600	8672	8836	9266	9434	9651	9788	1.8	-0.4	0.3	0.5
Crude oil and Feedstocks	5596	7730	7837	6115	6057	6125	6262	6622	6762	6934	7051	3.4	-2.5	0.3	0.6
Oil products	1916	1919	1137	2627	2542	2548	2574	2644	2673	2717	2737	-5.1	8.4	0.1	0.3
Natural gas	7482	7535	6846	7606	7009	7339	7469	7506	7875	8259	7558	-0.9	0.2	0.6	0.1
Electricity	-861	-1086	-1285	-1020	-591	-614	-652	-734	-683	-684	-658	4.1	-7.5	1.0	0.0
Import Dependency (%)	22.9	28.0	25.6	33.6	32.0	30.7	32.1	35.3	40.4	41.7	38.8				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**72911**	**81931**	**85319**	**82069**	**79790**	**83278**	**85766**	**89041**	**90376**	**93905**	**100491**	1.6	-0.7	0.7	0.8
Nuclear energy	13590	24728	27998	27596	27596	27596	27594	37668	47742	54556	54467	7.5	-0.1	0.0	3.5
Solids	52752	49522	47113	41095	41990	40672	38739	28716	14514	6972	17948	-1.1	-1.1	-0.8	-3.8
Oil (including refinery gas)	372	326	159	231	0	0	0	0	0	0	0	-8.1	-100.0	0.0	0.0
Gas (including derived gases)	3907	4215	4121	5853	3591	6677	10047	12143	15189	16583	11840	0.5	-1.4	10.8	0.8
Biomass-waste	531	739	2188	2214	1097	2781	3669	4533	6602	8251	7608	15.2	-6.7	12.8	3.7
Hydro (pumping excluded)	1758	2380	2789	2421	2541	2471	2561	2716	2941	3453	3877	4.7	-0.9	0.1	2.1
Wind	1	21	335	508	759	824	878	912	991	1664	1782	78.9	8.5	1.5	3.6
Solar	0	0	615	2149	2214	2254	2276	2352	2395	2422	2967	0.0	13.7	0.3	1.3
Geothermal and other renewables	0	0	1	0	2	2	2	2	2	2	2	0.0	9.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**13990**	**16314**	**17995**	**18816**	**18571**	**19073**	**18911**	**16906**	**16162**	**17384**	**19084**	2.5	0.3	0.2	0.0
Nuclear energy	1958	4006	4006	4006	4006	4006	4006	5206	6406	7116	6848	7.4	0.0	0.0	2.7
Renewable energy	953	1043	2989	3628	3816	3907	3987	4068	4177	4558	5320	12.1	2.5	0.4	1.5
Hydro (pumping excluded)	952	1020	1049	1080	1080	1090	1109	1142	1190	1300	1393	1.0	0.3	0.3	1.1
Wind	1	22	213	282	408	452	488	514	547	789	838	70.9	6.7	1.8	2.7
Solar	0	1	1727	2266	2328	2365	2391	2412	2440	2469	3089	0.0	3.0	0.3	1.3
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	11079	11265	11000	11182	10749	11160	10918	7632	5579	5710	6916	-0.1	-0.2	0.2	-2.3
of which cogeneration units	3733	5199	4792	3841	3973	3026	2941	2862	3056	3402	3913	2.5	-1.9	-3.0	1.4
of which CCS units	0	0	0	0	0	0	0	0	0	0	1320	0.0	0.0	0.0	0.0
Solids fired	9823	9935	9571	9656	9487	9414	8797	5364	2303	1881	3098	-0.3	-0.1	-0.8	-5.1
Gas fired	1097	1110	1176	1220	933	1419	1783	1961	2749	3167	3153	0.7	-2.3	6.7	2.9
Oil fired	140	140	117	134	72	64	64	28	24	24	24	-1.8	-4.7	-1.2	-4.8
Biomass-waste fired	19	80	136	171	258	263	274	279	503	638	641	21.7	6.6	0.6	4.4
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	55.0	52.9	50.0	46.3	45.5	46.4	48.3	56.5	60.5	58.9	55.7				
Efficiency of gross thermal power generation (%)	31.4	30.0	30.3	31.9	32.7	32.4	33.5	36.5	44.5	47.4	44.1				
% of gross electricity from CHP	17.9	16.8	14.2	17.4	19.5	15.7	16.3	18.1	21.5	23.4	22.3				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.9				
% of carbon free (RES, nuclear) gross electricity generation	21.8	34.0	39.8	42.5	42.9	43.1	43.1	54.1	67.1	74.9	70.4				
Fuel Inputs to Thermal Power Generation (GWh_e)	**15744**	**15702**	**15219**	**13299**	**12271**	**13322**	**13483**	**10692**	**7009**	**5770**	**7298**	-0.3	-2.1	0.9	-3.0
Solids	13945	14025	13445	10677	11016	11147	10731	7582	3528	1857	4108	-0.4	-2.0	-0.3	-4.7
Oil (including refinery gas)	311	161	78	59	0	0	0	0	0	0	0	-12.9	-100.0	0.0	0.0
Gas (including derived gases)	1236	1292	1134	1938	970	1441	1864	2102	2239	2465	1783	-0.9	-1.5	6.7	-0.2
Biomass & Waste	253	224	562	626	284	733	886	1006	1240	1446	1406	8.3	-6.6	12.1	2.3
Geothermal heat	0	0	0	0	2	2	2	2	2	2	2	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**15035**	**19758**	**20049**	**17183**	**17172**	**17086**	**16972**	**19000**	**20653**	**22101**	**21811**	2.9	-1.5	-0.1	1.3
Refineries	6151	8144	8337	6497	6452	6520	6643	6826	6969	7147	7263	3.1	-2.5	0.3	0.4
Biofuels and hydrogen production	62	3	231	285	596	551	552	571	584	604	625	14.1	9.9	-0.8	0.6
District heating	975	916	787	650	694	711	628	590	579	575	559	-2.1	-1.2	-1.0	-0.6
Derived gases, cokeries etc.	7846	10696	10693	9751	9430	9304	9148	11013	12521	13776	13364	3.1	-1.2	-0.3	1.9

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Czech Republic: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**103**	**112**	**108**	**113**	**124**	**135**	**146**	**155**	**165**	**174**	**184**	0.5	1.4	1.6	1.2
Public road transport	16	16	17	17	19	20	22	23	24	25	26	0.5	1.0	1.5	1.0
Private cars and motorcycles	67	72	67	68	75	80	86	92	98	103	108	0.0	1.1	1.4	1.1
Rail	15	15	16	18	20	22	23	25	26	28	29	0.1	2.5	1.6	1.0
Aviation [3]	5	10	9	9	11	12	14	16	17	19	20	5.6	2.3	2.7	1.9
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Freight transport activity (Gtkm)	**46**	**49**	**48**	**50**	**55**	**59**	**64**	**68**	**72**	**76**	**80**	0.3	1.4	1.5	1.1
Heavy goods and light commercial vehicles	29	34	34	35	38	41	44	47	49	52	55	1.7	1.1	1.4	1.2
Rail	17	15	14	15	17	18	20	21	23	24	25	-2.4	2.1	1.8	1.1
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	-7.0	1.1	1.7	1.3
Energy demand in transport (ktoe) [4]	**4252**	**5983**	**6121**	**6178**	**6317**	**6280**	**6399**	**6616**	**6790**	**6978**	**7170**	3.7	0.3	0.1	0.6
Public road transport	233	296	379	385	404	418	431	442	455	473	492	5.0	0.6	0.7	0.7
Private cars and motorcycles	2563	3389	3394	3319	3298	3197	3194	3267	3346	3434	3521	2.8	-0.3	-0.3	0.5
Heavy goods and light commercial vehicles	1038	1753	1810	1914	2004	2013	2071	2165	2215	2266	2335	5.7	1.0	0.3	0.6
Rail	216	197	193	211	235	245	258	265	267	263	256	-1.1	2.0	1.0	0.0
Aviation	197	343	341	345	373	405	441	473	502	536	559	5.6	0.9	1.7	1.2
Inland navigation	5	5	4	4	4	4	4	5	5	5	6	-2.2	-0.7	1.5	1.2
By transport activity															
Passenger transport	3107	4132	4229	4175	4219	4170	4225	4347	4470	4609	4736	3.1	0.0	0.0	0.6
Freight transport	1145	1850	1892	2003	2098	2111	2174	2270	2320	2369	2434	5.1	1.0	0.4	0.6
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.6	0.8	1.1	1.4				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	1.5	0.0	3.8	4.7	9.7	9.0	8.9	8.9	8.8	8.8	8.7				
ENERGY EFFICIENCY															
Primary energy consumption	**39004**	**42175**	**41899**	**38675**	**38412**	**38789**	**38419**	**37217**	**35398**	**35806**	**37286**	0.7	-0.9	0.0	-0.1
Final Energy Demand	**24798**	**26026**	**24853**	**24635**	**25338**	**25091**	**24923**	**24822**	**24896**	**25434**	**25960**	0.0	0.2	-0.2	0.2
by sector															
Industry	10129	9681	7933	7883	8193	8007	7886	7544	7364	7527	7668	-2.4	0.3	-0.4	-0.1
Energy intensive industries	6420	6748	5015	5079	5138	4977	4764	4389	4065	4034	4038	-2.4	0.2	-0.8	-0.8
Other industrial sectors	3709	2934	2919	2804	3055	3030	3122	3155	3299	3492	3630	-2.4	0.5	0.2	0.8
Residential	6150	6345	6665	6340	6561	6549	6441	6509	6542	6661	6812	0.8	-0.2	-0.2	0.3
Tertiary	4151	3904	3979	4098	4114	4093	4025	3973	4010	4071	4107	-0.4	0.3	-0.2	0.1
Transport[5]	4368	6095	6276	6315	6470	6443	6571	6797	6979	7176	7372	3.7	0.3	0.2	0.6
by fuel															
Solids	5134	3769	2424	2616	2308	1994	1694	1315	954	813	691	-7.2	-0.5	-3.0	-4.4
Oil	5322	6817	6541	6366	6162	6130	6180	6322	6413	6534	6666	2.1	-0.6	0.0	0.4
Gas	6491	6741	6662	6128	6347	6193	6017	5798	5746	5891	5978	0.3	-0.5	-0.5	0.0
Electricity	4246	4754	4919	5012	5249	5513	5687	5922	6177	6507	6801	1.5	0.7	0.8	0.9
Heat (from CHP and District Heating)	2624	2478	2249	2102	2288	2417	2446	2478	2482	2458	2494	-1.5	0.2	0.7	0.1
Renewable energy forms	981	1467	2058	2411	2981	2841	2893	2978	3104	3200	3287	7.7	3.8	-0.3	0.6
Other	0	0	0	1	2	3	6	10	20	30	42	-100.0	0.0	11.3	10.1
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	366	329	285	250	227	211	191	171	151	141	136	-2.5	-2.3	-1.7	-1.7
Industry (Energy on Value added, index 2000=100)	100	69	44	43	41	37	33	29	26	25	24	-7.8	-0.8	-2.0	-1.7
Residential (Energy on Private Income, index 2000=100)	100	87	80	75	70	63	55	50	46	42	39	-2.2	-1.4	-2.3	-1.7
Tertiary (Energy on Value added, index 2000=100)	100	82	76	73	67	60	54	48	45	42	39	-2.7	-1.3	-2.1	-1.6
Passenger transport (toe/Mpkm) [6]	29	35	36	34	31	28	26	25	24	24	23	2.2	-1.5	-1.7	-0.7
Freight transport (toe/Mtkm)	25	38	40	40	38	36	34	33	32	31	30	4.8	-0.3	-1.2	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**153.1**	**150.6**	**140.8**	**128.6**	**121.9**	**120.7**	**116.1**	**99.7**	**79.3**	**72.3**	**68.2**	-0.8	-1.4	-0.5	-2.6
of which ETS sectors (2013 scope) GHG emissions		87.1	79.4	68.7	66.1	67.0	64.7	50.0	31.0	23.9	19.7		-1.8	-0.2	-5.8
of which ESD sectors (2013 scope) GHG emissions		63.6	61.4	59.9	55.8	53.7	51.3	49.7	48.3	48.4	48.5		-1.0	-0.8	-0.3
CO_2 Emissions (energy related)	**125.7**	**124.3**	**114.6**	**102.9**	**99.6**	**99.1**	**96.1**	**80.7**	**61.4**	**54.5**	**50.6**	-0.9	-1.4	-0.4	-3.2
Power generation/District heating	66.8	66.2	63.2	52.9	51.5	53.2	51.9	38.8	21.8	15.1	11.0	-0.6	-2.0	0.1	-7.5
Energy Branch	2.6	2.2	3.1	2.7	2.6	2.5	2.4	2.1	1.6	1.5	1.6	1.6	-1.6	-0.6	-2.2
Industry	28.3	24.7	17.5	17.0	16.2	14.9	13.2	11.3	9.5	9.4	9.1	-4.7	-0.7	-2.0	-1.8
Residential	8.8	8.4	8.3	7.8	7.5	7.3	7.1	6.9	6.5	6.3	6.2	-0.6	-1.0	-0.6	-0.7
Tertiary	6.8	4.9	4.9	4.8	4.7	4.3	4.1	3.8	3.7	3.6	3.6	-3.3	-0.4	-1.4	-0.6
Transport	12.4	17.8	17.6	17.6	17.0	17.0	17.3	17.8	18.3	18.7	19.1	3.6	-0.3	0.2	0.5
CO_2 Emissions (non energy and non land use related)	**5.6**	**5.3**	**4.8**	**5.2**	**5.3**	**5.2**	**5.1**	**5.0**	**4.9**	**4.9**	**4.7**	-1.7	1.1	-0.5	-0.4
Non-CO2 GHG emissions	**21.7**	**21.1**	**21.5**	**20.5**	**17.1**	**16.4**	**14.9**	**14.0**	**13.0**	**12.9**	**13.0**	-0.1	-2.3	-1.3	-0.7
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**77.5**	**76.3**	**71.3**	**65.1**	**61.7**	**61.1**	**58.8**	**50.5**	**40.1**	**36.6**	**34.5**	-0.8	-1.4	-0.5	-2.6
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.60	0.55	0.52	0.46	0.45	0.45	0.43	0.31	0.17	0.12	0.08	-1.4	-1.4	-0.5	-7.9
Final energy demand (t of CO_2/toe)	2.27	2.15	1.94	1.92	1.79	1.73	1.67	1.60	1.53	1.49	1.46	-1.6	-0.8	-0.7	-0.7
Industry	2.79	2.55	2.21	2.16	1.98	1.86	1.68	1.49	1.29	1.25	1.19	-2.3	-1.1	-1.7	-1.7
Residential	1.43	1.33	1.24	1.24	1.14	1.11	1.10	1.06	1.00	0.95	0.91	-1.4	-0.8	-0.4	-1.0
Tertiary	1.63	1.26	1.22	1.18	1.13	1.05	1.01	0.95	0.91	0.89	0.87	-2.9	-0.7	-1.1	-0.7
Transport	2.85	2.92	2.81	2.79	2.63	2.64	2.63	2.62	2.62	2.60	2.59	-0.1	-0.7	0.0	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**4.7**	**6.1**	**9.5**	**11.9**	**13.5**	**14.1**	**15.2**	**16.4**	**18.4**	**19.8**	**20.1**				
RES-H&C share	5.9	9.1	12.6	15.5	17.0	17.8	19.6	21.7	24.7	26.3	27.7				
RES-E share	3.4	3.8	7.5	10.3	9.0	10.9	12.0	13.0	15.7	18.4	17.5				
RES-T share (based on ILUC formula)	1.8	0.3	4.4	5.5	10.2	10.2	10.6	10.8	11.3	12.1	12.3				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	50	58	60	83	83	88	85	84	82	80	85	2.0	3.3	0.2	0.0
Average Price of Electricity in Final demand sectors (€'13/MWh	66	83	142	128	132	132	135	140	139	139	137	7.9	-0.7	0.2	0.1
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**14.7**	**20.3**	**28.4**	**27.5**	**32.2**	**35.4**	**38.1**	**41.1**	**44.3**	**47.2**	**49.7**	6.8	1.3	1.7	1.3
as % of GDP	**13.1**	**14.8**	**18.1**	**16.7**	**17.8**	**18.0**	**17.7**	**17.5**	**17.4**	**17.1**	**16.7**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Denmark: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**5**	**5**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	0.4	0.4	0.5	0.3
GDP (in 000 M€13)	**233**	**248**	**247**	**256**	**289**	**321**	**350**	**380**	**415**	**454**	**499**	0.6	1.6	1.9	1.8
Gross Inland Consumption (ktoe)	**19733**	**19553**	**20040**	**16820**	**16786**	**16299**	**16458**	**16606**	**16402**	**16800**	**17147**	0.2	-1.8	-0.2	0.2
Solids	3985	3713	3809	1860	1686	1092	1062	1209	607	114	81	-0.5	-7.8	-4.5	-12.1
Oil	9101	8063	7568	6738	6259	6103	5951	5823	5779	5842	5889	-1.8	-1.9	-0.5	-0.1
Natural gas	4465	4413	4435	3680	2654	2513	2679	2494	2874	3262	3229	-0.1	-5.0	0.1	0.9
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	57	118	-98	747	572	662	344	447	389	477	461	0.0	0.0	-5.0	1.5
Renewable energy forms	2124	3246	4326	3795	5615	5930	6423	6632	6754	7105	7487	7.4	2.6	1.4	0.8
Energy Branch Consumption	**1121**	**1205**	**1132**	**911**	**887**	**745**	**641**	**526**	**471**	**499**	**500**	0.1	-2.4	-3.2	-1.2
Non-Energy Uses	**301**	**289**	**263**	**283**	**313**	**328**	**343**	**357**	**375**	**386**	**415**	-1.3	1.8	0.9	0.9
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**27958**	**30781**	**22915**	**15259**	**15890**	**13510**	**11608**	**8950**	**8468**	**8566**	**8613**	-2.0	-3.6	-3.1	-1.5
Solids	0	0	0	0	0	0	0	0	0	0	0	-100.0	0.0	0.0	0.0
Oil	18465	18464	12040	8158	7715	6446	4477	1984	1537	1531	1524	-4.2	-4.4	-5.3	-5.2
Natural gas	7428	9397	7356	4188	3860	2461	1971	1519	1384	1230	951	-0.1	-6.2	-6.5	-3.6
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	2065	2920	3520	2913	4315	4602	5160	5446	5547	5805	6138	5.5	2.1	1.8	0.9
Hydro	3	2	2	2	2	2	2	2	2	2	2	-3.6	0.2	1.1	0.0
Biomass & Waste	1688	2335	2825	1819	2811	2862	2831	2755	2834	3045	3131	5.3	0.0	0.1	0.5
Wind	365	569	672	1007	1317	1493	1689	1758	1833	1878	2137	6.3	7.0	2.5	1.2
Solar and others	8	10	16	80	100	128	179	212	240	262	270	7.2	19.9	6.1	2.1
Geothermal	1	4	5	6	85	118	458	719	639	618	598	13.8	32.6	18.3	1.3
Net Imports (ktoe)	**-7370**	**-10130**	**-3257**	**2304**	**1722**	**3675**	**5781**	**8647**	**9005**	**9397**	**9802**	-7.8	0.0	12.9	2.7
Solids	3783	3505	2642	1860	1686	1092	1062	1209	607	114	81	-3.5	-4.4	-4.5	-12.1
Oil	-8386	-9068	-3586	-676	-638	526	2383	4791	5257	5400	5546	-8.1	-15.9	0.0	4.3
Crude oil and Feedstocks	-8783	-10933	-5033	-669	-727	262	1971	4254	4563	4524	4454	-5.4	-17.6	0.0	4.2
Oil products	397	1865	1447	-7	89	264	412	537	694	876	1092	13.8	-24.3	16.6	5.0
Natural gas	-2882	-5010	-3022	-508	-1198	67	731	1014	1546	2105	2366	0.5	-8.8	0.0	6.1
Electricity	57	118	-98	747	572	662	344	447	389	477	461	0.0	0.0	-5.0	1.5
Import Dependency (%)	-35.1	-49.9	-15.7	13.1	9.8	21.4	33.2	49.1	51.5	52.3	53.2				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**36053**	**36246**	**38862**	**26963**	**30716**	**31157**	**35263**	**36433**	**38832**	**40950**	**44089**	0.8	-2.3	1.4	1.1
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	16673	15463	17006	6440	5417	3263	3144	3838	1688	196	127	0.2	-10.8	-5.3	-14.8
Oil (including refinery gas)	4439	1375	774	214	0	42	41	39	69	171	114	-16.0	-100.0	0.0	5.2
Gas (including derived gases)	8774	8780	7906	4589	752	1407	3346	3592	6490	8507	8406	-1.0	-21.0	16.1	4.7
Biomass-waste	1895	3989	5340	3223	8439	8295	8295	7734	8451	9416	9768	10.9	4.7	-0.2	0.8
Hydro (pumping excluded)	30	23	21	21	21	21	24	24	24	24	24	-3.5	0.2	1.1	0.0
Wind	4241	6614	7809	11709	15318	17360	19645	20438	21313	21837	24847	6.3	7.0	2.5	1.2
Solar	1	2	6	768	768	768	768	768	797	799	803	17.5	63.0	0.0	0.2
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**11787**	**13021**	**13419**	**15207**	**13634**	**13146**	**12857**	**12553**	**13304**	**14536**	**15085**	1.3	0.2	-0.6	0.8
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	2401	3141	3818	5910	6456	6682	7300	7300	7350	7402	8090	4.7	5.4	1.2	0.5
Hydro (pumping excluded)	10	11	9	9	9	9	10	10	10	10	10	-1.0	0.0	1.1	0.0
Wind	2390	3127	3802	5064	5609	5835	6452	6452	6502	6552	7237	4.8	4.0	1.4	0.6
Solar	1	3	7	837	838	838	838	838	838	840	844	21.5	61.4	0.0	0.0
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	9386	9880	9601	9297	7179	6465	5558	5253	5954	7134	6994	0.2	-2.9	-2.5	1.2
of which cogeneration units	5578	5685	5806	7114	5787	5475	4597	4605	4539	4741	4732	0.4	0.0	-2.3	0.1
of which CCS units	0	0	0	0	0	0	0	0	0	400	400	0.0	0.0	0.0	0.0
Solids fired	5214	5061	4466	4225	2366	2090	1472	1222	405	34	34	-1.5	-6.2	-4.6	-17.1
Gas fired	1862	2278	2274	2274	1135	1039	999	1048	2672	4270	4298	2.0	-6.7	-1.3	7.6
Oil fired	860	860	1017	1017	492	223	217	217	215	214	58	1.7	-7.0	-7.9	-6.4
Biomass-waste fired	1449	1681	1844	1781	3186	3113	2870	2767	2663	2616	2604	2.4	5.6	-1.0	-0.5
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	33.4	30.2	31.4	19.6	24.7	26.2	30.4	32.2	32.6	31.2	32.4				
Efficiency of gross thermal power generation (%)	34.9	35.7	35.3	32.4	33.3	32.6	33.7	33.6	38.4	40.4	40.3				
% of gross electricity from CHP	52.6	52.1	49.2	53.6	46.5	40.5	40.5	41.1	43.0	44.4	41.8				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	7.1				
% of carbon free (RES, nuclear) gross electricity generation	17.1	29.3	33.9	58.3	79.9	84.9	81.5	79.5	78.8	78.3	80.4				
Fuel Inputs to Thermal Power Generation (GWh_e)	**7834**	**7127**	**7624**	**3838**	**3770**	**3429**	**3789**	**3887**	**3743**	**3896**	**3932**	-0.3	-6.8	0.0	0.2
Solids	3669	3444	3770	1696	1535	960	960	1136	549	64	41	0.3	-8.6	-4.6	-14.6
Oil (including refinery gas)	1354	346	221	65	0	14	14	13	16	52	32	-16.6	-77.7	238.9	4.3
Gas (including derived gases)	2112	1996	1812	1197	216	368	725	754	1097	1411	1415	-1.5	-19.2	12.9	3.4
Biomass & Waste	699	1341	1821	880	2019	2087	2091	1984	2081	2369	2444	10.0	1.0	0.3	0.8
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**9001**	**8288**	**8139**	**8416**	**8122**	**7762**	**7767**	**7782**	**7558**	**7508**	**7462**	-1.0	0.0	-0.4	-0.2
Refineries	8435	7700	7175	7493	6988	6706	6445	6236	6098	6052	5970	-1.6	-0.3	-0.8	-0.4
Biofuels and hydrogen production	0	0	27	277	434	383	331	333	346	371	393	0.0	32.1	-2.7	0.9
District heating	549	575	923	644	689	658	972	1192	1091	1061	1075	5.3	-2.9	3.5	0.5
Derived gases, cokeries etc.	17	13	13	3	10	16	19	21	22	24	24	-2.9	-2.2	6.4	1.0

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Denmark: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**75**	**76**	**78**	**83**	**90**	**94**	**99**	**102**	**106**	**109**	**113**	0.4	1.3	1.0	0.6
Public road transport	7	7	7	7	8	8	8	8	8	8	8	-0.7	0.9	0.6	0.2
Private cars and motorcycles	51	51	52	54	58	60	62	63	64	65	66	0.1	1.1	0.7	0.3
Rail	6	6	7	7	8	9	9	10	10	11	11	1.8	1.6	1.9	0.9
Aviation [3]	8	9	10	12	13	14	16	18	19	21	23	2.7	2.5	2.2	1.7
Inland navigation	3	3	3	3	3	4	4	4	4	4	4	-0.7	1.0	0.9	0.7
Freight transport activity (Gtkm)	**21**	**22**	**23**	**25**	**29**	**31**	**33**	**35**	**36**	**38**	**40**	0.6	2.3	1.3	1.0
Heavy goods and light commercial vehicles	18	18	18	20	23	25	27	28	30	31	32	0.2	2.5	1.3	1.0
Rail	2	2	2	2	3	3	3	3	4	4	4	1.0	1.6	1.6	1.3
Inland navigation	2	2	2	2	3	3	3	3	3	3	4	3.6	1.0	0.9	0.9
Energy demand in transport (ktoe) [4]	**4816**	**5324**	**5180**	**5009**	**4966**	**4848**	**4784**	**4777**	**4833**	**4920**	**5004**	0.7	-0.4	-0.4	0.2
Public road transport	203	202	199	204	213	214	213	210	208	206	206	-0.2	0.7	0.0	-0.2
Private cars and motorcycles	2627	2866	2828	2599	2400	2227	2149	2113	2094	2083	2059	0.7	-1.6	-1.1	-0.2
Heavy goods and light commercial vehicles	864	1003	1011	971	1061	1084	1090	1104	1136	1166	1198	1.6	0.5	0.3	0.5
Rail	103	107	113	118	125	130	134	136	136	134	132	0.9	1.0	0.7	-0.1
Aviation	856	955	874	960	997	1017	1018	1029	1069	1137	1213	0.2	1.3	0.2	0.9
Inland navigation	163	192	156	158	170	177	181	186	190	193	196	-0.4	0.9	0.6	0.4
By transport activity															
Passenger transport	3874	4197	4049	3915	3774	3629	3557	3534	3556	3613	3666	0.4	-0.7	-0.6	0.2
Freight transport	942	1128	1132	1094	1192	1219	1227	1243	1277	1307	1338	1.9	0.5	0.3	0.4
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.3	0.7	1.0	1.3	1.7	2.1				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	0.5	5.6	9.0	8.3	7.4	7.5	7.6	7.8	7.9				
ENERGY EFFICIENCY															
Primary energy consumption	**19432**	**19264**	**19777**	**16536**	**16473**	**15971**	**16115**	**16249**	**16027**	**16414**	**16732**	0.2	-1.8	-0.2	0.2
Final Energy Demand	**14717**	**15497**	**15606**	**14800**	**14735**	**14603**	**14405**	**14347**	**14522**	**14844**	**15170**	0.6	-0.6	-0.2	0.3
by sector															
Industry	2934	2864	2417	2568	2716	2654	2585	2476	2528	2605	2741	-1.9	1.2	-0.5	0.3
Energy intensive industries	1156	1107	849	908	937	863	788	706	703	711	716	-3.0	1.0	-1.7	-0.5
Other industrial sectors	1778	1757	1569	1659	1779	1792	1797	1770	1825	1894	2025	-1.2	1.3	0.1	0.6
Residential	4162	4453	4916	4345	4170	4150	4100	4126	4157	4253	4294	1.7	-1.6	-0.2	0.2
Tertiary	2805	2856	3094	2879	2884	2950	2935	2967	3005	3066	3132	1.0	-0.7	0.2	0.3
Transport[5]	4816	5324	5179	5009	4966	4848	4784	4777	4833	4920	5004	0.7	-0.4	-0.4	0.2
by fuel															
Solids	290	253	166	163	151	132	102	74	59	50	40	-5.4	-1.0	-3.8	-4.6
Oil	7058	7293	6759	6083	5663	5504	5356	5231	5190	5208	5246	-0.4	-1.8	-0.6	-0.1
Gas	1667	1708	1771	1744	1822	1692	1536	1471	1543	1639	1668	0.6	0.3	-1.7	0.4
Electricity	2791	2877	2783	2733	2820	2967	3072	3248	3419	3629	3826	0.0	0.1	0.9	1.1
Heat (from CHP and District Heating)	2255	2424	2840	2556	2511	2506	2575	2558	2530	2489	2547	2.3	-1.2	0.3	-0.1
Renewable energy forms	656	943	1287	1519	1759	1787	1743	1742	1748	1785	1788	7.0	3.2	-0.1	0.1
Other	0	0	0	3	10	16	20	24	34	45	56	-100.0	0.0	6.9	5.2
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	85	79	81	66	58	51	47	44	40	37	34	-0.4	-3.3	-2.1	-1.6
Industry (Energy on Value added, index 2000=100)	100	101	91	94	90	81	73	65	62	59	57	-0.9	-0.1	-2.1	-1.2
Residential (Energy on Private Income, index 2000=100)	100	96	102	84	71	63	57	52	48	44	40	0.2	-3.6	-2.2	-1.8
Tertiary (Energy on Value added, index 2000=100)	100	96	101	91	80	73	66	61	57	52	49	0.1	-2.4	-1.8	-1.5
Passenger transport (toe/Mpkm) [6]	44	46	43	39	34	31	28	27	26	25	24	-0.4	-2.2	-1.8	-0.7
Freight transport (toe/Mtkm)	44	51	50	44	42	40	38	36	35	34	34	1.3	-1.7	-1.0	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**71.7**	**66.3**	**63.9**	**50.5**	**45.8**	**42.1**	**41.2**	**40.5**	**38.8**	**36.9**	**36.3**	-1.1	-3.3	-1.1	-0.6
of which ETS sectors (2013 scope) GHG emissions		29.3	27.9	18.0	14.7	12.1	12.4	12.5	10.8	8.9	8.5		-6.2	-1.7	-1.9
of which ESD sectors (2013 scope) GHG emissions		37.0	36.0	32.5	31.1	30.0	28.8	28.0	27.9	28.0	27.9		-1.4	-0.8	-0.2
CO_2 Emissions (energy related)	**53.3**	**50.0**	**48.8**	**35.8**	**31.2**	**27.9**	**27.6**	**27.3**	**25.5**	**23.6**	**23.2**	-0.9	-4.4	-1.2	-0.9
Power generation/District heating	24.5	20.3	21.2	10.6	7.2	5.1	6.0	6.8	5.1	3.0	2.5	-1.4	-10.3	-1.7	-4.3
Energy Branch	2.2	2.3	2.1	1.9	1.7	1.4	1.2	0.8	0.7	0.7	0.7	-0.5	-2.0	-4.0	-2.5
Industry	5.4	5.1	3.9	4.1	4.1	3.6	3.1	2.6	2.5	2.6	2.6	-3.2	0.5	-2.8	-0.9
Residential	3.9	3.6	3.2	2.6	2.2	2.1	1.9	1.9	1.9	1.9	1.9	-2.0	-3.8	-1.5	0.1
Tertiary	3.0	2.7	2.9	2.5	2.4	2.3	2.2	2.2	2.1	2.1	2.1	-0.3	-1.8	-0.7	-0.4
Transport	14.3	15.9	15.5	14.2	13.5	13.3	13.2	13.1	13.2	13.3	13.4	0.8	-1.3	-0.3	0.1
CO_2 Emissions (non energy and non land use related)	**2.6**	**2.3**	**1.4**	**1.4**	**1.5**	**1.5**	**1.3**	**1.2**	**1.2**	**1.2**	**1.1**	-6.1	1.0	-1.9	-0.7
Non-CO2 GHG emissions	**15.8**	**14.0**	**13.7**	**13.3**	**13.1**	**12.7**	**12.3**	**12.0**	**12.0**	**12.0**	**12.0**	-1.4	-0.4	-0.6	-0.1
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**99.2**	**91.8**	**88.4**	**69.8**	**63.4**	**58.3**	**57.0**	**56.1**	**53.6**	**51.0**	**50.3**	-1.1	-3.3	-1.1	-0.6
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.36	0.28	0.26	0.17	0.11	0.08	0.09	0.10	0.07	0.04	0.03	-3.0	-8.3	-2.3	-4.8
Final energy demand (t of CO_2/toe)	1.81	1.76	1.63	1.58	1.51	1.46	1.42	1.37	1.35	1.34	1.32	-1.0	-0.8	-0.6	-0.3
Industry	1.85	1.79	1.63	1.58	1.52	1.37	1.21	1.04	0.99	1.00	0.95	-1.3	-0.6	-2.3	-1.2
Residential	0.95	0.80	0.66	0.59	0.53	0.51	0.46	0.46	0.46	0.45	0.45	-3.6	-2.2	-1.3	-0.1
Tertiary	1.05	0.95	0.93	0.88	0.83	0.80	0.76	0.73	0.70	0.68	0.66	-1.2	-1.1	-0.9	-0.7
Transport	2.97	2.99	2.99	2.83	2.72	2.74	2.75	2.74	2.72	2.70	2.68	0.0	-0.9	0.1	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**10.5**	**15.6**	**22.0**	**23.9**	**33.8**	**37.4**	**39.0**	**38.9**	**40.1**	**41.9**	**43.2**				
RES-H&C share	15.3	22.2	30.8	28.2	36.6	42.3	43.9	44.3	45.7	49.3	49.2				
RES-E share	15.0	25.0	33.1	42.0	63.5	66.2	71.4	68.0	68.9	67.6	70.5				
RES-T share (based on ILUC formula)	0.3	0.5	1.3	8.0	13.0	13.8	15.4	16.8	18.4	20.8	23.5				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€13/MWh)	75	87	89	108	108	112	105	92	86	89	77	1.8	1.9	-0.2	-1.6
Average Price of Electricity in Final demand sectors (€13/MWh	169	178	195	186	208	210	213	214	214	214	214	1.4	0.6	0.3	0.0
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**18.3**	**21.9**	**23.2**	**20.9**	**25.5**	**27.9**	**29.7**	**31.2**	**32.9**	**34.6**	**36.3**	2.4	1.0	1.5	1.0
as % of GDP	**7.9**	**8.8**	**9.4**	**8.2**	**8.8**	**8.7**	**8.5**	**8.2**	**7.9**	**7.6**	**7.3**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Estonia: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	-0.5	-0.4	-0.6	-0.3
GDP (in 000 M€13)	**11**	**15**	**15**	**18**	**20**	**22**	**24**	**26**	**28**	**29**	**31**	3.6	3.0	1.6	1.2
Gross Inland Consumption (ktoe)	**4979**	**5622**	**6155**	**6344**	**6420**	**6437**	**5994**	**5455**	**5379**	**5205**	**4923**	2.1	0.4	-0.7	-1.0
Solids	2968	3190	3917	3589	3669	3699	3115	2418	2387	1959	1609	2.8	-0.7	-1.6	-3.2
Oil	916	1182	1109	1065	977	967	963	968	977	986	990	1.9	-1.3	-0.1	0.1
Natural gas	662	800	563	796	858	803	744	816	761	724	600	-1.6	4.3	-1.4	-1.1
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	-80	-138	-280	-100	-114	-96	78	45	81	64	61	13.4	-8.6	0.0	-1.3
Renewable energy forms	513	589	847	995	1030	1065	1094	1208	1172	1472	1663	5.1	2.0	0.6	2.1
Energy Branch Consumption	**163**	**193**	**199**	**190**	**186**	**184**	**158**	**131**	**128**	**117**	**97**	2.0	-0.7	-1.6	-2.4
Non-Energy Uses	**180**	**229**	**90**	**280**	**295**	**305**	**312**	**316**	**319**	**320**	**318**	-6.7	12.6	0.6	0.1
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**3435**	**4250**	**5467**	**5368**	**5387**	**5467**	**4908**	**4318**	**4232**	**4108**	**3930**	4.8	-0.1	-0.9	-1.1
Solids	2669	3176	3943	3594	3670	3704	3121	2423	2395	1963	1613	4.0	-0.7	-1.6	-3.2
Oil	249	375	532	681	650	652	635	618	602	586	567	7.9	2.0	-0.2	-0.6
Natural gas	5	7	5	0	0	0	0	0	0	0	0	-1.7	-100.0	0.0	0.0
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	512	692	988	1093	1067	1111	1152	1278	1235	1558	1750	6.8	0.8	0.8	2.1
Hydro	0	2	2	3	3	3	3	7	8	8	7	19.1	2.1	0.0	4.7
Biomass & Waste	512	686	962	1040	1005	1046	1056	1099	1038	1325	1348	6.5	0.4	0.5	1.2
Wind	0	5	24	49	57	59	87	163	177	211	380	0.0	9.2	4.2	7.6
Solar and others	0	0	0	0	2	3	5	8	11	13	14	0.0	0.0	12.4	5.2
Geothermal	0	0	0	0	0	0	1	1	1	2	2	0.0	0.0	19.3	5.5
Net Imports (ktoe)	**1628**	**1489**	**862**	**1219**	**1275**	**1213**	**1329**	**1380**	**1397**	**1350**	**1248**	-6.2	4.0	0.4	-0.3
Solids	270	23	-22	-5	0	-5	-6	-5	-7	-5	-3	0.0	-33.8	32.8	-2.7
Oil	786	917	760	625	562	546	556	570	593	612	633	-0.3	-3.0	-0.1	0.7
Crude oil and Feedstocks	-125	-225	-394	-560	-525	-517	-495	-472	-451	-430	-408	12.2	2.9	-0.6	-1.0
Oil products	911	1142	1153	1185	1087	1063	1051	1042	1044	1043	1041	2.4	-0.6	-0.3	0.0
Natural gas	657	792	558	796	864	815	759	840	794	765	644	-1.6	4.5	-1.3	-0.8
Electricity	-80	-138	-280	-100	-114	-96	78	45	81	64	61	13.4	-8.6	0.0	-1.3
Import Dependency (%)	32.0	25.9	13.5	18.5	19.1	18.2	21.3	24.2	24.8	24.7	24.1				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**8513**	**10205**	**12964**	**10765**	**11276**	**11278**	**9441**	**9761**	**9640**	**10207**	**10614**	4.3	-1.4	-1.8	0.6
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	7682	9302	11167	8608	9056	9031	6898	4905	4896	3231	1580	3.8	-2.1	-2.7	-7.1
Oil (including refinery gas)	56	32	41	0	0	0	0	0	0	0	0	-3.1	-100.0	0.0	0.0
Gas (including derived gases)	757	760	712	689	646	631	577	1709	1573	1966	1918	-0.6	-1.0	-1.1	6.2
Biomass-waste	13	35	740	859	873	893	920	1173	1015	2460	2620	49.8	1.7	0.5	5.4
Hydro (pumping excluded)	5	22	27	33	33	33	33	82	91	95	82	18.4	2.0	0.0	4.7
Wind	0	54	277	575	668	689	1011	1891	2063	2454	4413	0.0	9.2	4.2	7.6
Solar	0	0	0	1	1	1	1	1	1	1	1	0.0	0.0	0.0	0.2
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**2912**	**2684**	**2827**	**2689**	**2273**	**2210**	**2288**	**2305**	**2363**	**2512**	**3528**	-0.3	-2.2	0.1	2.2
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	2	36	114	312	343	354	454	738	795	931	1734	49.8	11.6	2.8	6.9
Hydro (pumping excluded)	2	5	6	8	8	8	8	20	22	23	20	11.6	2.9	0.0	4.7
Wind	0	31	108	303	334	345	445	717	772	907	1713	0.0	12.0	2.9	7.0
Solar	0	0	0	1	1	1	1	1	1	1	1	0.0	0.0	0.0	0.0
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	2910	2648	2713	2377	1930	1856	1833	1567	1568	1582	1794	-0.7	-3.3	-0.5	-0.1
of which cogeneration units	452	1604	447	439	272	257	355	283	298	382	351	-0.1	-4.9	2.7	0.0
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	2684	2411	2430	1871	1408	1408	1408	631	631	468	468	-1.0	-5.3	0.0	-5.4
Gas fired	218	224	224	362	373	299	272	777	777	743	959	0.3	5.2	-3.1	6.5
Oil fired	8	8	8	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Biomass-waste fired	0	5	51	144	148	148	154	158	159	371	367	0.0	11.2	0.4	4.4
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	29.8	38.8	47.4	40.9	51.1	52.7	42.9	45.1	43.5	43.8	33.0				
Efficiency of gross thermal power generation (%)	30.0	33.5	34.9	34.3	34.3	33.8	33.8	41.0	41.1	45.5	45.3				
% of gross electricity from CHP	11.0	10.2	10.3	12.7	11.4	9.6	12.4	11.7	13.5	17.5	16.4				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	0.2	1.1	8.1	13.6	14.0	14.3	20.8	32.2	32.9	49.1	67.0				
Fuel Inputs to Thermal Power Generation (GWh_e)	**2442**	**2600**	**3115**	**2543**	**2653**	**2684**	**2135**	**1632**	**1565**	**1448**	**1161**	2.5	-1.6	-2.2	-3.0
Solids	2199	2353	2715	2171	2281	2302	1754	1073	1064	654	349	2.1	-1.7	-2.6	-7.7
Oil (including refinery gas)	16	10	12	0	0	0	0	0	0	0	0	-3.0	-100.0	0.0	0.0
Gas (including derived gases)	226	227	209	168	163	169	163	311	299	360	353	-0.8	-2.4	0.0	3.9
Biomass & Waste	2	10	179	205	208	214	217	248	202	434	459	55.3	1.5	0.4	3.8
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**926**	**1271**	**1523**	**1753**	**1796**	**1791**	**1753**	**1740**	**1710**	**1677**	**1573**	5.1	1.7	-0.2	-0.5
Refineries	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Biofuels and hydrogen production	0	0	0	10	65	57	48	47	47	48	48	0.0	0.0	-3.0	0.0
District heating	454	489	446	418	439	430	430	427	412	392	330	-0.2	-0.2	-0.2	-1.3
Derived gases, cokeries etc.	473	782	1077	1325	1292	1303	1275	1266	1251	1236	1194	8.6	1.8	-0.1	-0.3

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)											Estonia: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**10**	**14**	**14**	**15**	**16**	**17**	**17**	**18**	**19**	**19**	**20**	2.8	1.6	0.8	0.7
Public road transport	3	3	2	2	2	2	3	3	3	3	3	-2.4	1.5	0.6	0.3
Private cars and motorcycles	7	10	10	11	12	12	13	13	13	14	14	4.3	1.4	0.5	0.5
Rail	0	0	0	0	0	0	1	1	1	1	1	-1.3	3.0	2.4	1.2
Aviation [3]	0	1	1	1	1	1	1	1	2	2	2	12.3	4.1	3.6	2.6
Inland navigation	0	0	0	0	0	0	0	0	1	1	1	-0.3	1.3	1.0	0.8
Freight transport activity (Gtkm)	**10**	**13**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	-1.1	2.2	2.0	1.2
Heavy goods and light commercial vehicles	2	3	2	3	3	3	3	4	4	4	4	1.9	3.1	1.3	0.9
Rail	8	11	7	7	8	9	10	11	12	12	13	-2.0	1.8	2.2	1.3
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	-6.9	1.0	1.2	0.9
Energy demand in transport (ktoe) [4]	**580**	**766**	**781**	**811**	**796**	**770**	**763**	**768**	**773**	**777**	**777**	3.0	0.2	-0.4	0.1
Public road transport	62	62	67	74	76	76	75	74	74	74	73	0.7	1.3	-0.1	-0.1
Private cars and motorcycles	349	475	499	524	484	444	422	414	407	401	395	3.6	-0.3	-1.4	-0.3
Heavy goods and light commercial vehicles	95	135	116	132	140	144	149	151	154	157	160	2.0	1.9	0.6	0.3
Rail	46	44	54	33	39	41	44	47	50	50	49	1.7	-3.2	1.3	0.5
Aviation	21	42	38	42	50	58	66	74	81	87	92	6.4	2.8	2.7	1.7
Inland navigation	7	8	8	6	7	7	7	8	8	8	8	1.2	-1.7	0.7	0.5
By transport activity															
Passenger transport	441	589	614	647	619	587	572	572	572	573	571	3.4	0.1	-0.8	0.0
Freight transport	138	178	167	164	177	183	191	196	201	204	205	1.9	0.6	0.7	0.4
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.2	0.3	0.6	1.0	1.2	1.5	1.7				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	0.0	1.3	8.2	7.6	6.5	6.5	6.5	6.6	6.6				
ENERGY EFFICIENCY															
Primary energy consumption	**4799**	**5394**	**6065**	**6064**	**6125**	**6132**	**5682**	**5139**	**5060**	**4884**	**4605**	2.4	0.1	-0.7	-1.0
Final Energy Demand	**2434**	**2877**	**2907**	**3036**	**3088**	**3072**	**3051**	**3022**	**3027**	**3039**	**3048**	1.8	0.6	-0.1	0.0
by sector															
Industry	571	718	575	713	749	747	724	676	670	662	656	0.1	2.7	-0.3	-0.5
Energy intensive industries	245	273	231	294	306	304	292	270	262	251	246	-0.6	2.8	-0.5	-0.9
Other industrial sectors	327	446	343	419	443	443	432	406	409	411	411	0.5	2.6	-0.3	-0.3
Residential	929	890	1028	963	983	992	996	1016	1014	1019	1023	1.0	-0.4	0.1	0.1
Tertiary	348	495	520	544	555	558	562	555	561	573	583	4.1	0.7	0.1	0.2
Transport[5]	586	774	785	816	801	776	770	775	781	786	786	3.0	0.2	-0.4	0.1
by fuel															
Solids	118	118	83	64	57	51	42	34	26	20	16	-3.4	-3.8	-2.9	-4.6
Oil	772	982	941	966	862	834	817	810	804	798	789	2.0	-0.9	-0.5	-0.2
Gas	177	263	207	286	330	322	288	250	248	250	243	1.6	4.8	-1.3	-0.8
Electricity	431	519	594	614	651	675	715	736	766	805	840	3.3	0.9	1.0	0.8
Heat (from CHP and District Heating)	511	547	531	484	518	518	528	533	532	533	533	0.4	-0.3	0.2	0.0
Renewable energy forms	425	447	550	622	671	672	659	656	646	627	619	2.6	2.0	-0.2	-0.3
Other	0	0	0	0	0	0	1	3	5	6	7	-100.0	0.0	18.8	8.6
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	465	372	405	346	314	290	249	211	195	178	161	-1.4	-2.5	-2.3	-2.2
Industry (Energy on Value added, index 2000=100)	100	84	67	69	66	61	56	50	47	44	42	-4.0	-0.1	-1.6	-1.4
Residential (Energy on Private Income, index 2000=100)	100	63	74	58	52	47	43	40	37	34	32	-2.9	-3.5	-1.8	-1.4
Tertiary (Energy on Value added, index 2000=100)	100	104	108	93	84	78	72	65	61	59	57	0.8	-2.5	-1.6	-1.2
Passenger transport (toe/Mpkm) [6]	42	41	44	41	37	34	31	30	28	27	26	0.3	-1.6	-1.7	-0.8
Freight transport (toe/Mtkm)	14	13	19	17	16	15	14	14	13	13	12	3.1	-1.6	-1.2	-0.8
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**17.0**	**18.2**	**18.8**	**16.5**	**16.6**	**16.5**	**13.7**	**11.0**	**10.8**	**9.0**	**7.4**	1.0	-1.2	-1.9	-3.0
of which ETS sectors (2013 scope) GHG emissions		13.0	13.8	11.3	11.9	11.9	9.4	6.8	6.7	4.9	3.4		-1.4	-2.3	-5.0
of which ESD sectors (2013 scope) GHG emissions		5.1	5.0	5.1	4.7	4.6	4.3	4.1	4.1	4.1	4.0		-0.5	-1.0	-0.3
CO_2 Emissions (energy related)	**14.0**	**15.5**	**16.4**	**14.1**	**14.4**	**14.3**	**11.8**	**9.1**	**9.0**	**7.2**	**5.6**	1.6	-1.3	-2.0	-3.6
Power generation/District heating	10.7	11.3	12.7	10.1	10.6	10.6	8.3	5.8	5.7	4.0	2.5	1.7	-1.7	-2.4	-5.8
Energy Branch	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-0.5	3.0	-1.0	-1.7
Industry	0.9	1.0	0.8	0.8	0.8	0.7	0.6	0.5	0.4	0.4	0.4	-1.8	0.0	-2.3	-2.6
Residential	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-4.2	0.5	-0.6	0.3
Tertiary	0.3	0.5	0.4	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	2.1	1.9	-1.1	-0.6
Transport	1.7	2.3	2.3	2.4	2.2	2.1	2.1	2.1	2.1	2.1	2.1	3.1	-0.6	-0.3	-0.1
CO_2 Emissions (non energy and non land use related)	**0.7**	**0.7**	**0.4**	**0.5**	**0.5**	**0.4**	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	-6.0	3.0	-2.6	-0.7
Non-CO2 GHG emissions	**2.3**	**1.9**	**2.0**	**1.9**	**1.8**	**1.8**	**1.6**	**1.5**	**1.5**	**1.5**	**1.5**	-1.4	-1.0	-1.3	-0.3
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**42.2**	**45.2**	**46.7**	**41.0**	**41.5**	**41.0**	**34.2**	**27.3**	**26.8**	**22.4**	**18.5**	1.0	-1.2	-1.9	-3.0
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.67	0.64	0.63	0.59	0.59	0.59	0.51	0.35	0.35	0.24	0.15	-0.6	-0.7	-1.3	-6.1
Final energy demand (t of CO_2/toe)	1.33	1.42	1.27	1.28	1.18	1.14	1.10	1.06	1.04	1.02	1.00	-0.5	-0.7	-0.7	-0.5
Industry	1.58	1.43	1.31	1.07	1.00	0.96	0.82	0.69	0.61	0.58	0.53	-1.8	-2.6	-2.0	-2.1
Residential	0.32	0.26	0.19	0.20	0.21	0.20	0.19	0.19	0.20	0.20	0.20	-5.2	1.0	-0.7	0.1
Tertiary	0.91	1.05	0.75	0.92	0.85	0.81	0.75	0.73	0.70	0.67	0.64	-2.0	1.2	-1.2	-0.8
Transport	2.96	2.98	2.99	2.96	2.75	2.76	2.78	2.76	2.74	2.72	2.69	0.1	-0.8	0.1	-0.2
RES in Gross Final Energy Consumption [7] **(in%)**	**17.9**	**17.4**	**24.6**	**24.2**	**25.7**	**26.2**	**27.5**	**31.1**	**31.2**	**39.7**	**45.8**				
RES-H&C share	31.8	32.2	43.2	39.9	38.3	39.4	41.3	42.8	43.6	51.9	53.4				
RES-E share	0.2	1.1	10.4	14.4	15.0	15.1	18.2	29.8	29.2	44.9	62.1				
RES-T share (based on ILUC formula)	0.0	0.0	0.2	0.2	10.0	10.0	9.4	10.7	11.4	14.3	18.0				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	42	43	47	65	66	71	87	91	94	104	104	1.0	3.5	2.8	0.9
Average Price of Electricity in Final demand sectors (€'13/MWh	59	63	80	109	124	136	141	151	150	144	141	3.2	4.5	1.3	0.0
Total energy-rel. and other mitigation costs [8] **(in 000 M€13)**	**1.3**	**2.0**	**2.9**	**3.7**	**4.4**	**4.8**	**5.2**	**5.7**	**6.0**	**6.3**	**6.6**	8.6	4.1	1.7	1.2
as % of GDP	**12.0**	**13.5**	**19.3**	**20.0**	**21.3**	**21.7**	**21.5**	**22.0**	**21.7**	**21.5**	**21.5**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Finland: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**5**	**5**	**5**	**5**	**6**	**6**	**6**	**6**	**6**	**6**	**6**	0.3	0.5	0.5	0.2
GDP (in 000 M€13)	**157**	**179**	**187**	**188**	**199**	**210**	**226**	**246**	**270**	**294**	**318**	1.7	0.6	1.3	1.7
Gross Inland Consumption (ktoe)	**32531**	**34529**	**37124**	**33972**	**35381**	**35349**	**33155**	**32173**	**31291**	**31914**	**32265**	1.3	-0.5	-0.6	-0.1
Solids	5131	4936	6874	4106	4602	4436	3526	2543	1328	998	912	3.0	-3.9	-2.6	-6.5
Oil	9342	10335	10121	9288	8396	7915	7387	7023	6813	6761	6750	0.8	-1.9	-1.3	-0.5
Natural gas	3422	3598	3838	2821	2833	3078	3053	2977	2486	2189	2356	1.2	-3.0	0.8	-1.3
Nuclear	5799	6003	5881	5763	8733	8733	6664	6664	7786	8908	8908	0.1	4.0	-2.7	1.5
Electricity	1022	1463	903	1226	-145	-602	-123	239	376	439	457	-1.2	0.0	-1.7	0.0
Renewable energy forms	7816	8195	9508	10767	10963	11789	12648	12728	12502	12619	12881	2.0	1.4	1.4	0.1
Energy Branch Consumption	**1168**	**1209**	**1529**	**1577**	**1552**	**1418**	**1346**	**1286**	**1296**	**1266**	**1247**	2.7	0.2	-1.4	-0.4
Non-Energy Uses	**1040**	**1155**	**1229**	**1157**	**1191**	**1225**	**1247**	**1277**	**1269**	**1294**	**1339**	1.7	-0.3	0.5	0.4
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**14892**	**16669**	**17662**	**18108**	**21398**	**22350**	**21400**	**21484**	**22156**	**23245**	**23520**	1.7	1.9	0.0	0.5
Solids	1088	2136	1803	1007	1125	1287	1297	1204	763	639	608	5.2	-4.6	1.4	-3.7
Oil	189	257	389	433	394	366	337	314	294	280	268	7.5	0.1	-1.5	-1.1
Natural gas	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Nuclear	5799	6003	5881	5763	8733	8733	6664	6664	7786	8908	8908	0.1	4.0	-2.7	1.5
Renewable energy sources	7816	8273	9589	10905	11145	11964	13102	13303	13312	13417	13735	2.1	1.5	1.6	0.2
Hydro	1261	1185	1111	1350	1215	1267	1301	1343	1351	1351	1410	-1.3	0.9	0.7	0.4
Biomass & Waste	6549	7072	8451	9354	9454	10124	11143	11236	11208	11282	11493	2.6	1.1	1.7	0.2
Wind	7	15	25	198	464	549	619	638	654	680	723	14.2	33.8	2.9	0.8
Solar and others	1	1	1	2	13	22	36	76	88	92	95	10.0	26.0	10.5	5.1
Geothermal	0	0	0	0	0	1	4	9	11	13	14	0.0	0.0	39.9	6.4
Net Imports (ktoe)	**18337**	**18979**	**17869**	**16077**	**14196**	**13206**	**11957**	**10890**	**9339**	**8878**	**8959**	-0.3	-2.3	-1.7	-1.4
Solids	3537	3341	3977	3099	3476	3149	2229	1339	565	359	304	1.2	-1.3	-4.3	-9.5
Oil	10357	10655	9232	9068	8210	7749	7242	6896	6702	6666	6669	-1.1	-1.2	-1.2	-0.4
Crude oil and Feedstocks	11964	10713	11206	13148	11858	10916	10012	9219	8595	8107	7690	-0.7	0.6	-1.7	-1.3
Oil products	-1607	-58	-1974	-4080	-3648	-3167	-2770	-2323	-1892	-1442	-1021	2.1	6.3	-2.7	-4.9
Natural gas	3422	3598	3838	2821	2837	3085	3063	2991	2506	2213	2383	1.2	-3.0	0.8	-1.2
Electricity	1022	1463	903	1226	-145	-602	-123	239	376	439	457	-1.2	0.0	-1.7	0.0
Import Dependency (%)	55.2	54.2	47.9	47.0	39.9	37.1	35.8	33.6	29.7	27.6	27.6				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**69934**	**70538**	**80591**	**71479**	**88841**	**97303**	**93419**	**91590**	**93070**	**96737**	**100606**	1.4	1.0	0.5	0.4
Nuclear energy	22479	23271	22800	23137	36999	37079	28850	28850	35207	41565	41565	0.1	5.0	-2.5	1.8
Solids	12452	10998	20826	8559	11239	12136	9821	6802	2639	1559	1475	5.3	-6.0	-1.3	-9.0
Oil (including refinery gas)	587	500	484	635	57	254	280	50	13	12	12	-1.9	-19.3	17.4	-14.5
Gas (including derived gases)	10816	11921	11847	7771	7654	10853	11572	11162	8204	6429	7865	0.9	-4.3	4.2	-1.9
Biomass-waste	8860	9891	11413	13361	13373	15854	20564	21670	23665	23538	24864	2.6	1.6	4.4	1.0
Hydro (pumping excluded)	14660	13784	12922	15701	14122	14734	15124	15618	15711	15709	16398	-1.3	0.9	0.7	0.4
Wind	78	170	294	2307	5392	6388	7194	7423	7608	7902	8407	14.2	33.8	2.9	0.8
Solar	1	2	5	7	6	6	14	14	23	22	20	14.9	2.0	9.7	1.8
Geothermal and other renewables	1	1	0	0	0	0	0	0	0	0	0	-8.4	-96.5	0.0	-100.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**16012**	**16586**	**16691**	**18173**	**19872**	**19380**	**18807**	**18524**	**18160**	**19504**	**19447**	0.4	1.8	-0.5	0.2
Nuclear energy	2726	2726	2726	2726	4378	4378	3398	3398	4175	4951	4951	0.0	4.8	-2.5	1.9
Renewable energy	2923	3121	3359	4289	5628	6023	6395	6584	6679	6703	6921	1.4	5.3	1.3	0.4
Hydro (pumping excluded)	2882	3035	3155	3276	3276	3368	3461	3571	3592	3592	3755	0.9	0.4	0.6	0.4
Wind	38	82	197	1001	2343	2646	2915	2995	3059	3084	3140	17.9	28.1	2.2	0.4
Solar	3	4	7	12	9	9	19	19	29	28	25	8.8	2.5	7.8	1.4
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	10363	10739	10605	11158	9866	8980	9014	8542	7306	7850	7575	0.2	-0.7	-0.9	-0.9
of which cogeneration units	8280	5832	6168	6361	5706	5334	5584	5465	5414	5597	5340	-2.9	-0.8	-0.2	-0.2
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	4676	4633	4532	4340	3303	2308	1844	1160	425	341	327	-0.3	-3.1	-5.7	-8.3
Gas fired	2570	2481	2703	2698	2968	3171	3233	3570	3215	4065	4065	0.5	0.9	0.9	1.2
Oil fired	1519	1505	1194	1532	643	628	607	412	98	56	49	-2.4	-6.0	-0.6	-11.8
Biomass-waste fired	1597	2120	2176	2589	2953	2873	3330	3399	3568	3389	3134	3.1	3.1	1.2	-0.3
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	47.9	46.7	52.8	43.2	49.0	55.0	54.3	54.0	55.8	53.9	56.3				
Efficiency of gross thermal power generation (%)	39.3	36.8	36.6	34.5	35.7	35.6	38.0	39.1	40.3	39.4	41.0				
% of gross electricity from CHP	36.4	38.9	36.2	33.7	30.8	31.1	34.6	35.7	33.3	29.4	30.8				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	65.9	66.8	58.9	76.3	78.7	76.1	76.8	80.3	88.3	91.7	90.7				
Fuel Inputs to Thermal Power Generation (GWh_e)	**7166**	**7782**	**10460**	**7561**	**7790**	**9435**	**9560**	**8726**	**7363**	**6885**	**7170**	3.9	-2.9	2.1	-1.4
Solids	3181	2998	5098	2421	2890	2914	2267	1563	608	398	372	4.8	-5.5	-2.4	-8.6
Oil (including refinery gas)	122	98	99	168	19	61	71	12	4	4	4	-2.1	-15.3	14.3	-13.4
Gas (including derived gases)	2119	2385	2516	1493	1463	1886	1959	1836	1342	1055	1272	1.7	-5.3	3.0	-2.1
Biomass & Waste	1744	2302	2747	3480	3419	4574	5263	5315	5408	5427	5521	4.6	2.2	4.4	0.2
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**21306**	**21544**	**23155**	**24530**	**26269**	**25216**	**21706**	**20528**	**20678**	**21199**	**20690**	0.8	1.3	-1.9	-0.2
Refineries	13059	12876	14265	15688	14260	13243	12200	11349	10655	10143	9710	0.9	0.0	-1.5	-1.1
Biofuels and hydrogen production	0	0	140	334	374	352	334	338	348	365	384	0.0	10.3	-1.1	0.7
District heating	1059	1265	1600	1434	1510	1422	1374	1381	1373	1383	1350	4.2	-0.6	-0.9	-0.1
Derived gases, cokeries etc.	7188	7403	7149	7074	10125	10201	7798	7459	8302	9309	9246	-0.1	3.5	-2.6	0.9

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Finland: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**80**	**87**	**91**	**94**	**97**	**101**	**104**	**107**	**110**	**113**	**115**	1.2	0.7	0.7	0.5
Public road transport	8	8	8	8	8	8	8	8	8	8	9	-0.2	0.3	0.3	0.3
Private cars and motorcycles	57	63	66	68	69	70	72	72	73	74	74	1.5	0.4	0.4	0.2
Rail	4	4	4	5	5	6	6	6	6	7	7	1.4	1.4	1.1	0.9
Aviation [3]	8	9	9	10	12	13	14	16	18	19	21	1.2	3.0	2.2	1.8
Inland navigation	4	4	4	4	4	4	4	4	5	5	5	-0.6	0.6	0.5	0.4
Freight transport activity (Gtkm)	**42**	**42**	**42**	**43**	**46**	**49**	**52**	**55**	**58**	**61**	**63**	-0.2	1.0	1.3	0.9
Heavy goods and light commercial vehicles	29	30	27	28	30	31	34	35	37	38	39	-0.5	0.8	1.3	0.7
Rail	10	10	10	10	11	12	13	14	15	16	17	-0.4	1.4	1.5	1.4
Inland navigation	3	3	5	5	5	5	6	6	6	7	7	3.0	0.8	0.9	1.1
Energy demand in transport (ktoe) [4]	**4338**	**4624**	**4827**	**4896**	**4744**	**4564**	**4374**	**4347**	**4389**	**4443**	**4489**	1.1	-0.2	-0.8	0.1
Public road transport	120	116	121	121	121	119	116	115	115	115	115	0.1	0.0	-0.4	-0.1
Private cars and motorcycles	2334	2542	2693	2631	2402	2197	2014	1939	1902	1880	1859	1.4	-1.1	-1.7	-0.4
Heavy goods and light commercial vehicles	1158	1186	1129	1145	1170	1166	1197	1210	1220	1235	1246	-0.3	0.4	0.2	0.2
Rail	90	92	90	94	101	105	108	111	114	114	112	0.0	1.1	0.7	0.2
Aviation	469	526	619	746	785	808	765	792	853	910	964	2.8	2.4	-0.3	1.2
Inland navigation	167	163	175	159	165	169	174	179	185	189	193	0.5	-0.6	0.5	0.5
By transport activity															
Passenger transport	3086	3310	3549	3604	3419	3237	3009	2963	2988	3024	3058	1.4	-0.4	-1.3	0.1
Freight transport	1251	1314	1278	1292	1325	1327	1365	1384	1401	1419	1431	0.2	0.4	0.3	0.2
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.2	0.5	1.4	1.7	2.0	2.2	2.5				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	2.9	7.0	8.2	8.1	8.1	8.3	8.3	8.5	8.7				
ENERGY EFFICIENCY															
Primary energy consumption	**31491**	**33375**	**35896**	**32814**	**34190**	**34124**	**31908**	**30897**	**30022**	**30620**	**30925**	1.3	-0.5	-0.7	-0.2
Final Energy Demand	**24510**	**25239**	**26243**	**24732**	**24394**	**23386**	**22614**	**22231**	**21756**	**22056**	**22435**	0.7	-0.7	-0.8	0.0
by sector															
Industry	12313	11922	11428	10647	10482	9702	9225	8769	8120	8104	8247	-0.7	-0.9	-1.3	-0.6
Energy intensive industries	10172	9616	9017	8347	8140	7329	6858	6417	5734	5581	5587	-1.2	-1.0	-1.7	-1.0
Other industrial sectors	2141	2306	2412	2299	2342	2373	2367	2352	2386	2523	2659	1.2	-0.3	0.1	0.6
Residential	4544	5053	5804	5338	5378	5350	5270	5312	5381	5512	5615	2.5	-0.8	-0.2	0.3
Tertiary	3296	3616	4169	3837	3776	3756	3730	3789	3851	3983	4070	2.4	-1.0	-0.1	0.4
Transport[5]	4356	4648	4842	4910	4758	4578	4388	4361	4403	4457	4503	1.1	-0.2	-0.8	0.1
by fuel															
Solids	1109	873	843	702	694	667	565	445	308	240	210	-2.7	-1.9	-2.0	-4.8
Oil	7850	8102	7619	7073	6514	6000	5500	5215	5059	5006	4969	-0.3	-1.6	-1.7	-0.5
Gas	1209	1082	1012	981	958	928	890	894	868	867	911	-1.8	-0.6	-0.7	0.1
Electricity	6507	6942	7178	6788	6852	7083	7216	7418	7638	7958	8263	1.0	-0.5	0.5	0.7
Heat (from CHP and District Heating)	3334	3972	4656	4143	4316	4210	3942	3819	3813	3840	3919	3.4	-0.8	-0.9	0.0
Renewable energy forms	4501	4268	4935	5042	5053	4487	4488	4423	4049	4117	4130	0.9	0.2	-1.2	-0.4
Other	0	0	0	3	7	10	14	16	22	28	34	0.0	#####	7.3	4.6
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	207	193	199	181	178	168	147	131	116	109	101	-0.4	-1.1	-1.9	-1.8
Industry (Energy on Value added, index 2000=100)	100	81	79	75	72	64	57	51	44	41	39	-2.3	-1.0	-2.2	-1.9
Residential (Energy on Private Income, index 2000=100)	100	94	98	86	82	77	70	64	59	55	51	-0.2	-1.8	-1.5	-1.6
Tertiary (Energy on Value added, index 2000=100)	100	100	110	100	92	86	79	73	68	64	60	0.9	-1.8	-1.4	-1.4
Passenger transport (toe/Mpkm) [6]	36	36	34	32	29	27	24	22	21	21	20	-0.6	-1.5	-2.1	-0.8
Freight transport (toe/Mtkm)	30	31	31	30	29	27	26	25	24	23	23	0.4	-0.6	-1.0	-0.7
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**73.1**	**71.5**	**78.2**	**61.1**	**59.1**	**57.4**	**51.3**	**45.0**	**37.7**	**35.3**	**35.2**	0.7	-2.8	-1.4	-1.9
of which ETS sectors (2013 scope) GHG emissions		37.2	43.9	30.8	32.0	32.0	27.3	22.1	15.5	13.3	13.3		-3.1	-1.6	-3.5
of which ESD sectors (2013 scope) GHG emissions		34.3	34.3	30.3	27.2	25.4	24.0	23.0	22.3	22.0	21.9		-2.3	-1.2	-0.5
CO_2 Emissions (energy related)	**58.1**	**57.7**	**65.3**	**48.5**	**48.0**	**46.6**	**40.9**	**35.4**	**28.2**	**25.8**	**25.7**	1.2	-3.0	-1.6	-2.3
Power generation/District heating	22.5	23.0	32.3	17.5	19.0	20.5	17.3	13.3	7.5	5.8	5.9	3.7	-5.2	-0.9	-5.3
Energy Branch	2.5	2.5	2.8	3.1	2.7	2.3	2.0	1.8	1.7	1.5	1.5	1.2	-0.1	-2.9	-1.6
Industry	14.2	12.7	11.0	10.1	9.6	7.9	6.8	5.7	4.5	4.0	3.9	-2.5	-1.4	-3.4	-2.8
Residential	2.4	2.3	1.8	1.4	1.3	1.2	0.9	0.9	0.8	0.7	0.7	-2.6	-3.6	-2.9	-1.8
Tertiary	3.6	3.5	3.4	2.8	2.4	2.1	2.0	2.0	2.0	2.0	1.9	-0.6	-3.5	-1.5	-0.3
Transport	12.9	13.8	14.0	13.6	13.0	12.5	11.9	11.7	11.8	11.8	11.9	0.8	-0.7	-0.9	0.0
CO_2 Emissions (non energy and non land use related)	**1.5**	**1.6**	**2.2**	**2.3**	**2.2**	**2.2**	**1.9**	**1.6**	**1.6**	**1.5**	**1.5**	3.8	0.3	-1.4	-1.3
Non-CO2 GHG emissions	**13.6**	**12.2**	**10.8**	**10.3**	**9.0**	**8.6**	**8.4**	**8.0**	**7.9**	**8.0**	**8.0**	-2.3	-1.8	-0.7	-0.2
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**101.1**	**98.9**	**108.1**	**84.4**	**81.8**	**79.3**	**70.9**	**62.2**	**52.2**	**48.9**	**48.7**	0.7	-2.8	-1.4	-1.9
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.20	0.19	0.23	0.14	0.13	0.14	0.12	0.09	0.05	0.04	0.04	1.4	-5.5	-1.0	-5.5
Final energy demand (t of CO_2/toe)	1.35	1.28	1.15	1.13	1.08	1.02	0.96	0.91	0.87	0.84	0.82	-1.6	-0.7	-1.2	-0.8
Industry	1.15	1.06	0.96	0.95	0.92	0.82	0.74	0.65	0.55	0.50	0.47	-1.8	-0.5	-2.1	-2.2
Residential	0.52	0.45	0.32	0.26	0.24	0.22	0.18	0.17	0.15	0.13	0.12	-5.0	-2.9	-2.7	-2.1
Tertiary	1.09	0.97	0.81	0.74	0.63	0.57	0.54	0.53	0.51	0.49	0.47	-2.9	-2.6	-1.4	-0.7
Transport	2.97	2.97	2.89	2.77	2.73	2.72	2.70	2.68	2.67	2.65	2.64	-0.3	-0.6	-0.1	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**28.7**	**28.8**	**32.5**	**41.1**	**42.4**	**44.3**	**49.1**	**51.2**	**51.5**	**51.6**	**51.8**				
RES-H&C share	38.2	39.1	44.4	55.2	56.6	59.1	65.2	69.4	70.8	72.8	72.7				
RES-E share	27.3	26.9	27.7	36.2	37.4	40.6	46.3	47.0	47.9	46.0	46.6				
RES-T share (based on ILUC formula)	0.8	0.9	4.3	16.3	19.0	20.3	22.3	23.1	24.7	25.6	26.8				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	52	55	59	95	92	89	96	93	92	93	89	1.4	4.5	0.5	-0.4
Average Price of Electricity in Final demand sectors (€'13/MWh	68	80	98	122	135	139	146	150	150	150	149	3.7	3.2	0.8	0.1
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**16.9**	**20.3**	**25.8**	**27.4**	**32.8**	**35.0**	**37.4**	**40.0**	**42.2**	**44.3**	**46.4**	4.4	2.4	1.3	1.1
as % of GDP	**10.7**	**11.3**	**13.8**	**14.6**	**16.5**	**16.6**	**16.6**	**16.2**	**15.6**	**15.1**	**14.6**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												France: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**57**	**60**	**61**	**63**	**64**	**66**	**67**	**68**	**69**	**70**	**71**	0.7	0.5	0.4	0.3
GDP (in 000 M€13)	**1812**	**1962**	**2024**	**2091**	**2266**	**2417**	**2594**	**2816**	**3078**	**3355**	**3668**	1.1	1.1	1.4	1.7
Gross Inland Consumption (ktoe)	**257565**	**276646**	**267546**	**255764**	**248843**	**241352**	**236532**	**231111**	**219472**	**215245**	**207899**	0.4	-0.7	-0.5	-0.6
Solids	15048	14303	12076	8763	8492	5720	5012	4077	3116	2499	2134	-2.2	-3.5	-5.1	-4.2
Oil	88937	93185	82668	79806	75372	73400	71292	69942	68998	67502	66983	-0.7	-0.9	-0.6	-0.3
Natural gas	35766	41025	42540	38807	35944	35236	32194	30666	36029	35698	33460	1.7	-1.7	-1.1	0.2
Nuclear	107093	116474	110539	109294	97019	94378	94378	91549	71491	66709	56178	0.3	-1.3	-0.3	-2.6
Electricity	-5974	-5187	-2641	-5379	-5695	-5687	-5512	-3363	-2479	-2515	-2473	-7.8	8.0	-0.3	-3.9
Renewable energy forms	16695	16847	22365	24473	37710	38305	39169	38240	42318	45351	51618	3.0	5.4	0.4	1.4
Energy Branch Consumption	**10822**	**9989**	**9635**	**8309**	**7426**	**6929**	**6726**	**6624**	**6082**	**5886**	**5573**	-1.2	-2.6	-1.0	-0.9
Non-Energy Uses	**16851**	**16704**	**14290**	**14232**	**14666**	**14778**	**15001**	**15146**	**15309**	**14707**	**15094**	-1.6	0.3	0.2	0.0
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**129790**	**136271**	**135095**	**135171**	**135777**	**133485**	**134231**	**130398**	**113998**	**112000**	**107416**	0.4	0.1	-0.1	-1.1
Solids	2483	383	162	143	0	0	0	0	0	0	0	-23.9	-100.0	0.0	0.0
Oil	2023	1604	1542	1217	1122	961	912	865	395	180	0	-2.7	-3.1	-2.1	-100.0
Natural gas	1505	909	646	304	294	286	276	268	303	295	286	-8.1	-7.6	-0.6	0.2
Nuclear	107093	116474	110539	109294	97019	94378	94378	91549	71491	66709	56178	0.3	-1.3	-0.3	-2.6
Renewable energy sources	16688	16902	22206	24212	37342	37860	38666	37716	41810	44816	50952	2.9	5.3	0.3	1.4
Hydro	5771	4442	5364	5476	5753	5515	5516	5635	5977	6327	6692	-0.7	0.7	-0.4	1.0
Biomass & Waste	10763	12159	15690	15780	23434	22252	20941	19316	20170	20414	20197	3.8	4.1	-1.1	-0.2
Wind	7	83	855	1850	4741	5620	7174	7185	8915	10472	14732	62.6	18.7	4.2	3.7
Solar and others	21	26	118	870	3086	4084	4587	5088	6309	7179	8922	18.7	38.6	4.0	3.4
Geothermal	126	192	180	236	327	389	448	492	438	426	409	3.6	6.2	3.2	-0.5
Net Imports (ktoe)	**134082**	**144103**	**132149**	**123217**	**115817**	**110733**	**105268**	**103740**	**108496**	**106243**	**103493**	-0.1	-1.3	-1.0	-0.1
Solids	13005	13511	12192	8620	8492	5720	5012	4077	3116	2499	2134	-0.6	-3.6	-5.1	-4.2
Oil	91265	95114	82886	81211	76947	75194	73196	71845	71277	69893	69525	-1.0	-0.7	-0.5	-0.3
Crude oil and Feedstocks	85329	85302	65254	46552	45830	45988	45826	46100	46852	46965	47642	-2.6	-3.5	0.0	0.2
Oil products	5936	9813	17632	34659	31117	29206	27370	25745	24424	22928	21883	11.5	5.8	-1.3	-1.1
Natural gas	35779	40720	39553	38504	35704	35060	32069	30657	36075	35830	33641	1.0	-1.0	-1.1	0.2
Electricity	-5974	-5187	-2641	-5379	-5695	-5687	-5512	-3363	-2479	-2515	-2473	-7.8	8.0	-0.3	-3.9
Import Dependency (%)	51.5	51.6	49.0	47.7	46.0	45.3	44.0	44.3	48.8	48.7	49.1				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**535965**	**571353**	**563931**	**584204**	**596131**	**599539**	**608391**	**603936**	**609180**	**628568**	**647492**	0.5	0.6	0.2	0.3
Nuclear energy	415162	451529	428521	444338	396167	385196	385062	378941	299262	283443	246066	0.3	-0.8	-0.3	-2.2
Solids	27004	27515	23359	8820	9109	361	69	0	0	0	0	-1.4	-9.0	-38.7	-100.0
Oil (including refinery gas)	7165	7925	5565	516	0	337	341	243	93	117	20	-2.5	-100.0	0.0	-13.3
Gas (including derived gases)	15365	26254	26385	25753	22326	23670	12047	10042	53975	55879	39283	5.6	-1.7	-6.0	6.1
Biomass-waste	3559	5016	6675	10512	14131	20068	20256	20474	26253	28898	28905	6.5	7.8	3.7	1.8
Hydro (pumping excluded)	67121	51658	62388	63673	66899	64123	64139	65518	69504	73566	77815	-0.7	0.7	-0.4	1.0
Wind	77	964	9942	21517	55129	65350	83418	83550	103668	121763	171302	62.6	18.7	4.2	3.7
Solar	5	10	620	8601	31589	39234	41048	41865	51257	58298	77182	63.1	48.2	2.7	3.2
Geothermal and other renewables	507	482	476	474	782	1198	2011	3303	5167	6603	6920	-0.6	5.1	9.9	6.4
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**114543**	**114015**	**123033**	**127555**	**148953**	**151245**	**157433**	**159232**	**168438**	**180094**	**206513**	0.7	1.9	0.6	1.4
Nuclear energy	64293	64053	63679	63247	61327	59493	59493	56330	42452	39119	32276	-0.1	-0.4	-0.3	-3.0
Renewable energy	23570	24601	32099	40333	66684	73867	80704	81892	95681	106529	132157	3.1	7.6	1.9	2.5
Hydro (pumping excluded)	23266	23571	23779	23635	23635	23635	23635	23947	24780	25662	26559	0.2	-0.1	0.0	0.6
Wind	57	777	7050	10358	22130	25130	30771	30771	36880	42841	57569	61.9	12.1	3.4	3.2
Solar	7	13	1030	6100	20535	24532	25382	25732	31850	35312	45200	64.7	34.9	2.1	2.9
Other renewables (tidal etc.)	240	240	240	240	384	571	916	1441	2171	2713	2829	0.0	4.8	9.1	5.8
Thermal power	26680	25361	27256	23974	20942	17884	17236	21010	30305	34446	42080	0.2	-2.6	-1.9	4.6
of which cogeneration units	7013	5779	4606	10620	6110	5171	4014	4841	5465	5451	5294	-4.1	2.9	-4.1	1.4
of which CCS units	0	0	0	0	0	0	0	0	0	0	400	0.0	0.0	0.0	0.0
Solids fired	10552	8637	7229	5385	3856	3834	3780	3480	2892	2892	2892	-3.7	-6.1	-0.2	-1.3
Gas fired	4116	6055	9334	9646	9181	8902	8344	13267	23193	27260	34924	8.5	-0.2	-1.0	7.4
Oil fired	11328	9794	9643	7693	5008	1849	1679	799	708	694	625	-1.6	-6.3	-10.4	-4.8
Biomass-waste fired	684	876	1049	1249	2894	3296	3431	3461	3508	3598	3636	4.4	10.7	1.7	0.3
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	2	3	3	3	3	3	3	3	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	51.0	54.6	50.0	50.2	44.0	43.7	42.6	41.8	40.1	38.7	34.9				
Efficiency of gross thermal power generation (%)	34.9	33.3	30.0	39.7	38.5	37.7	34.0	32.9	47.2	47.9	44.9				
% of gross electricity from CHP	3.0	2.4	2.8	2.4	1.9	1.9	1.8	1.9	2.6	2.6	2.7				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5				
% of carbon free (RES, nuclear) gross electricity generation	90.8	89.2	90.2	94.0	94.7	95.9	98.0	98.3	91.1	91.1	93.9				
Fuel Inputs to Thermal Power Generation (GWh_e)	**13278**	**17328**	**17887**	**9873**	**10191**	**10151**	**8290**	**8055**	**14632**	**15242**	**13059**	3.0	-5.5	-2.0	2.3
Solids	6559	6402	4717	2258	2327	79	14	0	0	0	0	-3.2	-6.8	-39.9	-100.0
Oil (including refinery gas)	1242	2160	1639	135	0	111	113	80	31	34	6	2.8	-79.3	269.1	-13.3
Gas (including derived gases)	4002	6298	8178	4941	3721	4399	2436	2073	7875	8085	5893	7.4	-7.6	-4.1	4.5
Biomass & Waste	1476	2469	3352	2529	4127	5546	5712	5887	6711	7108	7145	8.5	2.1	3.3	1.1
Geothermal heat	0	0	0	10	15	15	15	15	15	15	15	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**205144**	**211862**	**191250**	**166425**	**153150**	**150337**	**149661**	**146386**	**126212**	**121139**	**111060**	-0.7	-2.2	-0.2	-1.5
Refineries	90823	88392	73306	49009	48120	48189	47968	48157	48508	48429	48975	-2.1	-4.1	0.0	0.1
Biofuels and hydrogen production	325	651	2397	2746	3130	3099	3129	3015	3148	3394	3603	22.1	2.7	0.0	0.7
District heating	312	448	608	546	576	613	573	530	435	370	301	6.9	-0.5	0.0	-3.2
Derived gases, cokeries etc.	113684	122371	114938	114124	101324	98438	97990	94684	74120	68946	58181	0.1	-1.3	-0.3	-2.6

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												France: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**950**	**998**	**1033**	**1091**	**1167**	**1214**	**1265**	**1312**	**1366**	**1399**	**1436**	0.8	1.2	0.8	0.6
Public road transport	42	42	50	55	60	63	66	68	70	73	75	1.7	2.0	0.8	0.7
Private cars and motorcycles	754	801	811	850	901	926	952	974	1001	1016	1032	0.7	1.1	0.6	0.4
Rail	81	90	101	107	117	125	134	143	155	167	180	2.1	1.5	1.4	1.5
Aviation [3]	69	62	68	76	86	97	111	123	136	140	145	-0.1	2.4	2.5	1.4
Inland navigation	3	3	3	3	3	4	4	4	4	4	4	-0.8	0.6	0.7	0.8
Freight transport activity (Gtkm)	**412**	**409**	**392**	**413**	**470**	**520**	**577**	**608**	**640**	**661**	**682**	-0.5	1.8	2.1	0.8
Heavy goods and light commercial vehicles	311	319	296	310	356	395	440	462	485	501	516	-0.5	1.9	2.1	0.8
Rail	58	41	30	37	42	50	58	64	70	75	79	-6.3	3.5	3.1	1.6
Inland navigation	43	49	66	66	71	76	80	82	84	85	87	4.4	0.8	1.1	0.4
Energy demand in transport (ktoe) [4]	**50360**	**50194**	**49347**	**50154**	**50085**	**49391**	**49006**	**48832**	**49378**	**49543**	**49742**	-0.2	0.1	-0.2	0.1
Public road transport	536	519	595	654	706	717	724	734	746	758	771	1.0	1.7	0.3	0.3
Private cars and motorcycles	31157	31368	31602	31615	29887	28009	26789	26418	26420	26273	26213	0.1	-0.6	-1.1	-0.1
Heavy goods and light commercial vehicles	10961	10554	9424	9543	10329	10882	11581	11752	12047	12218	12364	-1.5	0.9	1.2	0.3
Rail	1134	980	932	1017	1072	1126	1176	1195	1215	1210	1204	-1.9	1.4	0.9	0.1
Aviation	6088	6291	6294	6827	7557	8097	8152	8134	8340	8470	8575	0.3	1.8	0.8	0.3
Inland navigation	483	481	500	499	534	560	585	599	610	614	615	0.4	0.7	0.9	0.3
By transport activity															
Passenger transport	38753	38887	39197	39839	38913	37595	36441	36059	36273	36260	36310	0.1	-0.1	-0.7	0.0
Freight transport	11607	11307	10150	10316	11172	11796	12565	12773	13106	13283	13432	-1.3	1.0	1.2	0.3
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.3	0.6	1.3	1.7	2.1	2.5	3.0				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.7	1.3	4.9	5.6	6.5	6.6	6.7	6.4	6.4	6.7	6.9				
ENERGY EFFICIENCY															
Primary energy consumption	**240713**	**259943**	**253256**	**241532**	**234177**	**226574**	**221531**	**215965**	**204162**	**200537**	**192805**	0.5	-0.8	-0.6	-0.7
Final Energy Demand	**154639**	**160337**	**155397**	**155251**	**156459**	**151206**	**147426**	**144700**	**144604**	**144546**	**145352**	0.0	0.1	-0.6	-0.1
by sector															
Industry	36670	34356	28478	30331	31344	30181	29244	27953	27520	27562	28016	-2.5	1.0	-0.7	-0.2
Energy intensive industries	20906	20576	16506	17590	18017	17082	16369	15284	14544	14099	13734	-2.3	0.9	-1.0	-0.9
Other industrial sectors	15764	13780	11972	12740	13327	13099	12875	12669	12976	13463	14282	-2.7	1.1	-0.3	0.5
Residential	42153	45931	45463	44159	45013	42545	40796	39603	38479	37774	37225	0.8	-0.1	-1.0	-0.5
Tertiary	25209	29569	31792	30270	29651	28697	27959	27871	28767	29195	29886	2.3	-0.7	-0.6	0.3
Transport[5]	50607	50482	49664	50492	50450	49783	49427	49272	49838	50015	50226	-0.2	0.2	-0.2	0.1
by fuel															
Solids	5775	5218	4547	4076	4150	3735	3276	2542	1773	1318	1046	-2.4	-0.9	-2.3	-5.6
Oil	72503	71421	64647	63583	59094	57103	54899	53538	52604	51674	50818	-1.1	-0.9	-0.7	-0.4
Gas	30907	33744	32430	32676	31149	29917	28864	27629	27003	26501	26482	0.5	-0.4	-0.8	-0.4
Electricity	33096	36352	38185	37788	38885	39380	40352	42053	43726	45325	47077	1.4	0.2	0.4	0.8
Heat (from CHP and District Heating)	3236	4163	3525	3658	3409	3501	3528	3775	3913	3976	4023	0.9	-0.3	0.3	0.7
Renewable energy forms	9123	9439	12064	13458	19727	17506	16414	15026	15318	15356	15378	2.8	5.0	-1.8	-0.3
Other	0	0	0	12	46	65	93	137	268	397	528	0.0	0.0	7.3	9.1
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	142	141	132	122	110	100	91	82	71	64	57	-0.7	-1.8	-1.8	-2.3
Industry (Energy on Value added, index 2000=100)	100	89	78	80	77	71	65	58	53	49	46	-2.5	-0.1	-1.7	-1.7
Residential (Energy on Private Income, index 2000=100)	100	98	91	86	80	71	63	56	50	45	40	-0.9	-1.3	-2.4	-2.2
Tertiary (Energy on Value added, index 2000=100)	100	108	110	101	91	82	74	68	64	59	55	1.0	-1.9	-2.0	-1.5
Passenger transport (toe/Mpkm) [6]	34	33	32	30	27	25	22	21	20	19	19	-0.7	-1.6	-1.9	-0.8
Freight transport (toe/Mtkm)	28	28	26	25	24	23	22	21	20	20	20	-0.9	-0.9	-0.9	-0.5
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**585.3**	**552.1**	**512.0**	**482.2**	**444.6**	**418.3**	**392.0**	**377.9**	**381.9**	**374.6**	**362.5**	-1.3	-1.4	-1.2	-0.4
of which ETS sectors (2013 scope) GHG emissions		173.2	147.3	131.7	125.1	113.1	99.3	91.5	99.5	96.2	87.2		-1.6	-2.3	-0.6
of which ESD sectors (2013 scope) GHG emissions		378.8	364.7	350.4	319.5	305.3	292.8	286.4	282.4	278.4	275.3		-1.3	-0.9	-0.3
CO_2 Emissions (energy related)	**388.3**	**394.4**	**360.0**	**332.5**	**307.9**	**288.2**	**270.4**	**257.9**	**262.3**	**255.7**	**245.0**	-0.8	-1.6	-1.3	-0.5
Power generation/District heating	46.7	53.6	48.1	26.7	21.7	15.0	9.6	8.0	20.9	20.9	14.3	0.3	-7.7	-7.8	2.0
Energy Branch	19.9	16.3	15.0	13.7	11.6	10.4	9.9	9.4	9.0	8.6	8.4	-2.7	-2.6	-1.6	-0.8
Industry	74.6	67.0	54.1	59.8	58.1	51.6	46.3	39.9	34.4	31.6	30.6	-3.2	0.7	-2.3	-2.0
Residential	59.3	64.8	57.2	51.5	43.6	42.4	40.2	38.3	35.3	33.2	31.2	-0.4	-2.7	-0.8	-1.3
Tertiary	39.8	44.4	44.7	38.9	33.3	31.7	29.8	28.3	28.0	27.6	27.3	1.1	-2.9	-1.1	-0.4
Transport	148.0	148.1	140.9	141.9	139.7	137.0	134.8	134.0	134.7	133.8	133.2	-0.5	-0.1	-0.4	-0.1
CO_2 Emissions (non energy and non land use related)	**28.9**	**28.5**	**25.7**	**25.6**	**26.6**	**25.1**	**20.6**	**19.8**	**19.4**	**18.6**	**17.1**	-1.2	0.3	-2.5	-0.9
Non-CO2 GHG emissions	**168.1**	**129.2**	**126.3**	**124.1**	**110.1**	**105.1**	**101.0**	**100.2**	**100.2**	**100.3**	**100.5**	-2.8	-1.4	-0.9	0.0
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**104.5**	**98.6**	**91.4**	**86.1**	**79.4**	**74.7**	**70.0**	**67.5**	**68.2**	**66.9**	**64.7**	-1.3	-1.4	-1.2	-0.4
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.08	0.09	0.08	0.04	0.03	0.02	0.01	0.01	0.03	0.03	0.02	-0.3	-8.1	-8.0	1.7
Final energy demand (t of CO_2/toe)	2.08	2.02	1.91	1.88	1.76	1.74	1.70	1.66	1.61	1.56	1.53	-0.8	-0.8	-0.3	-0.5
Industry	2.03	1.95	1.90	1.97	1.85	1.71	1.58	1.43	1.25	1.15	1.09	-0.7	-0.3	-1.6	-1.8
Residential	1.41	1.41	1.26	1.17	0.97	1.00	0.99	0.97	0.92	0.88	0.84	-1.1	-2.6	0.2	-0.8
Tertiary	1.58	1.50	1.41	1.29	1.12	1.10	1.06	1.02	0.97	0.94	0.91	-1.2	-2.2	-0.5	-0.8
Transport	2.92	2.93	2.84	2.81	2.77	2.75	2.73	2.72	2.70	2.68	2.65	-0.3	-0.2	-0.2	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**9.5**	**9.5**	**12.5**	**15.5**	**23.5**	**24.5**	**25.6**	**25.4**	**27.9**	**29.8**	**33.9**				
RES-H&C share	12.4	12.3	15.8	19.4	29.7	29.5	29.7	29.9	31.5	32.1	32.7				
RES-E share	14.7	13.7	14.9	19.8	31.6	35.4	38.5	37.8	43.9	48.1	58.4				
RES-T share (based on ILUC formula)	1.4	2.0	6.3	7.7	10.2	11.4	13.6	14.2	16.1	18.8	22.5				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	61	58	57	90	93	83	72	72	72	74	62	-0.7	5.1	-2.5	-0.8
Average Price of Electricity in Final demand sectors (€'13/MWh	108	100	109	123	146	146	151	156	156	155	156	0.0	2.9	0.4	0.2
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**154.6**	**176.3**	**196.0**	**216.7**	**273.4**	**282.0**	**292.1**	**300.3**	**309.0**	**315.7**	**323.4**	2.4	3.4	0.7	0.5
as % of GDP	**8.5**	**9.0**	**9.7**	**10.4**	**12.1**	**11.7**	**11.3**	**10.7**	**10.0**	**9.4**	**8.8**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Germany: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**82**	**83**	**82**	**81**	**81**	**80**	**80**	**79**	**78**	**76**	**75**	0.0	-0.1	-0.1	-0.3
GDP (in 000 M€13)	**2370**	**2442**	**2608**	**2790**	**2973**	**3126**	**3251**	**3371**	**3531**	**3720**	**3901**	1.0	1.3	0.9	0.9
Gross Inland Consumption (ktoe)	**342337**	**341916**	**332974**	**322609**	**308313**	**294937**	**278439**	**264663**	**260722**	**254715**	**255815**	-0.3	-0.8	-1.0	-0.4
Solids	84802	81952	78824	78036	77912	75944	65563	51297	43789	32782	37209	-0.7	-0.1	-1.7	-2.8
Oil	130980	121460	111798	111688	102566	98508	92355	88735	85553	83856	80457	-1.6	-0.9	-1.0	-0.7
Natural gas	71878	77782	75905	74011	68953	69748	67745	71257	71496	71130	67919	0.5	-1.0	-0.2	0.0
Nuclear	43751	42061	36257	23825	8474	0	0	0	0	0	0	-1.9	-13.5	-100.0	0.0
Electricity	263	-393	-1286	-4145	167	1001	1361	1336	1331	1274	1287	0.0	0.0	23.3	-0.3
Renewable energy forms	10665	19054	31477	39195	50242	49737	51415	52039	58553	65673	68943	11.4	4.8	0.2	1.5
Energy Branch Consumption	**14566**	**14384**	**13378**	**13631**	**12230**	**11775**	**10780**	**10207**	**9910**	**9357**	**10561**	-0.8	-0.9	-1.3	-0.1
Non-Energy Uses	**25064**	**24662**	**22582**	**24685**	**25861**	**26549**	**26751**	**26850**	**26967**	**27127**	**26241**	-1.0	1.4	0.3	-0.1
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**135549**	**137356**	**129648**	**120921**	**109452**	**96327**	**88301**	**82977**	**87394**	**88148**	**99234**	-0.4	-1.7	-2.1	0.6
Solids	60629	56484	45906	42340	37233	35593	28668	25009	24917	19008	28081	-2.7	-2.1	-2.6	-0.1
Oil	4680	5782	4754	4964	3809	2936	2257	1740	1342	1036	0	0.2	-2.2	-5.1	-100.0
Natural gas	15825	14334	11113	10749	9895	8269	6210	4399	2758	2557	2360	-3.5	-1.2	-4.6	-4.7
Nuclear	43751	42061	36257	23825	8474	0	0	0	0	0	0	-1.9	-13.5	-100.0	0.0
Renewable energy sources	10665	18695	31618	39044	50041	49530	51166	51830	58378	65547	68793	11.5	4.7	0.2	1.5
Hydro	1869	1689	1802	1925	1935	1979	2048	2214	2354	2526	2637	-0.4	0.7	0.6	1.3
Biomass & Waste	7876	14249	24988	27662	32135	30453	29185	29101	31405	32322	32746	12.2	2.5	-1.0	0.6
Wind	804	2341	3250	5689	9413	9738	11036	11185	11957	15413	16827	15.0	11.2	1.6	2.1
Solar and others	116	371	1493	3575	5530	6270	7383	7225	7700	8198	9484	29.1	14.0	2.9	1.3
Geothermal	0	46	86	192	1028	1091	1514	2105	4961	7088	7099	0.0	28.1	3.9	8.0
Net Imports (ktoe)	**204709**	**208118**	**201696**	**204465**	**201949**	**201809**	**193427**	**185043**	**176822**	**170209**	**160383**	-0.1	0.0	-0.4	-0.9
Solids	21663	25972	31644	35695	40678	40351	36895	26288	18872	13773	9128	3.9	2.5	-1.0	-6.7
Oil	125918	120239	109834	109501	101785	98651	93223	90079	87325	85979	83710	-1.4	-0.8	-0.9	-0.5
Crude oil and Feedstocks	101441	111039	91612	87783	82354	80483	77129	75447	73832	73060	71881	-1.0	-1.1	-0.7	-0.4
Oil products	24477	9200	18222	21718	19431	18168	16093	14632	13493	12919	11829	-2.9	0.6	-1.9	-1.5
Natural gas	56865	61940	61645	63262	59119	61599	61699	67131	69119	69057	66108	0.8	-0.4	0.4	0.3
Electricity	263	-393	-1286	-4145	167	1001	1361	1336	1331	1274	1287	0.0	0.0	23.3	-0.3
Import Dependency (%)	59.4	60.4	60.1	62.8	64.9	67.7	68.7	69.0	66.9	65.9	61.8				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**572313**	**615800**	**626583**	**645694**	**599220**	**603815**	**610832**	**611629**	**617686**	**623184**	**647216**	0.9	-0.4	0.2	0.3
Nuclear energy	169606	163055	140556	96916	34469	0	0	0	0	0	0	-1.9	-13.1	-100.0	0.0
Solids	296687	288142	262896	272895	273820	267176	231939	182947	160406	114516	136854	-1.2	0.4	-1.6	-2.6
Oil (including refinery gas)	4785	11997	8741	1079	941	1997	3056	3357	3621	3536	552	6.2	-20.0	12.5	-8.2
Gas (including derived gases)	59970	83608	100912	92808	74717	102228	108810	150110	154616	152778	124671	5.3	-3.0	3.8	0.7
Biomass-waste	10121	20849	42975	58715	33884	43429	53400	57464	67808	73975	74801	15.6	-2.3	4.7	1.7
Hydro (pumping excluded)	21732	19638	20953	22381	22505	23008	23820	25746	27375	29372	30665	-0.4	0.7	0.6	1.3
Wind	9352	27229	37793	66153	109450	113229	128324	130057	139033	179225	195659	15.0	11.2	1.6	2.1
Solar	60	1283	11727	34612	48465	51777	60513	60979	63857	68813	83044	69.3	15.2	2.2	1.6
Geothermal and other renewables	0	-1	30	137	969	969	969	969	969	969	969	0.0	41.4	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**114373**	**123973**	**154603**	**189032**	**207140**	**199424**	**209097**	**210211**	**214757**	**229867**	**252774**	3.1	3.0	0.1	1.0
Nuclear energy	21644	20656	20656	12188	6907	0	0	0	0	0	0	-0.5	-10.4	-100.0	0.0
Renewable energy	11040	25641	50141	90293	120226	123606	137031	137410	141918	158723	179860	16.3	9.1	1.3	1.4
Hydro (pumping excluded)	4831	5210	5407	5590	5592	5698	5857	6237	6558	6951	7170	1.1	0.3	0.5	1.0
Wind	6095	18375	27180	44946	61832	62007	67214	67214	69404	81242	86549	16.1	8.6	0.8	1.3
Solar	114	2056	17554	39757	52803	55901	63959	63959	65956	70531	86141	65.5	11.6	1.9	1.5
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	81689	77676	83806	86551	80006	75818	72066	72801	72839	71144	72914	0.3	-0.5	-1.0	0.1
of which cogeneration units	14369	20840	24554	17067	6215	12473	12493	10975	10927	13942	15542	5.5	-12.8	7.2	1.1
of which CCS units	0	0	0	0	0	0	0	0	0	0	7920	0.0	0.0	0.0	0.0
Solids fired	50924	48087	47789	52819	49170	44016	36775	25734	22523	19520	24057	-0.6	0.3	-2.9	-2.1
Gas fired	21336	21671	26890	25178	21891	23078	26978	39086	42020	43293	41426	2.3	-2.0	2.1	2.2
Oil fired	8066	5686	5688	5028	1674	1458	1248	1061	863	833	674	-3.4	-11.5	-2.9	-3.0
Biomass-waste fired	1363	2232	3432	3501	7100	7095	6894	6749	7261	7326	6586	9.7	7.5	-0.3	-0.2
Hydrogen plants	0	0	0	1	1	1	1	1	1	1	1	0.0	0.0	0.0	0.0
Geothermal heat	0	0	8	24	170	170	170	170	170	170	170	0.0	35.8	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	53.3	53.0	43.5	36.8	31.2	32.8	31.8	31.9	31.6	30.0	27.7				
Efficiency of gross thermal power generation (%)	37.8	38.6	39.4	40.5	37.6	39.5	42.0	45.6	46.7	48.4	46.9				
% of gross electricity from CHP	10.6	12.6	13.2	12.8	5.9	13.1	14.4	14.4	14.8	15.9	14.8				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	13.0				
% of carbon free (RES, nuclear) gross electricity generation	36.8	37.7	40.5	43.2	41.7	38.5	43.7	45.0	48.4	56.5	59.5				
Fuel Inputs to Thermal Power Generation (GWh_e)	**84562**	**90075**	**90587**	**90286**	**87947**	**90508**	**81474**	**74475**	**71298**	**61493**	**61988**	0.7	-0.3	-0.8	-1.4
Solids	67101	65740	59687	61356	60916	59242	50469	38488	33753	24145	29176	-1.2	0.2	-1.9	-2.7
Oil (including refinery gas)	1411	1427	855	236	311	647	990	1088	1180	1158	171	-4.9	-9.6	12.3	-8.4
Gas (including derived gases)	12891	17808	19955	16546	12826	17714	17934	22709	22882	22123	18295	4.5	-4.3	3.4	0.1
Biomass & Waste	3158	5100	10066	12030	13061	12071	11247	11356	12649	13233	13513	12.3	2.6	-1.5	0.9
Geothermal heat	0	0	24	118	834	834	834	834	834	834	834	0.0	42.7	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**180304**	**187908**	**163048**	**142875**	**120434**	**109627**	**104290**	**101515**	**100164**	**100474**	**98104**	-1.0	-3.0	-1.4	-0.3
Refineries	119420	125092	103238	98875	92807	90519	86598	84494	82560	81611	79703	-1.4	-1.1	-0.7	-0.4
Biofuels and hydrogen production	237	1859	2884	3011	2848	2802	2827	2952	3209	3465	3682	28.4	-0.1	-0.1	1.3
District heating	1198	3942	4754	4043	3530	3406	3293	3551	5872	7556	7314	14.8	-2.9	-0.7	4.1
Derived gases, cokeries etc.	59450	57015	52171	36947	21249	12900	11573	10517	8523	7843	7404	-1.3	-8.6	-5.9	-2.2

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Germany: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**1066**	**1099**	**1130**	**1187**	**1207**	**1241**	**1273**	**1295**	**1323**	**1347**	**1368**	0.6	0.7	0.5	0.4
Public road transport	69	67	62	63	67	68	69	70	72	72	73	-1.1	0.8	0.3	0.3
Private cars and motorcycles	850	876	905	942	950	966	987	995	1006	1013	1018	0.6	0.5	0.4	0.2
Rail	90	92	100	111	114	123	128	136	145	155	163	1.1	1.3	1.2	1.2
Aviation [3]	55	62	61	69	75	81	86	91	97	104	110	1.1	2.1	1.4	1.2
Inland navigation	2	2	2	2	2	2	2	3	3	3	3	-0.8	0.8	0.8	0.7
Freight transport activity (Gtkm)	**493**	**545**	**592**	**619**	**682**	**724**	**766**	**790**	**815**	**832**	**842**	1.9	1.4	1.2	0.5
Heavy goods and light commercial vehicles	342	385	422	439	486	518	551	566	581	591	595	2.1	1.4	1.3	0.4
Rail	83	95	107	116	126	134	140	146	154	160	165	2.6	1.6	1.1	0.8
Inland navigation	68	65	63	65	70	73	75	77	79	81	82	-0.7	1.1	0.7	0.5
Energy demand in transport (ktoe) [4]	**65101**	**59797**	**58145**	**59791**	**56192**	**53722**	**51524**	**49980**	**49511**	**49397**	**49357**	-1.1	-0.3	-0.9	-0.2
Public road transport	1047	897	803	815	840	830	812	801	796	792	790	-2.6	0.4	-0.3	-0.1
Private cars and motorcycles	42176	37675	35607	35814	31264	28653	26723	25595	24958	24398	23982	-1.7	-1.3	-1.6	-0.5
Heavy goods and light commercial vehicles	12303	11057	11325	11780	12383	12396	12635	12663	12673	12634	12525	-0.8	0.9	0.2	0.0
Rail	1947	1580	1414	1496	1442	1473	1450	1476	1515	1528	1543	-3.2	0.2	0.1	0.3
Aviation	7345	8265	8719	9601	9956	10052	9581	9118	9235	9708	10180	1.7	1.3	-0.4	0.3
Inland navigation	283	323	278	285	307	317	324	328	334	336	336	-0.2	1.0	0.5	0.2
By transport activity															
Passenger transport	51841	47805	45951	47113	42858	40347	37894	36307	35820	35755	35837	-1.2	-0.7	-1.2	-0.3
Freight transport	13261	11992	12194	12678	13333	13375	13630	13673	13690	13642	13520	-0.8	0.9	0.2	0.0
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.3	0.6	1.4	1.9	2.3	2.8	3.3				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.4	3.2	5.1	5.2	5.3	5.6	5.8	6.1	6.3	6.6	6.7				
ENERGY EFFICIENCY															
Primary energy consumption	**317273**	**317254**	**310393**	**297924**	**282452**	**268388**	**251687**	**237813**	**233755**	**227588**	**229575**	-0.2	-0.9	-1.1	-0.5
Final Energy Demand	**219989**	**218456**	**219721**	**217308**	**212550**	**205168**	**197367**	**190154**	**187135**	**186136**	**185668**	0.0	-0.3	-0.7	-0.3
by sector															
Industry	57570	59093	60563	62096	65189	62180	59437	54995	51879	51143	51407	0.5	0.7	-0.9	-0.7
Energy intensive industries	39345	40705	42170	43510	45941	43428	41111	37621	34982	34043	34168	0.7	0.9	-1.1	-0.9
Other industrial sectors	18225	18389	18393	18586	19248	18752	18326	17374	16897	17100	17240	0.1	0.5	-0.5	-0.3
Residential	63072	63498	62442	58726	57052	55938	54694	54176	54350	54552	54700	-0.1	-0.9	-0.4	0.0
Tertiary	34239	35302	38222	36396	33837	33051	31444	30732	31127	30779	29948	1.1	-1.2	-0.7	-0.2
Transport[5]	65109	60563	58494	60090	56472	53999	51792	50250	49778	49663	49613	-1.1	-0.4	-0.9	-0.2
by fuel															
Solids	10958	8238	9379	9284	9898	9797	8706	6944	5012	4254	3823	-1.5	0.5	-1.3	-4.0
Oil	99738	90309	83168	82419	73036	68347	62231	58758	55683	54008	52365	-1.8	-1.3	-1.6	-0.9
Gas	56064	55136	56501	56368	55599	51661	49471	47810	47742	48168	48742	0.1	-0.2	-1.2	-0.1
Electricity	41570	44907	45781	44880	45601	46881	48064	48303	48688	49293	49856	1.0	0.0	0.5	0.2
Heat (from CHP and District Heating)	6831	10751	11268	9856	9830	10291	10452	9961	10273	10341	10104	5.1	-1.4	0.6	-0.2
Renewable energy forms	4828	9116	13625	14468	18493	18044	18220	18063	19205	19370	19901	10.9	3.1	-0.1	0.4
Other	0	0	0	32	94	148	221	315	532	702	878	0.0	0.0	8.9	7.1
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	144	140	128	116	104	94	86	79	74	68	66	-1.2	-2.1	-1.9	-1.3
Industry (Energy on Value added, index 2000=100)	100	96	93	90	90	83	77	70	65	62	61	-0.7	-0.3	-1.6	-1.1
Residential (Energy on Private Income, index 2000=100)	100	99	94	83	75	69	64	61	58	54	51	-0.6	-2.2	-1.5	-1.1
Tertiary (Energy on Value added, index 2000=100)	100	98	98	87	76	70	64	59	57	53	49	-0.2	-2.6	-1.7	-1.3
Passenger transport (toe/Mpkm) [6]	42	37	33	32	28	25	23	21	20	19	19	-2.2	-1.7	-2.1	-0.9
Freight transport (toe/Mtkm)	27	22	21	20	20	18	18	17	17	16	16	-2.6	-0.5	-0.9	-0.5
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**1076.8**	**1015.8**	**957.1**	**943.5**	**893.0**	**865.5**	**779.7**	**711.4**	**665.5**	**610.1**	**531.5**	-1.2	-0.7	-1.3	-1.9
of which ETS sectors (2013 scope) GHG emissions		543.7	505.7	510.9	497.4	492.7	434.4	379.3	342.5	293.7	223.3		-0.2	-1.3	-3.3
of which ESD sectors (2013 scope) GHG emissions		472.1	451.3	432.6	395.6	372.8	345.3	332.0	323.0	316.4	308.2		-1.3	-1.4	-0.6
CO_2 Emissions (energy related)	**852.1**	**825.2**	**787.8**	**777.7**	**734.1**	**714.2**	**643.9**	**579.9**	**536.0**	**482.7**	**418.8**	-0.8	-0.7	-1.3	-2.1
Power generation/District heating	330.6	344.9	324.5	317.6	303.7	312.8	274.9	235.2	211.8	167.0	108.9	-0.2	-0.7	-1.0	-4.5
Energy Branch	28.1	26.2	23.5	25.9	22.0	21.0	19.1	18.1	17.2	16.4	16.4	-1.8	-0.7	-1.4	-0.8
Industry	130.2	115.3	115.3	112.7	116.6	103.1	91.4	77.7	64.4	60.9	59.5	-1.2	0.1	-2.4	-2.1
Residential	119.4	110.8	104.3	98.0	87.4	86.2	81.2	80.0	77.3	76.6	75.5	-1.3	-1.8	-0.7	-0.4
Tertiary	58.5	55.9	56.3	55.4	47.1	41.5	35.3	32.7	31.7	30.3	28.4	-0.4	-1.8	-2.8	-1.1
Transport	185.3	172.2	163.8	168.2	157.3	149.6	142.0	136.3	133.5	131.6	130.1	-1.2	-0.4	-1.0	-0.4
CO_2 Emissions (non energy and non land use related)	**63.7**	**61.6**	**55.6**	**56.8**	**58.4**	**57.2**	**50.0**	**48.7**	**47.7**	**46.5**	**32.6**	-1.4	0.5	-1.5	-2.1
Non-CO2 GHG emissions	**161.0**	**128.9**	**113.7**	**109.1**	**100.4**	**94.0**	**85.7**	**82.7**	**81.8**	**80.9**	**80.1**	-3.4	-1.2	-1.6	-0.3
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**85.5**	**80.6**	**76.0**	**74.9**	**70.9**	**68.7**	**61.9**	**56.5**	**52.8**	**48.4**	**42.2**	-1.2	-0.7	-1.3	-1.9
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.50	0.46	0.42	0.41	0.42	0.42	0.37	0.32	0.28	0.22	0.14	-1.7	-0.1	-1.2	-4.7
Final energy demand (t of CO_2/toe)	2.24	2.08	2.00	2.00	1.92	1.85	1.77	1.72	1.64	1.61	1.58	-1.1	-0.4	-0.8	-0.6
Industry	2.26	1.95	1.90	1.81	1.79	1.66	1.54	1.41	1.24	1.19	1.16	-1.7	-0.6	-1.5	-1.4
Residential	1.89	1.74	1.67	1.67	1.53	1.54	1.48	1.48	1.42	1.40	1.38	-1.2	-0.9	-0.3	-0.4
Tertiary	1.71	1.58	1.47	1.52	1.39	1.26	1.12	1.06	1.02	0.99	0.95	-1.5	-0.6	-2.1	-0.8
Transport	2.85	2.84	2.80	2.80	2.79	2.77	2.74	2.71	2.68	2.65	2.62	-0.2	-0.1	-0.2	-0.2
RES in Gross Final Energy Consumption [7] (in%)	**3.6**	**6.7**	**10.5**	**13.5**	**18.5**	**19.5**	**21.3**	**22.5**	**24.7**	**27.6**	**29.3**				
RES-H&C share	4.2	6.7	9.6	10.6	17.3	17.7	18.1	19.1	21.3	22.2	23.2				
RES-E share	6.1	10.5	18.1	29.5	34.9	36.7	41.6	43.0	46.3	54.4	57.4				
RES-T share (based on ILUC formula)	0.8	4.2	6.9	8.8	10.4	12.7	15.5	17.3	19.5	23.3	25.8				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	43	51	62	86	107	103	101	93	87	87	85	3.7	5.6	-0.5	-0.8
Average Price of Electricity in Final demand sectors (€'13/MWh	132	171	164	160	170	173	173	182	183	183	183	2.2	0.3	0.2	0.3
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**225.6**	**285.4**	**302.7**	**290.0**	**342.7**	**358.5**	**372.5**	**383.4**	**392.9**	**398.0**	**407.2**	3.0	1.3	0.8	0.4
as % of GDP	**9.5**	**11.7**	**11.6**	**10.4**	**11.5**	**11.5**	**11.5**	**11.4**	**11.1**	**10.7**	**10.4**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Greece: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**11**	**11**	**11**	**11**	**11**	**10**	**10**	**10**	**10**	**9**	**9**	0.3	-0.5	-0.6	-0.5
GDP (in 000 M€13)	**190**	**231**	**232**	**200**	**207**	**213**	**225**	**246**	**268**	**282**	**296**	2.0	-1.1	0.8	1.4
Gross Inland Consumption (ktoe)	**28292**	**31410**	**28725**	**26055**	**25165**	**23054**	**20886**	**21083**	**20674**	**19210**	**18852**	0.2	-1.3	-1.8	-0.5
Solids	9038	8944	7863	6765	5608	4573	2943	3071	2348	471	39	-1.4	-3.3	-6.2	-19.4
Oil	16085	18119	14974	12997	12166	10929	9728	9410	9122	8831	8684	-0.7	-2.1	-2.2	-0.6
Natural gas	1705	2354	3235	2979	3778	3346	3279	3434	3583	3629	3591	6.6	1.6	-1.4	0.5
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	-1	325	491	600	401	246	221	176	339	352	324	0.0	-2.0	-5.8	1.9
Renewable energy forms	1466	1668	2163	2714	3212	3961	4714	4993	5282	5928	6214	4.0	4.0	3.9	1.4
Energy Branch Consumption	**1634**	**1820**	**1839**	**1906**	**1781**	**1636**	**1454**	**1447**	**1379**	**1245**	**1210**	1.2	-0.3	-2.0	-0.9
Non-Energy Uses	**719**	**761**	**1108**	**824**	**848**	**836**	**835**	**878**	**913**	**904**	**911**	4.4	-2.6	-0.2	0.4
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**10012**	**10326**	**9461**	**9027**	**8311**	**8076**	**7266**	**7692**	**7229**	**6039**	**5923**	-0.6	-1.3	-1.3	-1.0
Solids	8222	8538	7315	6430	5309	4315	2763	2914	2227	407	1	-1.2	-3.2	-6.3	-33.7
Oil	282	101	132	75	73	71	68	66	0	0	0	-7.3	-5.7	-0.7	-100.0
Natural gas	42	18	8	0	0	0	0	0	0	0	0	-15.8	-100.0	0.0	0.0
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	1466	1668	2006	2521	2929	3690	4435	4712	5002	5632	5922	3.2	3.9	4.2	1.5
Hydro	318	431	641	506	508	477	480	484	483	482	482	7.3	-2.3	-0.6	0.0
Biomass & Waste	1009	1015	919	1157	1335	1405	1492	1560	1626	1755	1740	-0.9	3.8	1.1	0.8
Wind	39	109	233	330	448	897	1372	1378	1536	1830	1909	19.7	6.7	11.8	1.7
Solar and others	99	101	197	514	624	893	1072	1267	1330	1537	1763	7.1	12.2	5.6	2.5
Geothermal	2	12	16	16	15	17	20	24	27	28	28	25.9	-0.4	2.5	1.8
Net Imports (ktoe)	**22151**	**23498**	**21712**	**20057**	**19918**	**18010**	**16656**	**16426**	**16545**	**16313**	**16105**	-0.2	-0.9	-1.8	-0.2
Solids	769	364	401	335	299	258	181	157	121	64	38	-6.3	-2.9	-4.9	-7.5
Oil	19695	20476	17433	15950	15121	13826	12614	12248	12049	11791	11659	-1.2	-1.4	-1.8	-0.4
Crude oil and Feedstocks	20596	19488	20633	24349	23331	21980	20730	20213	19845	19403	19064	0.0	1.2	-1.2	-0.4
Oil products	-900	988	-3200	-8399	-8211	-8154	-8115	-7965	-7795	-7612	-7405	13.5	9.9	-0.1	-0.5
Natural gas	1689	2332	3231	2979	3814	3410	3362	3565	3755	3811	3792	6.7	1.7	-1.3	0.6
Electricity	-1	325	491	600	401	246	221	176	339	352	324	0.0	-2.0	-5.8	1.9
Import Dependency (%)	69.5	68.6	69.1	69.0	70.6	69.0	69.6	68.1	69.6	73.0	73.1				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**53425**	**59427**	**57367**	**54082**	**58052**	**57523**	**54970**	**58077**	**57279**	**57025**	**58595**	0.7	0.1	-0.5	0.3
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	34313	35543	30797	26751	22885	19611	11963	12644	9364	1821	0	-1.1	-2.9	-6.3	-100.0
Oil (including refinery gas)	8885	9207	6089	4847	5122	2384	131	123	126	57	59	-3.7	-1.7	-30.7	-3.9
Gas (including derived gases)	5920	8171	9830	8817	13840	11444	11286	11389	11642	12620	12576	5.2	3.5	-2.0	0.5
Biomass-waste	163	222	319	195	382	660	812	1091	1061	1781	1784	6.9	1.8	7.8	4.0
Hydro (pumping excluded)	3693	5017	7460	5880	5901	5552	5578	5631	5618	5609	5607	7.3	-2.3	-0.6	0.0
Wind	451	1266	2714	3834	5207	10434	15949	16021	17857	21281	22200	19.7	6.7	11.8	1.7
Solar	0	1	158	3757	4715	7438	9252	11177	11611	13856	16368	0.0	40.4	7.0	2.9
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**11212**	**13208**	**15889**	**19208**	**19703**	**22088**	**23780**	**24196**	**24086**	**25436**	**26514**	3.5	2.2	1.9	0.5
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	3298	3598	4715	8146	9363	12651	15233	16105	16768	18962	20371	3.6	7.1	5.0	1.5
Hydro (pumping excluded)	3072	3106	3215	3389	3579	3579	3579	3579	3579	3579	3579	0.5	1.1	0.0	0.0
Wind	226	491	1298	2152	2637	4306	6038	6038	6567	7600	7884	19.1	7.3	8.6	1.3
Solar	0	1	202	2605	3147	4766	5616	6488	6622	7783	8908	0.0	31.6	6.0	2.3
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	7914	9610	11174	11062	10340	9437	8548	8092	7318	6474	6143	3.5	-0.8	-1.9	-1.6
of which cogeneration units	195	3051	588	284	309	316	341	390	446	576	535	11.7	-6.2	1.0	2.3
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	4454	4754	4312	3923	3030	3100	2845	2834	2834	1405	833	-0.3	-3.5	-0.6	-6.0
Gas fired	1157	2203	4189	5062	5306	5272	4738	4418	3827	4416	4897	13.7	2.4	-1.1	0.2
Oil fired	2302	2625	2618	2022	1824	834	733	595	409	378	153	1.3	-3.6	-8.7	-7.5
Biomass-waste fired	1	28	55	55	180	230	232	245	249	275	260	50.5	12.6	2.5	0.6
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	50.3	47.7	38.3	29.6	31.4	28.2	25.5	26.5	26.4	25.3	25.1				
Efficiency of gross thermal power generation (%)	36.9	37.0	37.5	38.6	41.4	42.7	43.2	43.0	43.7	54.8	58.5				
% of gross electricity from CHP	2.1	7.8	4.3	3.0	3.4	2.9	3.1	3.9	4.3	4.5	6.6				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	8.1	10.9	18.6	25.3	27.9	41.9	57.5	58.4	63.1	74.6	78.4				
Fuel Inputs to Thermal Power Generation (GWh_e)	**11492**	**12344**	**10787**	**9041**	**8776**	**6860**	**4819**	**5053**	**4370**	**2555**	**2122**	-0.6	-2.0	-5.8	-4.0
Solids	8170	8694	7567	6558	5413	4399	2817	2972	2271	414	0	-0.8	-3.3	-6.3	-100.0
Oil (including refinery gas)	1978	1992	1278	1005	1071	504	43	40	42	15	16	-4.3	-1.8	-27.5	-5.0
Gas (including derived gases)	1280	1605	1863	1435	2209	1813	1783	1820	1855	1830	1811	3.8	1.7	-2.1	0.1
Biomass & Waste	64	52	79	43	83	144	176	221	203	296	295	2.2	0.4	7.8	2.6
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**22570**	**21629**	**22585**	**24150**	**24139**	**22821**	**21638**	**21140**	**20716**	**20322**	**20015**	0.0	0.7	-1.1	-0.4
Refineries	22508	21536	22462	23941	23853	22531	21335	20825	20387	19959	19627	0.0	0.6	-1.1	-0.4
Biofuels and hydrogen production	0	0	124	207	279	280	292	303	316	348	373	0.0	8.5	0.4	1.2
District heating	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Derived gases, cokeries etc.	62	93	0	2	7	9	11	12	13	14	15	-95.7	#####	5.2	1.5

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Greece: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**129**	**153**	**161**	**164**	**172**	**177**	**184**	**193**	**200**	**207**	**213**	2.2	0.7	0.7	0.7
Public road transport	22	22	21	21	22	23	23	23	23	24	24	-0.3	0.6	0.2	0.2
Private cars and motorcycles	67	90	105	106	108	108	110	112	114	114	115	4.7	0.2	0.2	0.2
Rail	3	3	3	3	3	4	4	4	4	5	5	-0.2	0.9	1.4	1.3
Aviation [3]	30	31	24	26	32	35	40	45	50	55	60	-2.2	2.8	2.3	2.1
Inland navigation	7	7	7	7	7	8	8	8	8	9	9	-0.1	0.2	0.6	0.6
Freight transport activity (Gtkm)	**38**	**34**	**37**	**37**	**39**	**41**	**42**	**44**	**46**	**47**	**48**	-0.1	0.5	0.7	0.6
Heavy goods and light commercial vehicles	28	24	30	30	32	33	34	35	36	37	38	0.8	0.5	0.7	0.5
Rail	0	1	1	1	1	1	1	1	1	1	1	3.7	0.8	0.9	0.8
Inland navigation	9	9	6	6	7	7	7	8	8	9	9	-3.6	0.5	0.7	1.2
Energy demand in transport (ktoe) [4]	**7286**	**8174**	**8147**	**7472**	**7257**	**6975**	**6728**	**6780**	**6807**	**6828**	**6841**	1.1	-1.2	-0.8	0.1
Public road transport	423	438	403	403	408	398	387	379	373	368	363	-0.5	0.1	-0.5	-0.3
Private cars and motorcycles	3327	4435	4483	4018	3698	3366	3074	2974	2910	2838	2774	3.0	-1.9	-1.8	-0.5
Heavy goods and light commercial vehicles	1668	1426	1601	1480	1489	1466	1439	1430	1424	1419	1424	-0.4	-0.7	-0.3	0.0
Rail	49	46	24	22	23	23	23	24	24	24	23	-6.8	-0.4	0.0	0.0
Aviation	1325	1181	919	936	1016	1090	1156	1295	1379	1471	1543	-3.6	1.0	1.3	1.5
Inland navigation	495	648	717	612	622	631	649	677	696	709	713	3.8	-1.4	0.4	0.5
By transport activity															
Passenger transport	5530	6460	6297	5784	5553	5290	5063	5107	5126	5145	5146	1.3	-1.2	-0.9	0.1
Freight transport	1756	1714	1850	1688	1704	1685	1665	1672	1681	1683	1695	0.5	-0.8	-0.2	0.1
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.2	0.5	1.0	1.4	1.7	2.1	2.3				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	1.5	2.8	3.9	4.1	4.5	4.6	4.7	5.0	5.1				
ENERGY EFFICIENCY															
Primary energy consumption	**27573**	**30650**	**27617**	**25230**	**24317**	**22218**	**20051**	**20206**	**19761**	**18307**	**17941**	0.0	-1.3	-1.9	-0.6
Final Energy Demand	**18676**	**20958**	**19197**	**17486**	**17105**	**16398**	**15635**	**15677**	**15739**	**15720**	**15657**	0.3	-1.1	-0.9	0.0
by sector															
Industry	4450	4161	3672	3224	3313	3193	2900	2917	2964	2975	2875	-1.9	-1.0	-1.3	0.0
Energy intensive industries	2737	2588	2427	2157	2198	2094	1821	1873	1877	1879	1776	-1.2	-1.0	-1.9	-0.1
Other industrial sectors	1714	1573	1245	1067	1115	1099	1079	1045	1087	1096	1100	-3.1	-1.1	-0.3	0.1
Residential	4502	5510	4615	4351	4275	4084	3941	3852	3761	3661	3625	0.2	-0.8	-0.8	-0.4
Tertiary	2426	3100	2752	2426	2247	2133	2051	2113	2191	2238	2298	1.3	-2.0	-0.9	0.6
Transport[5]	7297	8188	8158	7484	7271	6989	6743	6795	6823	6845	6859	1.1	-1.1	-0.8	0.1
by fuel															
Solids	891	458	302	208	195	175	126	99	77	56	39	-10.3	-4.3	-4.2	-5.7
Oil	12744	14413	12110	10307	9478	8892	8267	7961	7680	7487	7343	-0.5	-2.4	-1.4	-0.6
Gas	257	586	982	1018	1029	996	939	1033	1142	1190	1173	14.3	0.5	-0.9	1.1
Electricity	3710	4377	4568	4397	4583	4472	4342	4547	4670	4744	4849	2.1	0.0	-0.5	0.6
Heat (from CHP and District Heating)	28	49	46	44	51	60	71	90	100	97	99	5.2	0.9	3.4	1.7
Renewable energy forms	1046	1076	1191	1510	1762	1793	1873	1929	2043	2107	2099	1.3	4.0	0.6	0.6
Other	0	0	0	2	7	11	15	19	27	39	55	0.0	0.0	7.7	6.7
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	149	136	124	130	121	108	93	86	77	68	64	-1.8	-0.2	-2.6	-1.9
Industry (Energy on Value added, index 2000=100)	100	88	101	99	98	92	80	74	70	67	62	0.1	-0.4	-2.0	-1.3
Residential (Energy on Private Income, index 2000=100)	100	99	80	88	88	83	77	70	64	61	59	-2.2	0.9	-1.3	-1.3
Tertiary (Energy on Value added, index 2000=100)	100	101	86	88	78	72	66	62	59	57	55	-1.5	-0.9	-1.8	-0.8
Passenger transport (toe/Mpkm) [6]	40	40	37	33	30	27	25	24	23	22	22	-0.9	-2.1	-1.7	-0.8
Freight transport (toe/Mtkm)	46	51	50	45	43	41	39	38	37	36	35	0.7	-1.3	-0.9	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**133.3**	**139.6**	**121.4**	**105.7**	**96.6**	**85.1**	**71.7**	**70.9**	**66.7**	**55.9**	**52.6**	-0.9	-2.3	-2.9	-1.5
of which ETS sectors (2013 scope) GHG emissions		77.2	64.9	57.3	52.9	44.6	34.4	34.6	30.9	21.0	18.3		-2.0	-4.2	-3.1
of which ESD sectors (2013 scope) GHG emissions		62.4	56.5	48.4	43.7	40.5	37.3	36.3	35.8	34.9	34.3		-2.6	-1.6	-0.4
CO_2 Emissions (energy related)	**98.4**	**106.4**	**92.1**	**79.6**	**72.9**	**62.7**	**50.4**	**50.3**	**45.8**	**35.2**	**32.4**	-0.7	-2.3	-3.6	-2.2
Power generation/District heating	52.1	55.6	47.9	40.9	37.0	28.9	19.1	19.9	16.4	6.5	4.3	-0.8	-2.6	-6.4	-7.2
Energy Branch	3.1	3.4	3.6	3.9	3.6	3.3	3.0	3.0	2.9	2.7	2.7	1.6	0.0	-1.5	-0.6
Industry	10.4	8.9	7.2	6.2	6.0	5.3	4.5	3.8	3.4	3.2	2.8	-3.7	-1.8	-2.9	-2.2
Residential	7.6	9.9	6.7	5.0	4.3	4.1	3.7	3.3	3.0	2.8	2.7	-1.3	-4.2	-1.6	-1.6
Tertiary	3.4	4.3	2.8	1.8	1.2	1.0	0.9	0.9	0.9	0.9	0.8	-2.1	-8.0	-2.9	-0.5
Transport	21.8	24.4	24.0	21.7	20.9	20.0	19.2	19.3	19.3	19.2	19.1	1.0	-1.4	-0.8	0.0
CO_2 Emissions (non energy and non land use related)	**8.9**	**9.6**	**6.6**	**6.8**	**6.7**	**6.9**	**7.2**	**6.6**	**6.7**	**6.8**	**6.1**	-2.9	0.1	0.8	-0.8
Non-CO2 GHG emissions	**26.1**	**23.6**	**22.6**	**19.3**	**16.9**	**15.4**	**14.0**	**14.1**	**14.2**	**13.9**	**14.1**	-1.4	-2.9	-1.9	0.0
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**124.1**	**129.9**	**113.0**	**98.4**	**89.9**	**79.2**	**66.7**	**66.0**	**62.1**	**52.0**	**49.0**	-0.9	-2.3	-2.9	-1.5
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.97	0.93	0.83	0.75	0.63	0.49	0.34	0.33	0.28	0.11	0.07	-1.6	-2.7	-6.0	-7.5
Final energy demand (t of CO_2/toe)	2.32	2.26	2.12	1.99	1.89	1.86	1.81	1.74	1.69	1.65	1.62	-0.9	-1.1	-0.5	-0.5
Industry	2.35	2.13	1.96	1.91	1.80	1.68	1.54	1.31	1.15	1.07	0.99	-1.8	-0.8	-1.6	-2.2
Residential	1.69	1.79	1.45	1.16	1.01	1.00	0.93	0.86	0.80	0.76	0.73	-1.5	-3.5	-0.8	-1.2
Tertiary	1.41	1.38	1.01	0.76	0.54	0.48	0.44	0.43	0.40	0.38	0.36	-3.3	-6.1	-2.0	-1.1
Transport	2.99	2.98	2.94	2.90	2.87	2.87	2.85	2.84	2.82	2.80	2.78	-0.2	-0.2	-0.1	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**7.2**	**7.0**	**9.7**	**14.4**	**18.4**	**23.6**	**29.6**	**31.4**	**33.5**	**37.8**	**40.0**				
RES-H&C share	13.6	12.8	17.4	24.8	29.9	32.6	36.8	39.7	42.9	45.0	46.5				
RES-E share	7.2	8.2	12.3	22.4	25.8	39.9	55.0	56.6	59.2	69.9	74.0				
RES-T share (based on ILUC formula)	0.0	0.0	1.9	1.4	10.2	11.4	14.2	15.9	17.7	21.0	23.2				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€13/MWh)	60	63	72	85	97	99	100	92	87	72	64	1.9	3.0	0.3	-2.2
Average Price of Electricity in Final demand sectors (€13/MWh	74	78	108	124	137	146	155	154	149	153	154	3.8	2.4	1.2	0.0
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**15.2**	**20.2**	**26.7**	**26.6**	**31.4**	**32.8**	**34.2**	**35.9**	**37.4**	**38.9**	**39.9**	5.8	1.6	0.9	0.8
as % of GDP	**8.0**	**8.7**	**11.5**	**13.3**	**15.1**	**15.4**	**15.2**	**14.6**	**14.0**	**13.8**	**13.5**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Hungary: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**9**	**9**	-0.2	-0.2	-0.1	-0.2
GDP (in 000 M€13)	**83**	**102**	**101**	**107**	**117**	**131**	**145**	**158**	**169**	**180**	**192**	1.9	1.5	2.2	1.4
Gross Inland Consumption (ktoe)	**25298**	**27611**	**25811**	**23493**	**24212**	**25203**	**27054**	**26521**	**26929**	**27125**	**27435**	0.2	-0.6	1.1	0.1
Solids	3850	3031	2730	2635	2085	1408	1190	431	355	287	256	-3.4	-2.7	-5.5	-7.4
Oil	6964	7115	6699	6271	6320	6630	6898	7154	7283	7407	7590	-0.4	-0.6	0.9	0.5
Natural gas	9657	12094	9816	7786	8602	7435	7111	8115	7899	7863	7986	0.2	-1.3	-1.9	0.6
Nuclear	3672	3585	4078	3666	3677	6045	8412	6612	6661	6661	6661	1.1	-1.0	8.6	-1.2
Electricity	296	535	447	1204	862	827	412	367	405	481	462	4.2	6.8	-7.1	0.6
Renewable energy forms	859	1251	2042	1931	2665	2858	3030	3843	4326	4426	4480	9.0	2.7	1.3	2.0
Energy Branch Consumption	**1164**	**1062**	**1095**	**1029**	**947**	**943**	**985**	**899**	**915**	**920**	**935**	-0.6	-1.4	0.4	-0.3
Non-Energy Uses	**1587**	**2169**	**1974**	**2275**	**2502**	**2820**	**3165**	**3412**	**3557**	**3670**	**3788**	2.2	2.4	2.4	0.9
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**11598**	**10372**	**11065**	**10244**	**9828**	**10691**	**13105**	**10810**	**11360**	**11469**	**11533**	-0.5	-1.2	2.9	-0.6
Solids	2893	1748	1593	1794	1328	644	614	4	4	3	3	-5.8	-1.8	-7.4	-23.0
Oil	1699	1457	1150	795	619	288	209	0	0	0	0	-3.8	-6.0	-10.3	-100.0
Natural gas	2475	2331	2235	1857	1203	526	498	0	0	0	0	-1.0	-6.0	-8.4	-100.0
Nuclear	3672	3585	4078	3666	3677	6045	8412	6612	6661	6661	6661	1.1	-1.0	8.6	-1.2
Renewable energy sources	859	1251	2010	2132	3001	3188	3372	4194	4695	4804	4869	8.9	4.1	1.2	1.9
Hydro	15	17	16	20	20	20	20	20	20	63	92	0.6	2.1	0.0	8.0
Biomass & Waste	758	1145	1844	1905	2622	2610	2535	2599	2696	2723	2729	9.3	3.6	-0.3	0.4
Wind	0	1	46	50	77	77	77	207	250	272	306	0.0	5.3	0.0	7.2
Solar and others	0	2	6	9	46	75	78	106	152	180	236	0.0	23.7	5.5	5.7
Geothermal	86	87	99	148	237	406	662	1262	1577	1567	1506	1.4	9.2	10.8	4.2
Net Imports (ktoe)	**13956**	**17421**	**14988**	**13249**	**14384**	**14512**	**13949**	**15712**	**15569**	**15656**	**15902**	0.7	-0.4	-0.3	0.7
Solids	1087	1299	1143	841	757	764	576	427	352	283	253	0.5	-4.0	-2.7	-4.0
Oil	5291	5780	5637	5476	5701	6342	6689	7154	7283	7407	7590	0.6	0.1	1.6	0.6
Crude oil and Feedstocks	5887	5988	5806	5273	5505	6092	6391	6828	6965	7105	7300	-0.1	-0.5	1.5	0.7
Oil products	-596	-208	-169	203	196	250	298	326	318	302	290	-11.9	0.0	4.3	-0.1
Natural gas	7283	9808	7726	5929	7400	6909	6613	8115	7899	7863	7986	0.6	-0.4	-1.1	0.9
Electricity	296	535	447	1204	862	827	412	367	405	481	462	4.2	6.8	-7.1	0.6
Import Dependency (%)	55.2	63.1	58.1	56.4	59.4	57.6	51.6	59.2	57.8	57.7	58.0				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**35191**	**35756**	**37371**	**27859**	**33045**	**35948**	**41925**	**43186**	**45271**	**46770**	**48605**	0.6	-1.2	2.4	0.7
Nuclear energy	14180	13834	15761	15087	15024	24706	34387	26977	28346	28346	28346	1.1	-0.5	8.6	-1.0
Solids	9590	7023	6234	6436	4940	2224	2113	0	0	0	0	-4.2	-2.3	-8.1	-100.0
Oil (including refinery gas)	4404	455	490	52	0	0	0	0	0	0	0	-19.7	-100.0	0.0	0.0
Gas (including derived gases)	6719	12502	11714	3383	9557	5395	2219	11015	10741	11123	11376	5.7	-2.0	-13.6	8.5
Biomass-waste	120	1730	2449	2015	2241	2340	1921	2395	2722	2971	3558	35.2	-0.9	-1.5	3.1
Hydro (pumping excluded)	178	202	188	232	232	232	232	232	236	731	1072	0.5	2.1	0.0	8.0
Wind	0	10	534	585	890	890	890	2406	2907	3159	3562	0.0	5.2	0.0	7.2
Solar	0	0	1	32	97	97	97	97	254	375	626	0.0	55.6	0.0	9.8
Geothermal and other renewables	0	0	0	38	65	65	65	65	65	65	65	0.0	0.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**8589**	**8297**	**8292**	**7495**	**7075**	**7666**	**8463**	**8440**	**8856**	**9771**	**10093**	-0.4	-1.6	1.8	0.9
Nuclear energy	1920	1920	1920	1960	1960	3221	4482	3522	3692	3692	3692	0.0	0.2	8.6	-1.0
Renewable energy	48	66	348	431	640	640	640	1291	1625	1999	2475	21.9	6.3	0.0	7.0
Hydro (pumping excluded)	48	49	53	57	57	57	57	57	58	183	267	1.0	0.7	0.0	8.0
Wind	0	17	293	329	477	477	477	1128	1317	1457	1616	0.0	5.0	0.0	6.3
Solar	0	0	2	45	106	106	106	106	249	360	592	0.0	48.7	0.0	9.0
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	6621	6311	6024	5103	4476	3806	3342	3627	3539	4080	3926	-0.9	-2.9	-2.9	0.8
of which cogeneration units	1464	2047	1862	1144	1575	1080	1574	1103	939	1474	1422	2.4	-1.7	0.0	-0.5
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	1747	1380	1155	1137	674	407	396	3	3	3	3	-4.1	-5.2	-5.2	-21.2
Gas fired	4160	4622	4605	3496	3384	2978	2531	3208	3093	3607	3483	1.0	-3.0	-2.9	1.6
Oil fired	602	176	91	91	11	11	5	5	4	0	0	-17.2	-19.2	-7.3	-100.0
Biomass-waste fired	112	133	173	349	356	357	357	359	386	417	388	4.4	7.5	0.0	0.4
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	30	52	52	52	52	52	52	52	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	42.9	45.7	47.7	39.3	50.3	50.6	53.5	55.9	55.8	52.3	52.6				
Efficiency of gross thermal power generation (%)	29.8	32.8	34.1	37.3	40.6	38.9	32.6	47.9	48.4	50.6	51.9				
% of gross electricity from CHP	13.5	19.1	19.6	14.4	13.8	10.0	7.6	10.2	10.1	13.1	15.7				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	41.1	44.1	50.7	64.6	56.1	78.8	89.7	74.5	76.3	76.2	76.6				
Fuel Inputs to Thermal Power Generation (GWh_e)	**6009**	**5692**	**5265**	**2752**	**3559**	**2216**	**1669**	**2419**	**2402**	**2405**	**2486**	-1.3	-3.8	-7.3	2.0
Solids	2755	1924	1646	1611	1254	577	550	0	0	0	0	-5.0	-2.7	-7.9	-100.0
Oil (including refinery gas)	1052	155	138	15	0	0	0	0	0	0	0	-18.4	-100.0	0.0	0.0
Gas (including derived gases)	2140	3079	2704	657	1596	910	495	1728	1637	1610	1658	2.4	-5.1	-11.0	6.2
Biomass & Waste	61	534	777	436	653	673	568	635	709	739	773	28.9	-1.7	-1.4	1.5
Geothermal heat	0	0	0	32	56	56	56	56	56	56	56	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**12946**	**13165**	**14441**	**12781**	**12806**	**15408**	**18071**	**16759**	**17109**	**17235**	**17374**	1.1	-1.2	3.5	-0.2
Refineries	7638	8118	8427	6997	7094	7393	7635	7879	8022	8189	8423	1.0	-1.7	0.7	0.5
Biofuels and hydrogen production	0	3	175	182	349	337	356	364	370	373	385	0.0	7.2	0.2	0.4
District heating	471	627	474	648	635	639	914	1402	1652	1685	1616	0.1	3.0	3.7	2.9
Derived gases, cokeries etc.	4837	4417	5365	4954	4729	7039	9166	7114	7064	6987	6950	1.0	-1.3	6.8	-1.4

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Hungary: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**80**	**84**	**84**	**86**	**95**	**104**	**111**	**119**	**126**	**133**	**140**	0.5	1.3	1.5	1.2
Public road transport	19	18	16	17	18	19	19	20	21	22	22	-1.3	0.8	0.8	0.7
Private cars and motorcycles	47	51	54	54	60	64	68	73	77	81	84	1.4	1.1	1.2	1.1
Rail	12	12	10	11	12	14	15	17	18	19	21	-1.8	2.0	2.1	1.6
Aviation [3]	2	4	4	4	5	6	8	9	11	12	13	5.9	3.0	5.0	2.4
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Freight transport activity (Gtkm)	**27**	**35**	**34**	**35**	**38**	**42**	**45**	**48**	**51**	**53**	**56**	2.3	1.1	1.8	1.1
Heavy goods and light commercial vehicles	17	24	23	23	24	26	29	30	32	33	34	2.7	0.8	1.5	0.9
Rail	9	9	9	10	11	12	14	15	16	17	18	0.0	2.0	2.4	1.4
Inland navigation	1	2	2	2	3	3	3	3	3	4	4	10.4	0.9	1.7	1.0
Energy demand in transport (ktoe) [4]	**3309**	**4308**	**4341**	**3958**	**4123**	**4219**	**4352**	**4521**	**4634**	**4703**	**4822**	2.8	-0.5	0.5	0.5
Public road transport	339	361	335	346	355	354	353	358	366	370	375	-0.1	0.6	-0.1	0.3
Private cars and motorcycles	1805	2191	2208	2035	2072	2072	2089	2134	2170	2197	2237	2.0	-0.6	0.1	0.3
Heavy goods and light commercial vehicles	763	1341	1418	1214	1279	1297	1341	1397	1430	1439	1472	6.4	-1.0	0.5	0.5
Rail	171	154	150	152	170	190	203	215	225	230	234	-1.3	1.3	1.8	0.7
Aviation	230	261	230	207	243	301	362	412	439	461	499	0.0	0.6	4.1	1.6
Inland navigation	1	1	1	4	4	4	4	5	5	5	5	3.1	14.5	1.4	0.7
By transport activity															
Passenger transport	2449	2877	2826	2642	2732	2798	2877	2981	3056	3114	3199	1.4	-0.3	0.5	0.5
Freight transport	860	1431	1515	1316	1390	1421	1476	1540	1578	1589	1623	5.8	-0.9	0.6	0.5
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.6	0.8	1.1	1.3				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.1	4.1	4.7	8.8	8.4	8.7	8.6	8.6	8.5	8.5				
ENERGY EFFICIENCY															
Primary energy consumption	**23711**	**25442**	**23837**	**21219**	**21709**	**22383**	**23889**	**23109**	**23372**	**23455**	**23646**	0.1	-0.9	1.0	-0.1
Final Energy Demand	**16139**	**18218**	**16596**	**15895**	**16131**	**15983**	**16008**	**15823**	**15949**	**16117**	**16394**	0.3	-0.3	-0.1	0.1
by sector															
Industry	3513	3369	2890	3081	3009	3135	3186	2905	2906	2973	3013	-1.9	0.4	0.6	-0.3
Energy intensive industries	2517	2267	1854	1941	1856	1892	1856	1660	1667	1684	1683	-3.0	0.0	0.0	-0.5
Other industrial sectors	996	1102	1036	1141	1153	1243	1330	1245	1239	1288	1331	0.4	1.1	1.4	0.0
Residential	5603	6464	5740	5253	5242	5053	5062	5028	5057	5112	5189	0.2	-0.9	-0.3	0.1
Tertiary	3712	4072	3625	3566	3718	3541	3372	3330	3314	3291	3329	-0.2	0.3	-1.0	-0.1
Transport[5]	3311	4313	4341	3995	4161	4255	4388	4560	4673	4742	4862	2.7	-0.4	0.5	0.5
by fuel															
Solids	665	690	481	501	368	400	280	179	137	96	74	-3.2	-2.6	-2.7	-6.4
Oil	4218	4904	4638	4261	4182	4253	4303	4371	4397	4433	4520	1.0	-1.0	0.3	0.2
Gas	6503	7852	6261	5868	5815	5454	5407	5148	5040	4948	4997	-0.4	-0.7	-0.7	-0.4
Electricity	2531	2780	2941	2977	3086	3284	3359	3489	3686	3918	4058	1.5	0.5	0.8	1.0
Heat (from CHP and District Heating)	1447	1308	1090	985	1008	927	1016	949	963	1017	1034	-2.8	-0.8	0.1	0.1
Renewable energy forms	774	683	1184	1301	1666	1658	1634	1674	1711	1686	1688	4.3	3.5	-0.2	0.2
Other	0	0	0	1	5	7	9	12	16	19	21	0.0	0.0	6.9	4.0
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	305	271	257	219	207	193	187	168	159	151	143	-1.7	-2.1	-1.0	-1.3
Industry (Energy on Value added, index 2000=100)	100	74	64	63	57	53	49	41	39	38	37	-4.4	-1.2	-1.5	-1.4
Residential (Energy on Private Income, index 2000=100)	100	90	87	77	71	61	55	50	47	45	42	-1.4	-2.0	-2.4	-1.3
Tertiary (Energy on Value added, index 2000=100)	100	90	81	75	71	60	52	47	43	40	38	-2.0	-1.3	-3.1	-1.6
Passenger transport (toe/Mpkm) [6]	30	33	32	30	27	26	24	24	23	22	21	0.8	-1.7	-1.1	-0.7
Freight transport (toe/Mtkm)	32	41	45	38	37	34	33	32	31	30	29	3.5	-2.0	-1.2	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**79.8**	**76.9**	**67.7**	**59.4**	**55.6**	**49.7**	**46.9**	**46.0**	**45.2**	**44.8**	**45.1**	-1.6	-2.0	-1.7	-0.2
of which ETS sectors (2013 scope) GHG emissions		30.6	25.6	19.8	19.4	14.7	12.7	12.2	11.7	11.6	11.6		-2.7	-4.1	-0.5
of which ESD sectors (2013 scope) GHG emissions		46.3	42.1	39.6	36.2	35.0	34.1	33.8	33.5	33.2	33.5		-1.5	-0.6	-0.1
CO_2 Emissions (energy related)	**55.0**	**56.4**	**49.0**	**41.5**	**40.4**	**35.0**	**33.2**	**32.3**	**31.5**	**31.1**	**31.5**	-1.1	-1.9	-2.0	-0.3
Power generation/District heating	22.1	18.3	16.0	10.5	10.7	6.0	4.7	4.9	4.4	4.4	4.4	-3.2	-4.0	-7.8	-0.3
Energy Branch	1.5	1.2	1.5	1.6	1.4	1.3	1.3	1.2	1.2	1.2	1.3	-0.3	-0.6	-0.9	-0.1
Industry	6.8	6.7	5.3	5.8	5.0	4.7	4.2	3.3	3.1	3.0	2.9	-2.4	-0.6	-1.7	-1.8
Residential	8.8	10.7	8.6	7.3	7.0	6.9	6.9	6.7	6.6	6.6	6.7	-0.2	-2.1	-0.1	-0.2
Tertiary	6.1	6.7	5.2	5.2	5.2	4.6	4.3	4.0	3.7	3.4	3.4	-1.6	-0.1	-2.0	-1.1
Transport	9.7	12.7	12.3	11.2	11.2	11.4	11.7	12.1	12.4	12.6	12.8	2.4	-1.0	0.5	0.5
CO_2 Emissions (non energy and non land use related)	**4.5**	**4.9**	**3.7**	**4.4**	**4.8**	**5.0**	**4.8**	**5.0**	**5.1**	**5.2**	**5.1**	-1.9	2.5	0.2	0.3
Non-CO2 GHG emissions	**20.3**	**15.6**	**15.0**	**13.5**	**10.4**	**9.6**	**8.9**	**8.7**	**8.6**	**8.5**	**8.5**	-3.0	-3.6	-1.6	-0.2
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**84.3**	**81.2**	**71.5**	**62.7**	**58.7**	**52.5**	**49.5**	**48.6**	**47.7**	**47.3**	**47.6**	-1.6	-2.0	-1.7	-0.2
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.41	0.34	0.31	0.26	0.23	0.12	0.09	0.09	0.08	0.07	0.07	-2.7	-2.9	-9.4	-0.9
Final energy demand (t of CO_2/toe)	1.94	2.02	1.90	1.85	1.76	1.73	1.69	1.66	1.62	1.58	1.58	-0.2	-0.7	-0.4	-0.4
Industry	1.92	2.00	1.84	1.87	1.67	1.51	1.33	1.14	1.06	0.99	0.97	-0.4	-1.0	-2.3	-1.6
Residential	1.57	1.66	1.50	1.39	1.33	1.36	1.37	1.34	1.31	1.29	1.28	-0.4	-1.2	0.2	-0.3
Tertiary	1.65	1.65	1.44	1.45	1.40	1.30	1.26	1.21	1.12	1.05	1.02	-1.4	-0.3	-1.0	-1.1
Transport	2.92	2.94	2.83	2.81	2.69	2.69	2.67	2.66	2.66	2.65	2.64	-0.3	-0.5	-0.1	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**4.8**	**4.5**	**8.6**	**10.0**	**13.0**	**13.4**	**13.6**	**15.7**	**17.0**	**17.7**	**18.1**				
RES-H&C share	7.6	6.0	11.1	13.4	16.7	18.2	19.0	21.7	24.0	24.9	24.5				
RES-E share	0.6	4.4	7.1	6.7	7.9	7.7	6.6	10.7	12.1	13.7	16.3				
RES-T share (based on ILUC formula)	0.0	0.3	4.7	6.0	10.0	10.1	10.2	10.8	11.1	11.8	12.4				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	48	60	67	76	71	77	78	89	93	95	97	3.5	0.5	0.9	1.1
Average Price of Electricity in Final demand sectors (€'13/MWh	78	107	132	113	130	136	147	154	154	153	153	5.4	-0.2	1.3	0.2
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**11.2**	**16.1**	**20.3**	**18.0**	**22.1**	**25.0**	**27.2**	**29.3**	**31.3**	**32.8**	**34.3**	6.1	0.9	2.1	1.2
as % of GDP	**13.5**	**15.9**	**20.2**	**16.7**	**18.9**	**19.1**	**18.7**	**18.6**	**18.5**	**18.3**	**17.8**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Ireland: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	1.9	0.8	0.0	0.4
GDP (in 000 M€13)	**130**	**165**	**165**	**183**	**208**	**225**	**245**	**267**	**289**	**309**	**336**	2.4	2.3	1.6	1.6
Gross Inland Consumption (ktoe)	**14425**	**15265**	**15191**	**14208**	**14427**	**14442**	**14335**	**14320**	**14462**	**14263**	**14634**	0.5	-0.5	-0.1	0.1
Solids	2601	2664	1979	2028	1843	1570	1249	1148	1073	193	136	-2.7	-0.7	-3.8	-10.5
Oil	8145	8589	7818	6926	6753	6851	6811	6884	6910	6899	7015	-0.4	-1.5	0.1	0.1
Natural gas	3436	3470	4683	4016	3976	4111	4048	3762	3670	3880	3783	3.1	-1.6	0.2	-0.3
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	8	176	40	87	-138	-147	-82	-17	11	80	89	17.0	0.0	-5.1	0.0
Renewable energy forms	235	366	671	1152	1992	2057	2309	2544	2797	3212	3611	11.1	11.5	1.5	2.3
Energy Branch Consumption	**254**	**300**	**243**	**250**	**205**	**203**	**189**	**182**	**180**	**157**	**157**	-0.4	-1.7	-0.8	-0.9
Non-Energy Uses	**675**	**516**	**341**	**360**	**405**	**426**	**447**	**474**	**488**	**514**	**551**	-6.6	1.7	1.0	1.0
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**2159**	**1647**	**1843**	**2031**	**1951**	**2007**	**2219**	**2421**	**2624**	**3007**	**3364**	-1.6	0.6	1.3	2.1
Solids	965	820	981	740	0	1	1	1	0	0	0	0.2	-56.7	14.8	-27.1
Oil	0	0	0	44	0	0	0	0	0	0	0	0.0	0.0	14.8	-27.1
Natural gas	958	461	233	231	231	231	231	229	229	241	241	-13.2	-0.1	0.0	0.2
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	235	366	628	1016	1719	1775	1987	2191	2395	2766	3124	10.3	10.6	1.5	2.3
Hydro	73	54	52	62	79	78	78	80	95	117	129	-3.4	4.4	-0.1	2.5
Biomass & Waste	141	216	327	420	647	689	828	969	1093	1207	1298	8.8	7.1	2.5	2.3
Wind	21	96	242	520	935	947	988	1016	1061	1276	1506	27.7	14.5	0.6	2.1
Solar and others	0	1	8	13	58	60	89	123	138	157	181	54.0	22.8	4.3	3.6
Geothermal	0	0	0	0	0	1	3	3	7	9	10	0.0	0.0	21.5	6.0
Net Imports (ktoe)	**12370**	**13765**	**13215**	**12285**	**12588**	**12554**	**12241**	**12026**	**11968**	**11391**	**11409**	0.7	-0.5	-0.3	-0.4
Solids	1681	1886	945	1288	1843	1569	1248	1147	1073	193	136	-5.6	6.9	-3.8	-10.5
Oil	8203	8694	7706	6991	6864	6969	6933	7007	7034	7027	7148	-0.6	-1.1	0.1	0.2
Crude oil and Feedstocks	3016	3166	2987	2873	2876	2845	2737	2665	2599	2518	2468	-0.1	-0.4	-0.5	-0.5
Oil products	5186	5527	4718	4118	3988	4124	4196	4341	4435	4509	4680	-0.9	-1.7	0.5	0.5
Natural gas	2478	3010	4480	3784	3746	3882	3819	3537	3447	3645	3549	6.1	-1.8	0.2	-0.4
Electricity	8	176	40	87	-138	-147	-82	-17	11	80	89	17.0	0.0	-5.1	0.0
Import Dependency (%)	84.9	89.6	86.5	85.8	86.6	86.2	84.7	83.2	82.0	79.1	77.2				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**23673**	**25626**	**28425**	**26857**	**31049**	**32251**	**32231**	**32651**	**33694**	**34325**	**36099**	1.8	0.9	0.4	0.6
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	8587	8839	6384	6793	6070	5096	3883	3815	3787	0	0	-2.9	-0.5	-4.4	-100.0
Oil (including refinery gas)	4638	3340	605	15	3	16	6	6	6	7	7	-18.4	-41.0	7.3	0.2
Gas (including derived gases)	9263	11574	17705	12617	12491	14281	14764	14396	14471	15915	14723	6.7	-3.4	1.7	0.0
Biomass-waste	95	130	317	660	682	927	1165	1674	1962	2190	2339	12.8	8.0	5.5	3.5
Hydro (pumping excluded)	846	631	599	721	918	906	906	930	1109	1359	1499	-3.4	4.4	-0.1	2.5
Wind	244	1112	2815	6049	10869	11009	11491	11814	12342	14838	17516	27.7	14.5	0.6	2.1
Solar	0	0	0	1	16	16	16	16	16	16	16	0.0	0.0	0.0	0.1
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**4452**	**5930**	**8091**	**9091**	**9723**	**9164**	**8836**	**8893**	**9313**	**10221**	**11156**	6.2	1.9	-1.0	1.2
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	355	751	1611	2724	4259	4301	4448	4521	4667	5433	6214	16.3	10.2	0.4	1.7
Hydro (pumping excluded)	236	234	237	237	295	295	295	301	346	409	442	0.0	2.2	0.0	2.0
Wind	119	517	1374	2486	3945	3987	4135	4201	4302	5005	5753	27.7	11.1	0.5	1.7
Solar	0	0	0	1	19	19	19	19	19	19	19	0.0	0.0	0.0	0.0
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	4097	5179	6480	6366	5464	4863	4388	4372	4646	4788	4941	4.7	-1.7	-2.2	0.6
of which cogeneration units	77	240	285	264	63	333	312	380	402	356	377	14.0	-14.0	17.3	1.0
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	1369	1387	1213	1186	842	842	842	842	842	561	0	-1.2	-3.6	0.0	-34.1
Gas fired	1872	2625	4081	3969	3624	3498	3165	3192	3538	3938	4627	8.1	-1.2	-1.3	1.9
Oil fired	842	1124	1143	1143	801	326	173	125	7	1	1	3.1	-3.5	-14.2	-21.8
Biomass-waste fired	14	43	43	69	197	198	208	213	259	287	313	11.4	16.6	0.5	2.1
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	57.4	47.1	38.5	32.4	35.4	39.1	40.6	41.0	40.5	37.8	36.5				
Efficiency of gross thermal power generation (%)	40.7	43.2	46.8	47.2	47.6	47.5	47.9	50.3	52.2	58.8	59.1				
% of gross electricity from CHP	2.4	1.7	6.7	8.4	2.8	15.1	19.0	30.5	34.5	35.8	34.8				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	5.0	7.3	13.1	27.7	40.2	39.9	42.1	44.2	45.8	53.6	59.2				
Fuel Inputs to Thermal Power Generation (GWh_e)	**4775**	**4758**	**4600**	**3661**	**3479**	**3682**	**3556**	**3399**	**3331**	**2650**	**2484**	-0.4	-2.8	0.2	-1.8
Solids	1930	1920	1358	1448	1344	1130	869	864	857	0	0	-3.5	-0.1	-4.3	-100.0
Oil (including refinery gas)	997	769	128	4	1	4	1	2	2	2	2	-18.5	-40.4	7.4	0.2
Gas (including derived gases)	1825	2040	3039	2066	1981	2330	2406	2199	2097	2250	2063	5.2	-4.2	2.0	-0.8
Biomass & Waste	24	30	75	143	153	218	279	334	375	399	419	12.2	7.5	6.2	2.1
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**3341**	**3204**	**3033**	**3024**	**3137**	**3110**	**3012**	**2952**	**2897**	**2833**	**2789**	-1.0	0.3	-0.4	-0.4
Refineries	3341	3203	2940	2933	2929	2897	2788	2717	2650	2568	2518	-1.3	0.0	-0.5	-0.5
Biofuels and hydrogen production	0	1	93	89	200	201	208	217	227	243	250	0.0	7.9	0.4	0.9
District heating	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Derived gases, cokeries etc.	0	0	0	2	8	12	16	18	20	21	20	0.0	#####	7.1	1.4

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Ireland: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**50**	**65**	**70**	**69**	**78**	**86**	**92**	**97**	**102**	**106**	**111**	3.4	1.1	1.7	0.9
Public road transport	7	8	8	9	9	9	9	10	10	10	11	2.0	0.3	0.7	0.7
Private cars and motorcycles	35	45	48	46	52	58	62	65	68	71	73	3.3	0.8	1.8	0.8
Rail	1	2	2	2	2	2	2	2	2	2	2	2.7	0.9	0.8	0.6
Aviation [3]	6	10	10	11	14	16	17	19	20	22	23	5.2	3.1	1.9	1.5
Inland navigation	1	1	1	1	1	1	1	1	1	1	1	0.9	0.9	0.6	0.5
Freight transport activity (Gtkm)	**12**	**17**	**11**	**12**	**14**	**15**	**17**	**19**	**20**	**21**	**22**	-0.9	2.4	2.5	1.3
Heavy goods and light commercial vehicles	11	17	10	11	13	15	17	18	20	21	22	-0.5	2.4	2.5	1.3
Rail	0	0	0	0	0	0	0	0	0	0	0	-15.4	1.2	1.4	1.1
Inland navigation	0	0	0	0	0	0	0	1	1	1	1	-2.5	1.4	1.6	1.2
Energy demand in transport (ktoe) [4]	**4082**	**5078**	**4715**	**4586**	**4768**	**4901**	**5079**	**5253**	**5363**	**5465**	**5607**	1.5	0.1	0.6	0.5
Public road transport	96	101	110	111	112	113	116	119	122	126	129	1.4	0.2	0.4	0.6
Private cars and motorcycles	2206	2577	2807	2583	2529	2557	2568	2577	2586	2601	2633	2.4	-1.0	0.2	0.1
Heavy goods and light commercial vehicles	1086	1482	967	1019	1137	1237	1365	1465	1529	1584	1640	-1.2	1.6	1.8	0.9
Rail	40	42	44	44	47	49	49	49	48	47	45	0.8	0.7	0.5	-0.4
Aviation	629	857	767	809	921	922	957	1018	1054	1083	1133	2.0	1.9	0.4	0.8
Inland navigation	25	18	20	21	22	23	23	24	25	25	25	-2.1	1.0	0.6	0.4
By transport activity															
Passenger transport	2958	3559	3724	3544	3605	3638	3687	3761	3807	3854	3939	2.3	-0.3	0.2	0.3
Freight transport	1124	1519	990	1042	1162	1263	1392	1493	1556	1611	1667	-1.3	1.6	1.8	0.9
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.2	0.3	0.7	1.0	1.3	1.6	1.9				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	2.0	2.0	4.4	4.4	4.4	4.5	4.6	4.8	4.7				
ENERGY EFFICIENCY															
Primary energy consumption	**13750**	**14749**	**14850**	**13848**	**14022**	**14016**	**13888**	**13847**	**13974**	**13749**	**14083**	0.8	-0.6	-0.1	0.1
Final Energy Demand	**10779**	**12597**	**11957**	**11423**	**11762**	**11669**	**11668**	**11823**	**12074**	**12365**	**12776**	1.0	-0.2	-0.1	0.5
by sector															
Industry	2498	2582	2146	2453	2576	2431	2314	2254	2287	2337	2403	-1.5	1.8	-1.1	0.2
Energy intensive industries	1245	1341	1023	1166	1188	1035	927	863	861	855	862	-1.9	1.5	-2.5	-0.4
Other industrial sectors	1252	1241	1123	1287	1388	1397	1387	1391	1426	1482	1542	-1.1	2.1	0.0	0.5
Residential	2513	2954	3296	2823	2852	2841	2819	2836	2883	2970	3093	2.7	-1.4	-0.1	0.5
Tertiary	1684	1979	1799	1556	1562	1490	1450	1474	1535	1587	1666	0.7	-1.4	-0.7	0.7
Transport[5]	4085	5082	4715	4590	4772	4906	5085	5259	5369	5470	5613	1.4	0.1	0.6	0.5
by fuel															
Solids	671	751	604	567	500	440	380	284	216	193	136	-1.0	-1.9	-2.7	-5.0
Oil	7045	8204	7270	6439	6239	6316	6266	6313	6319	6292	6384	0.3	-1.5	0.0	0.1
Gas	1200	1364	1593	1883	1930	1718	1582	1513	1533	1589	1677	2.9	1.9	-2.0	0.3
Electricity	1745	2094	2186	2107	2256	2346	2415	2518	2630	2763	2913	2.3	0.3	0.7	0.9
Heat (from CHP and District Heating)	0	0	0	1	14	36	64	85	108	107	110	0.0	0.0	16.1	2.8
Renewable energy forms	118	184	304	424	815	801	945	1092	1244	1394	1527	10.0	10.4	1.5	2.4
Other	0	0	0	2	8	12	16	19	23	27	30	0.0	#####	7.4	3.2
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	111	93	92	78	69	64	59	54	50	46	44	-1.9	-2.8	-1.7	-1.5
Industry (Energy on Value added, index 2000=100)	100	85	75	80	74	64	57	51	49	47	45	-2.8	-0.2	-2.5	-1.2
Residential (Energy on Private Income, index 2000=100)	100	95	98	86	74	65	57	50	46	42	39	-0.2	-2.7	-2.6	-1.9
Tertiary (Energy on Value added, index 2000=100)	100	97	82	64	56	50	44	41	39	38	37	-1.9	-3.7	-2.4	-1.0
Passenger transport (toe/Mpkm) [6]	51	46	46	43	38	35	33	32	30	29	29	-1.2	-1.7	-1.5	-0.7
Freight transport (toe/Mtkm)	96	88	92	89	86	82	80	78	77	75	75	-0.3	-0.7	-0.7	-0.4
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**71.8**	**73.1**	**65.0**	**63.1**	**61.2**	**61.1**	**59.2**	**58.7**	**58.5**	**55.5**	**55.6**	-1.0	-0.6	-0.3	-0.3
of which ETS sectors (2013 scope) GHG emissions		25.4	20.0	18.5	17.6	17.1	15.4	14.6	14.2	11.0	10.7		-1.3	-1.3	-1.8
of which ESD sectors (2013 scope) GHG emissions		47.8	45.0	44.6	43.7	44.0	43.8	44.1	44.3	44.5	44.9		-0.3	0.0	0.1
CO_2 Emissions (energy related)	**43.2**	**47.3**	**42.0**	**37.8**	**36.1**	**35.5**	**33.9**	**32.9**	**32.4**	**29.2**	**29.0**	-0.3	-1.5	-0.6	-0.8
Power generation/District heating	15.6	15.3	13.3	11.0	10.2	10.1	9.2	8.7	8.5	5.3	4.8	-1.6	-2.6	-1.0	-3.2
Energy Branch	0.3	0.4	0.3	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.2	-1.3	-1.1	-0.8	-0.6
Industry	5.3	5.6	3.6	3.8	3.5	3.0	2.3	1.8	1.5	1.4	1.5	-3.9	-0.3	-4.0	-2.2
Residential	6.4	7.2	7.8	6.5	6.1	5.8	5.5	5.2	4.9	4.7	4.5	2.1	-2.5	-0.9	-1.0
Tertiary	3.4	3.5	3.1	2.5	2.4	2.1	1.9	1.9	2.0	2.0	2.1	-0.7	-2.8	-1.9	0.3
Transport	12.3	15.3	13.9	13.6	13.8	14.2	14.6	15.1	15.3	15.5	15.9	1.3	-0.1	0.6	0.4
CO_2 Emissions (non energy and non land use related)	**2.9**	**2.7**	**1.4**	**1.8**	**1.9**	**1.8**	**1.5**	**1.5**	**1.4**	**1.4**	**1.3**	-7.0	3.1	-2.4	-0.7
Non-CO2 GHG emissions	**25.6**	**23.1**	**21.5**	**23.5**	**23.2**	**23.8**	**23.8**	**24.3**	**24.7**	**24.9**	**25.3**	-1.7	0.8	0.3	0.3
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**124.2**	**126.5**	**112.3**	**109.1**	**105.9**	**105.7**	**102.4**	**101.5**	**101.2**	**96.0**	**96.1**	-1.0	-0.6	-0.3	-0.3
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.66	0.60	0.47	0.41	0.33	0.31	0.28	0.26	0.24	0.15	0.13	-3.4	-3.5	-1.5	-3.8
Final energy demand (t of CO_2/toe)	2.53	2.51	2.38	2.31	2.18	2.15	2.09	2.03	1.97	1.92	1.87	-0.6	-0.9	-0.4	-0.5
Industry	2.13	2.16	1.66	1.55	1.34	1.25	0.99	0.79	0.66	0.61	0.61	-2.5	-2.1	-3.0	-2.4
Residential	2.53	2.44	2.37	2.30	2.12	2.04	1.96	1.82	1.71	1.59	1.45	-0.7	-1.1	-0.8	-1.5
Tertiary	1.99	1.77	1.74	1.63	1.51	1.43	1.34	1.32	1.28	1.26	1.25	-1.3	-1.4	-1.2	-0.4
Transport	3.00	3.01	2.96	2.96	2.89	2.89	2.88	2.87	2.86	2.84	2.83	-0.2	-0.2	0.0	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**2.0**	**2.8**	**5.6**	**8.7**	**15.5**	**16.1**	**18.1**	**20.1**	**21.9**	**24.9**	**27.3**				
RES-H&C share	2.4	3.5	4.5	6.1	11.9	13.1	17.5	22.2	25.9	29.1	31.5				
RES-E share	4.8	7.2	14.5	26.5	42.3	42.0	43.4	44.4	45.6	52.2	57.6				
RES-T share (based on ILUC formula)	0.0	0.0	2.4	4.3	10.0	10.3	11.3	12.4	13.4	15.5	16.7				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	42	72	75	89	92	96	95	90	78	79	79	5.9	2.1	0.3	-0.9
Average Price of Electricity in Final demand sectors (€'13/MWh	117	147	158	175	178	181	180	180	178	175	175	3.0	1.2	0.1	-0.1
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**9.8**	**13.9**	**15.5**	**15.6**	**18.8**	**20.8**	**22.1**	**23.2**	**24.5**	**25.6**	**26.9**	4.7	1.9	1.6	1.0
as % of GDP	**7.5**	**8.4**	**9.4**	**8.5**	**9.1**	**9.2**	**9.0**	**8.7**	**8.5**	**8.3**	**8.0**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Italy: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**57**	**58**	**59**	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**67**	0.4	0.5	0.3	0.2
GDP (in 000 M€13)	**1564**	**1643**	**1622**	**1565**	**1675**	**1776**	**1885**	**2030**	**2194**	**2361**	**2557**	0.4	0.3	1.2	1.5
Gross Inland Consumption (ktoe)	**174219**	**187471**	**174761**	**159036**	**161205**	**153812**	**149813**	**148336**	**146762**	**146234**	**145228**	0.0	-0.8	-0.7	-0.2
Solids	12550	16461	14170	16106	18637	12628	11323	9645	3493	3471	1575	1.2	2.8	-4.9	-9.4
Oil	89540	83963	69558	61171	56787	53670	50854	48606	46892	45869	44721	-2.5	-2.0	-1.1	-0.6
Natural gas	57945	70651	68057	56177	59766	59369	58570	57971	62142	59106	58535	1.6	-1.3	-0.2	0.0
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	3813	4227	3797	3954	2578	2764	2644	2227	1882	1697	1677	0.0	-3.8	0.3	-2.3
Renewable energy forms	10371	12170	19180	21628	23437	25382	26421	29887	32353	36090	38720	6.3	2.0	1.2	1.9
Energy Branch Consumption	**7704**	**10052**	**9539**	**8520**	**8168**	**7387**	**7054**	**6919**	**6534**	**6179**	**5920**	2.2	-1.5	-1.5	-0.9
Non-Energy Uses	**9019**	**8607**	**9560**	**7050**	**7322**	**7369**	**7419**	**7579**	**7912**	**7946**	**8341**	0.6	-2.6	0.1	0.6
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**28400**	**27839**	**29560**	**30751**	**31626**	**32481**	**33102**	**33946**	**35524**	**37274**	**38923**	0.4	0.7	0.5	0.8
Solids	3	60	64	55	0	0	0	0	0	0	0	33.7	-100.0	0.0	0.0
Oil	4915	6376	5687	5142	5667	5638	5668	4191	3621	2781	2220	1.5	0.0	0.0	-4.6
Natural gas	13627	9886	6885	6760	5758	4600	4019	3156	2773	1533	919	-6.6	-1.8	-3.5	-7.1
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	9856	11516	16924	18793	20201	22243	23415	26598	29130	32960	35783	5.6	1.8	1.5	2.1
Hydro	3800	3101	4395	4139	4089	4213	4278	4415	4526	4586	4633	1.5	-0.7	0.5	0.4
Biomass & Waste	1736	3392	6670	10105	11260	11537	11557	14037	15412	15917	16058	14.4	5.4	0.3	1.7
Wind	48	202	785	1258	1260	2201	2815	2903	3420	3993	5336	32.1	4.8	8.4	3.2
Solar and others	12	30	298	2199	2502	3168	3595	4009	4448	7468	8736	37.4	23.7	3.7	4.5
Geothermal	4259	4791	4776	1092	1090	1124	1170	1234	1325	997	1020	1.2	-13.7	0.7	-0.7
Net Imports (ktoe)	**152069**	**160241**	**149804**	**131764**	**133151**	**125040**	**120544**	**118217**	**115091**	**112866**	**110333**	-0.1	-1.2	-1.0	-0.4
Solids	13133	16367	14301	16050	18637	12628	11323	9645	3493	3471	1575	0.9	2.7	-4.9	-9.4
Oil	87599	79154	67826	59509	54636	51628	48867	47998	46806	46657	46147	-2.5	-2.1	-1.1	-0.3
Crude oil and Feedstocks	89451	94307	84882	68525	61761	57024	52778	50363	47575	45690	43692	-0.5	-3.1	-1.6	-0.9
Oil products	-1852	-15153	-17056	-9016	-7125	-5396	-3911	-2365	-769	967	2455	24.9	-8.4	-5.8	0.0
Natural gas	47008	59840	61600	49416	54064	54881	54703	55059	59687	57911	57998	2.7	-1.3	0.1	0.3
Electricity	3813	4227	3797	3954	2578	2764	2644	2227	1882	1697	1677	0.0	-3.8	0.3	-2.3
Import Dependency (%)	86.5	84.5	84.3	81.1	80.8	79.4	78.5	77.7	76.4	75.2	73.9				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**269941**	**296840**	**298773**	**288972**	**316523**	**313784**	**323149**	**351614**	**378763**	**399988**	**417853**	1.0	0.6	0.2	1.3
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	26272	43606	39734	58856	67163	45093	44668	38751	9867	9204	0	4.2	5.4	-4.0	-100.0
Oil (including refinery gas)	85878	47124	21714	8781	7791	8009	7760	5067	4492	2811	864	-12.8	-9.7	0.0	-10.4
Gas (including derived gases)	106398	156191	158215	110293	126166	124246	122447	136377	167626	146745	143734	4.0	-2.2	-0.3	0.8
Biomass-waste	1908	6153	11586	18671	21446	24171	25556	43427	58282	61677	63655	19.8	6.4	1.8	4.7
Hydro (pumping excluded)	44199	36067	51116	48123	47549	48994	49749	51342	52626	53324	53875	1.5	-0.7	0.5	0.4
Wind	563	2344	9126	14628	14646	25588	32732	33761	39768	46429	62047	32.1	4.8	8.4	3.2
Solar	17	31	1906	23409	25552	31473	34027	36679	39891	74047	87928	59.9	29.6	2.9	4.9
Geothermal and other renewables	4706	5324	5376	6210	6210	6210	6210	6210	6210	5749	5749	1.3	1.5	0.0	-0.4
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**71896**	**82950**	**104920**	**127454**	**122841**	**119387**	**114442**	**108495**	**119182**	**143185**	**156207**	3.9	1.6	-0.7	1.6
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	16770	18701	26470	46375	47829	54393	59078	60762	64204	88545	102310	4.7	6.1	2.1	2.8
Hydro (pumping excluded)	16390	17036	17563	18512	18808	18808	18939	19205	19418	19524	19588	0.7	0.7	0.1	0.2
Wind	363	1635	5794	8958	8963	12570	15577	15846	17736	19793	25957	31.9	4.5	5.7	2.6
Solar	17	30	3113	18905	20057	23015	24562	25711	27050	49227	56765	68.3	20.5	2.0	4.3
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	55126	64249	78450	81079	75012	64994	55364	47733	54978	54640	53897	3.6	-0.4	-3.0	-0.1
of which cogeneration units	6476	5888	7351	17216	16885	18389	14401	11010	11258	13464	13377	1.3	8.7	-1.6	-0.4
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	9518	8279	9511	9511	8858	5103	5098	4803	2226	2214	1901	0.0	-0.7	-5.4	-4.8
Gas fired	22819	36431	51677	52045	51353	47623	41739	35862	45213	45081	45062	8.5	-0.1	-2.1	0.4
Oil fired	21763	17998	14748	13928	8629	6040	2332	798	603	483	128	-3.8	-5.2	-12.3	-13.5
Biomass-waste fired	436	870	1774	4810	5388	5443	5409	5485	6151	6157	6114	15.1	11.7	0.0	0.6
Hydrogen plants	0	0	12	12	12	12	12	12	12	12	0	0.0	0.0	0.0	-100.0
Geothermal heat	590	671	728	773	773	773	773	773	773	692	692	2.1	0.6	0.0	-0.6
Avg. Load factor of net power capacity [2] (%)	40.8	39.1	31.3	24.8	28.2	29.0	31.2	35.9	35.5	31.3	30.0				
Efficiency of gross thermal power generation (%)	39.4	37.7	37.7	45.5	45.6	46.7	46.9	49.8	54.0	54.3	55.0				
% of gross electricity from CHP	8.3	9.0	11.5	15.3	15.5	11.5	11.1	9.8	9.2	7.2	6.9				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	19.0	16.8	26.5	38.4	36.5	43.5	45.9	48.8	52.0	60.3	65.4				
Fuel Inputs to Thermal Power Generation (GWh_e)	**49150**	**58911**	**53964**	**38349**	**43160**	**38246**	**37883**	**39679**	**39221**	**35816**	**33486**	0.9	-2.2	-1.3	-0.6
Solids	6045	10399	9484	12963	14694	9221	9087	7817	1905	1916	0	4.6	4.5	-4.7	-100.0
Oil (including refinery gas)	18954	12079	7365	1905	1675	1741	1682	1080	929	588	190	-9.0	-13.8	0.0	-10.3
Gas (including derived gases)	19668	29585	28966	18745	21521	21344	20871	21318	25133	21650	21236	3.9	-2.9	-0.3	0.1
Biomass & Waste	438	2270	3527	3795	4330	5000	5303	8524	10314	11118	11516	23.2	2.1	2.0	4.0
Geothermal heat	4046	4578	4623	941	941	941	941	941	941	544	544	1.3	-14.7	0.0	-2.7
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**101609**	**106909**	**97409**	**78677**	**74424**	**69543**	**64390**	**60256**	**56820**	**54266**	**51983**	-0.4	-2.7	-1.4	-1.1
Refineries	95900	101959	91472	74873	68985	64333	60123	56260	52962	50165	47646	-0.5	-2.8	-1.4	-1.2
Biofuels and hydrogen production	0	177	1419	1593	2221	2077	2025	2014	1997	2115	2156	0.0	4.6	-0.9	0.3
District heating	0	0	110	121	123	124	123	148	185	178	162	0.0	1.2	0.0	1.4
Derived gases, cokeries etc.	5709	4773	4408	2090	3094	3009	2118	1835	1676	1807	2018	-2.6	-3.5	-3.7	-0.2

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Italy: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**943**	**931**	**952**	**967**	**1020**	**1052**	**1091**	**1123**	**1133**	**1184**	**1203**	0.1	0.7	0.7	0.5
Public road transport	93	101	102	105	107	109	111	115	115	120	122	0.9	0.5	0.4	0.5
Private cars and motorcycles	756	727	740	746	782	800	827	845	844	881	887	-0.2	0.5	0.6	0.4
Rail	55	56	54	55	62	67	72	75	79	82	85	-0.2	1.4	1.4	0.9
Aviation [3]	34	43	51	56	63	70	75	83	90	96	102	4.3	2.2	1.7	1.5
Inland navigation	5	5	5	5	5	5	5	5	6	6	6	-0.3	0.3	0.5	0.5
Freight transport activity (Gtkm)	**253**	**303**	**268**	**271**	**290**	**306**	**323**	**337**	**347**	**362**	**371**	0.6	0.8	1.1	0.7
Heavy goods and light commercial vehicles	192	226	202	203	217	230	243	253	258	272	278	0.5	0.7	1.1	0.7
Rail	23	23	19	20	22	24	25	26	28	28	29	-2.0	1.7	1.2	0.7
Inland navigation	38	54	48	48	51	53	55	58	61	62	64	2.4	0.5	0.9	0.7
Energy demand in transport (ktoe) [4]	**42174**	**44377**	**41220**	**39856**	**39022**	**38024**	**37684**	**37831**	**37530**	**38303**	**38300**	-0.2	-0.5	-0.3	0.1
Public road transport	1061	1231	1245	1278	1310	1307	1297	1313	1288	1327	1345	1.6	0.5	-0.1	0.2
Private cars and motorcycles	27882	27505	25835	24747	23409	22114	21617	21281	20738	21121	20997	-0.8	-1.0	-0.8	-0.1
Heavy goods and light commercial vehicles	7944	10062	8686	8259	8436	8550	8696	8882	8905	9219	9327	0.9	-0.3	0.3	0.4
Rail	526	492	463	487	520	549	565	576	584	574	566	-1.3	1.2	0.8	0.0
Aviation	3491	3700	3863	4073	4283	4406	4381	4621	4813	4865	4845	1.0	1.0	0.2	0.5
Inland navigation	1269	1387	1128	1012	1063	1099	1128	1158	1203	1198	1219	-1.2	-0.6	0.6	0.4
By transport activity															
Passenger transport	33399	32865	31375	30531	29456	28302	27781	27707	27335	27807	27685	-0.6	-0.6	-0.6	0.0
Freight transport	8775	11512	9844	9324	9566	9722	9903	10124	10195	10496	10615	1.2	-0.3	0.3	0.3
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.8	1.2	1.4	1.6				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.4	3.5	4.1	5.8	5.6	5.5	5.4	5.3	5.4	5.3				
ENERGY EFFICIENCY															
Primary energy consumption	**165200**	**178864**	**165201**	**151986**	**153883**	**146443**	**142394**	**140757**	**138850**	**138288**	**136887**	0.0	-0.7	-0.8	-0.2
Final Energy Demand	**125579**	**134544**	**124781**	**122385**	**122484**	**119189**	**115857**	**114419**	**114885**	**116344**	**116607**	-0.1	-0.2	-0.6	0.0
by sector															
Industry	40502	39858	30905	27952	28796	27059	24450	23598	23660	23757	23997	-2.7	-0.7	-1.6	-0.1
Energy intensive industries	25289	25477	19382	16985	17756	16719	14627	13807	13619	13408	13244	-2.6	-0.9	-1.9	-0.5
Other industrial sectors	15214	14382	11523	10966	11040	10340	9823	9790	10040	10348	10753	-2.7	-0.4	-1.2	0.5
Residential	27656	31313	31959	34859	34760	34425	34224	33855	33853	33752	33581	1.5	0.8	-0.2	-0.1
Tertiary	14901	18537	20182	19017	19162	18917	18717	18333	19013	19690	19870	3.1	-0.5	-0.2	0.3
Transport[5]	42519	44836	41734	40557	39765	38789	38466	38634	38358	39145	39159	-0.2	-0.5	-0.3	0.1
by fuel															
Solids	3586	3980	2910	2094	2675	2269	1385	1084	899	873	880	-2.1	-0.8	-6.4	-2.2
Oil	57249	59005	48733	45659	41916	39208	36782	35331	33763	33295	32418	-1.6	-1.5	-1.3	-0.6
Gas	38022	40609	38499	36390	37400	37243	36717	35658	35986	36630	36538	0.1	-0.3	-0.2	0.0
Electricity	23472	25871	25736	25288	26164	26337	26977	28873	30886	32462	33954	0.9	0.2	0.3	1.2
Heat (from CHP and District Heating)	1449	3082	3332	3592	3800	3904	3930	3633	3738	3654	3676	8.7	1.3	0.3	-0.3
Renewable energy forms	1802	1997	5570	9356	10511	10199	10022	9777	9502	9266	8931	11.9	6.6	-0.5	-0.6
Other	0	0	0	6	17	28	44	63	111	164	211	0.0	0.0	9.6	8.2
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	111	114	108	102	96	87	79	73	67	62	57	-0.3	-1.1	-1.9	-1.7
Industry (Energy on Value added, index 2000=100)	100	100	83	79	78	71	62	57	54	52	49	-1.8	-0.7	-2.3	-1.1
Residential (Energy on Private Income, index 2000=100)	100	109	110	123	114	106	99	90	83	77	70	0.9	0.4	-1.4	-1.7
Tertiary (Energy on Value added, index 2000=100)	100	117	126	121	113	105	97	88	84	81	75	2.3	-1.0	-1.5	-1.3
Passenger transport (toe/Mpkm) [6]	33	33	30	29	26	24	23	22	21	20	20	-1.0	-1.5	-1.4	-0.6
Freight transport (toe/Mtkm)	35	38	37	34	33	32	31	30	29	29	29	0.6	-1.1	-0.7	-0.3
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**558.5**	**592.5**	**509.9**	**457.0**	**458.9**	**417.0**	**393.4**	**375.6**	**351.9**	**342.0**	**327.6**	-0.9	-1.0	-1.5	-0.9
of which ETS sectors (2013 scope) GHG emissions		261.5	213.8	172.1	188.2	160.5	148.7	139.4	120.9	111.3	99.9		-1.3	-2.3	-2.0
of which ESD sectors (2013 scope) GHG emissions		331.0	296.1	284.8	270.7	256.5	244.6	236.2	231.0	230.6	227.7		-0.9	-1.0	-0.4
CO_2 Emissions (energy related)	**432.5**	**470.4**	**404.2**	**354.7**	**361.7**	**326.1**	**308.6**	**292.7**	**270.8**	**261.0**	**247.9**	-0.7	-1.1	-1.6	-1.1
Power generation/District heating	137.1	158.5	135.9	106.9	121.6	97.9	94.0	87.2	70.9	62.1	52.4	-0.1	-1.1	-2.5	-2.9
Energy Branch	15.9	18.4	16.4	14.1	12.9	11.6	10.8	10.1	9.5	8.8	8.3	0.4	-2.4	-1.7	-1.3
Industry	78.0	72.5	49.5	42.3	43.2	37.9	29.4	26.6	25.5	25.2	24.9	-4.5	-1.3	-3.8	-0.8
Residential	53.4	59.9	53.6	51.4	49.8	49.2	48.9	47.5	46.3	45.2	43.5	0.0	-0.7	-0.2	-0.6
Tertiary	24.4	29.3	30.2	26.0	25.5	24.6	22.6	19.1	18.0	18.1	17.9	2.2	-1.7	-1.2	-1.2
Transport	123.7	131.8	118.6	114.0	108.8	105.0	102.9	102.2	100.4	101.5	100.9	-0.4	-0.9	-0.6	-0.1
CO_2 Emissions (non energy and non land use related)	**28.6**	**30.8**	**24.1**	**21.1**	**21.8**	**21.6**	**20.6**	**19.2**	**17.2**	**16.9**	**15.1**	-1.7	-1.0	-0.5	-1.5
Non-CO2 GHG emissions	**97.3**	**91.3**	**81.6**	**81.2**	**75.5**	**69.2**	**64.1**	**63.6**	**63.9**	**64.1**	**64.6**	-1.7	-0.8	-1.6	0.0
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**106.3**	**112.8**	**97.1**	**87.0**	**87.4**	**79.4**	**74.9**	**71.5**	**67.0**	**65.1**	**62.4**	-0.9	-1.0	-1.5	-0.9
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.47	0.45	0.38	0.31	0.32	0.26	0.24	0.21	0.16	0.13	0.11	-2.0	-1.7	-2.7	-3.9
Final energy demand (t of CO_2/toe)	2.23	2.18	2.02	1.91	1.86	1.82	1.76	1.71	1.66	1.63	1.60	-1.0	-0.8	-0.5	-0.5
Industry	1.93	1.82	1.60	1.51	1.50	1.40	1.20	1.13	1.08	1.06	1.04	-1.8	-0.6	-2.2	-0.7
Residential	1.93	1.91	1.68	1.48	1.43	1.43	1.43	1.40	1.37	1.34	1.30	-1.4	-1.6	0.0	-0.5
Tertiary	1.64	1.58	1.50	1.37	1.33	1.30	1.21	1.04	0.95	0.92	0.90	-0.9	-1.2	-1.0	-1.5
Transport	2.91	2.94	2.84	2.81	2.74	2.71	2.67	2.65	2.62	2.59	2.58	-0.2	-0.4	-0.2	-0.2
RES in Gross Final Energy Consumption [7] (in%)	**4.7**	**5.8**	**10.5**	**18.2**	**19.8**	**22.3**	**24.2**	**27.3**	**29.7**	**32.6**	**34.7**				
RES-H&C share	2.9	4.6	10.4	20.1	22.2	24.3	27.0	31.2	33.5	34.6	35.5				
RES-E share	15.7	16.3	20.1	33.6	32.7	38.8	41.3	44.9	48.6	57.1	62.1				
RES-T share (based on ILUC formula)	0.6	1.1	5.0	7.1	10.7	12.2	13.5	15.7	17.7	20.6	22.4				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	66	77	90	86	94	98	98	87	85	82	81	3.2	0.4	0.5	-1.0
Average Price of Electricity in Final demand sectors (€'13/MWh	140	130	153	152	157	166	171	174	177	175	173	0.9	0.3	0.8	0.1
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**134.7**	**151.9**	**164.9**	**170.7**	**189.8**	**202.1**	**214.1**	**225.8**	**237.8**	**246.3**	**252.0**	2.0	1.4	1.2	0.8
as % of GDP	**8.6**	**9.2**	**10.2**	**10.9**	**11.3**	**11.4**	**11.4**	**11.1**	**10.8**	**10.4**	**9.9**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Latvia: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	-1.2	-1.0	-1.4	-0.6
GDP (in 000 M€13)	**13**	**20**	**19**	**23**	**27**	**29**	**31**	**33**	**36**	**38**	**40**	3.6	3.5	1.7	1.2
Gross Inland Consumption (ktoe)	**3864**	**4592**	**4629**	**4341**	**4521**	**4741**	**4659**	**4582**	**4524**	**4542**	**4499**	1.8	-0.2	0.3	-0.2
Solids	132	82	109	84	72	55	40	29	23	20	16	-1.9	-4.1	-5.7	-4.5
Oil	1295	1487	1521	1464	1434	1482	1453	1451	1486	1502	1508	1.6	-0.6	0.1	0.2
Natural gas	1092	1358	1462	867	919	1172	1025	974	894	902	813	3.0	-4.5	1.1	-1.2
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	154	185	75	169	143	76	170	166	193	159	113	-6.9	6.7	1.7	-2.0
Renewable energy forms	1191	1481	1463	1758	1953	1957	1970	1962	1928	1960	2048	2.1	2.9	0.1	0.2
Energy Branch Consumption	**39**	**42**	**48**	**33**	**36**	**40**	**37**	**45**	**30**	**24**	**24**	2.1	-2.8	0.1	-2.0
Non-Energy Uses	**75**	**97**	**73**	**105**	**127**	**143**	**148**	**152**	**158**	**162**	**166**	-0.3	5.7	1.5	0.6
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**1411**	**1868**	**1979**	**2228**	**2478**	**2457**	**2479**	**2463**	**2426**	**2474**	**2558**	3.4	2.3	0.0	0.2
Solids	16	3	2	1	0	0	0	0	0	0	0	-17.4	-100.0	0.0	0.0
Oil	2	7	2	0	0	0	0	0	0	0	0	1.1	-100.0	0.0	0.0
Natural gas	0	0	0	0	0	0	0	0	0	0	0	2.1	-100.0	0.0	0.0
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	1393	1858	1975	2228	2478	2457	2479	2463	2426	2474	2558	3.6	2.3	0.0	0.2
Hydro	242	286	303	248	272	272	272	272	276	277	286	2.2	-1.1	0.0	0.3
Biomass & Waste	1150	1568	1668	1972	2150	2127	2147	2132	2088	2134	2104	3.8	2.6	0.0	-0.1
Wind	0	4	4	8	54	56	56	57	57	57	160	30.2	29.2	0.3	5.4
Solar and others	0	0	0	0	1	2	3	2	4	3	5	0.0	0.0	10.9	2.0
Geothermal	0	0	0	0	0	0	1	0	2	2	3	0.0	0.0	18.0	8.3
Net Imports (ktoe)	**2361**	**3097**	**2220**	**2456**	**2404**	**2654**	**2557**	**2513**	**2523**	**2518**	**2409**	-0.6	0.8	0.6	-0.3
Solids	61	77	112	84	72	55	40	29	23	20	16	6.3	-4.3	-5.7	-4.5
Oil	1235	1783	1671	1807	1789	1841	1818	1823	1880	1913	1933	3.1	0.7	0.2	0.3
Crude oil and Feedstocks	87	4	2	0	0	0	0	0	0	0	0	-31.8	-100.0	0.0	0.0
Oil products	1148	1779	1669	1807	1789	1841	1818	1823	1880	1913	1933	3.8	0.7	0.2	0.3
Natural gas	1113	1434	903	867	924	1182	1038	995	924	940	856	-2.1	0.2	1.2	-1.0
Electricity	154	185	75	169	143	76	170	166	193	159	113	-6.9	6.7	1.7	-2.0
Import Dependency (%)	61.0	63.9	45.5	52.4	49.2	51.9	50.8	50.5	51.0	50.4	48.5				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**4136**	**4906**	**6627**	**5587**	**6626**	**8054**	**7539**	**8006**	**8050**	**8692**	**9619**	4.8	0.0	1.3	1.2
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	78	0	2	78	111	88	88	89	96	92	76	-30.7	49.4	-2.3	-0.8
Oil (including refinery gas)	107	6	2	0	0	0	0	0	0	0	0	-32.8	-100.0	0.0	0.0
Gas (including derived gases)	1128	1486	2988	2023	2057	3362	2826	3289	3051	3303	2810	10.2	-3.7	3.2	0.0
Biomass-waste	0	41	66	511	663	796	811	809	1037	1407	1541	0.0	26.0	2.0	3.3
Hydro (pumping excluded)	2819	3326	3520	2878	3160	3160	3160	3160	3205	3221	3330	2.2	-1.1	0.0	0.3
Wind	4	47	49	95	634	646	653	658	659	668	1861	28.5	29.2	0.3	5.4
Solar	0	0	0	1	2	2	2	2	2	2	2	0.0	0.0	0.0	0.2
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**2089**	**2162**	**2546**	**2837**	**3103**	**3107**	**3113**	**2969**	**2928**	**2903**	**3308**	2.0	2.0	0.0	0.3
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	1515	1562	1606	1652	1874	1875	1877	1877	1900	1908	2350	0.6	1.6	0.0	1.1
Hydro (pumping excluded)	1513	1536	1576	1589	1589	1589	1589	1589	1612	1620	1665	0.4	0.1	0.0	0.2
Wind	2	26	30	62	283	284	286	286	286	286	683	31.1	25.2	0.1	4.4
Solar	0	0	0	1	2	2	2	2	2	2	2	0.0	0.0	0.0	0.0
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	574	600	940	1185	1229	1232	1236	1092	1028	994	958	5.1	2.7	0.0	-1.3
of which cogeneration units	254	586	870	1026	1026	1094	1096	940	927	906	915	13.1	1.7	0.7	-0.9
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	23	2	21	21	21	21	21	21	21	21	21	-0.9	0.0	0.0	0.0
Gas fired	522	572	893	1098	1098	1091	1091	947	867	812	803	5.5	2.1	-0.1	-1.5
Oil fired	27	15	15	15	15	15	15	15	8	0	0	-5.4	0.0	0.0	-100.0
Biomass-waste fired	2	10	10	50	95	105	108	108	132	161	134	17.8	24.9	1.4	1.1
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	20.2	23.3	27.2	20.9	22.9	27.9	26.1	28.8	30.0	33.1	32.3				
Efficiency of gross thermal power generation (%)	20.7	21.9	32.3	45.9	45.2	44.9	42.3	46.6	48.4	51.2	50.6				
% of gross electricity from CHP	31.4	30.7	45.0	38.6	33.1	45.3	41.8	45.2	46.4	50.2	42.5				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	68.3	69.6	54.9	62.4	67.3	57.2	61.4	57.8	60.9	60.9	70.0				
Fuel Inputs to Thermal Power Generation (GWh_e)	**545**	**602**	**815**	**490**	**539**	**814**	**757**	**773**	**744**	**806**	**753**	4.1	-4.1	3.5	0.0
Solids	53	1	9	13	17	14	14	14	15	14	12	-15.9	6.4	-2.2	-0.8
Oil (including refinery gas)	84	19	10	0	0	0	0	0	0	0	0	-19.3	-100.0	0.0	0.0
Gas (including derived gases)	408	562	767	360	377	603	541	556	487	509	437	6.5	-6.9	3.7	-1.1
Biomass & Waste	0	22	29	117	144	196	202	203	242	282	304	0.0	17.5	3.4	2.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**570**	**479**	**383**	**344**	**428**	**418**	**409**	**410**	**407**	**408**	**401**	-3.9	1.1	-0.5	-0.1
Refineries	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Biofuels and hydrogen production	0	3	27	37	89	77	72	72	75	78	79	0.0	12.6	-2.1	0.5
District heating	569	476	356	307	339	340	335	336	330	328	319	-4.6	-0.5	-0.1	-0.3
Derived gases, cokeries etc.	1	0	0	0	0	1	1	2	3	3	3	-95.3	#####	15.4	3.2

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)											Latvia: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**15**	**17**	**18**	**18**	**20**	**21**	**22**	**23**	**25**	**26**	**27**	1.5	1.0	1.2	1.0
Public road transport	2	3	2	2	2	3	3	3	3	3	3	-0.2	0.7	0.6	0.4
Private cars and motorcycles	12	12	13	13	14	14	15	15	16	16	16	0.8	0.7	0.7	0.4
Rail	1	1	1	1	1	1	1	1	2	2	2	-1.2	1.7	2.6	1.4
Aviation [3]	0	1	2	2	2	3	4	4	5	6	6	20.4	2.2	3.6	3.1
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Freight transport activity (Gtkm)	**15**	**24**	**21**	**24**	**26**	**30**	**32**	**35**	**38**	**40**	**41**	3.1	2.2	2.2	1.2
Heavy goods and light commercial vehicles	2	4	4	4	5	5	6	6	6	7	7	5.8	2.2	1.8	1.1
Rail	13	20	17	20	21	24	27	29	32	33	34	2.6	2.2	2.3	1.2
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	179.2	1.5	1.5	1.0
Energy demand in transport (ktoe) [4]	**746**	**1064**	**1200**	**1158**	**1194**	**1227**	**1215**	**1231**	**1286**	**1316**	**1336**	4.9	0.0	0.2	0.5
Public road transport	51	67	68	65	66	67	69	70	70	70	70	2.9	-0.3	0.4	0.1
Private cars and motorcycles	502	603	673	613	590	568	534	510	505	501	497	3.0	-1.3	-1.0	-0.4
Heavy goods and light commercial vehicles	89	242	260	255	292	317	324	339	360	370	378	11.2	1.2	1.0	0.8
Rail	76	94	76	87	91	101	108	115	123	123	122	0.1	1.8	1.7	0.6
Aviation	27	59	118	132	148	166	172	188	219	242	259	15.9	2.3	1.5	2.1
Inland navigation	0	0	5	6	7	8	8	8	9	9	9	0.0	3.5	1.1	0.7
By transport activity															
Passenger transport	582	729	861	811	805	802	776	770	797	815	829	4.0	-0.7	-0.4	0.3
Freight transport	163	335	340	347	389	425	439	461	490	501	508	7.6	1.4	1.2	0.7
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.2	0.7	1.2	1.5	1.7	1.8				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.3	2.3	3.3	7.6	6.4	6.2	6.2	6.2	6.2	6.1				
ENERGY EFFICIENCY															
Primary energy consumption	**3789**	**4495**	**4556**	**4237**	**4394**	**4598**	**4511**	**4430**	**4366**	**4380**	**4333**	1.9	-0.4	0.3	-0.2
Final Energy Demand	**3254**	**4018**	**4120**	**4104**	**4243**	**4291**	**4221**	**4150**	**4134**	**4165**	**4145**	2.4	0.3	-0.1	-0.1
by sector															
Industry	576	699	774	912	995	1018	983	927	876	854	828	3.0	2.5	-0.1	-0.9
Energy intensive industries	229	282	305	277	307	303	268	250	244	240	236	2.9	0.1	-1.3	-0.6
Other industrial sectors	348	417	469	635	688	715	715	676	632	614	592	3.0	3.9	0.4	-0.9
Residential	1327	1504	1389	1286	1293	1283	1265	1246	1218	1233	1210	0.5	-0.7	-0.2	-0.2
Tertiary	602	749	756	744	758	759	755	743	750	758	767	2.3	0.0	0.0	0.1
Transport[5]	749	1067	1201	1162	1198	1230	1218	1234	1290	1320	1340	4.8	0.0	0.2	0.5
by fuel															
Solids	62	74	94	70	55	41	26	15	8	6	4	4.2	-5.3	-7.0	-8.9
Oil	1056	1323	1446	1355	1307	1338	1305	1299	1327	1339	1343	3.2	-1.0	0.0	0.1
Gas	329	508	498	391	439	453	419	394	384	381	373	4.2	-1.2	-0.5	-0.6
Electricity	385	493	534	568	617	655	700	727	777	819	851	3.3	1.4	1.3	1.0
Heat (from CHP and District Heating)	598	603	575	524	574	578	576	571	570	590	587	-0.4	0.0	0.0	0.1
Renewable energy forms	824	1018	973	1194	1251	1225	1193	1142	1063	1025	980	1.7	2.5	-0.5	-1.0
Other	0	0	0	0	0	1	2	3	5	6	7	0.0	0.0	18.0	7.0
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	293	235	246	189	171	162	148	138	126	119	113	-1.8	-3.6	-1.4	-1.4
Industry (Energy on Value added, index 2000=100)	100	87	102	98	93	87	79	73	67	64	61	0.2	-0.9	-1.6	-1.3
Residential (Energy on Private Income, index 2000=100)	100	74	67	51	45	40	37	34	31	29	27	-4.0	-3.9	-2.0	-1.5
Tertiary (Energy on Value added, index 2000=100)	100	83	82	67	59	53	49	45	42	39	38	-2.0	-3.3	-1.8	-1.3
Passenger transport (toe/Mpkm) [6]	37	41	44	41	37	34	31	29	27	26	25	1.7	-1.8	-1.9	-1.0
Freight transport (toe/Mtkm)	11	14	16	14	15	14	14	13	13	13	12	4.4	-0.8	-1.0	-0.5
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**10.5**	**11.3**	**12.3**	**10.6**	**10.1**	**10.7**	**10.1**	**9.8**	**9.5**	**9.6**	**9.4**	1.6	-1.9	-0.1	-0.3
of which ETS sectors (2013 scope) GHG emissions		3.1	3.6	2.4	2.5	3.0	2.7	2.6	2.5	2.5	2.4		-3.7	0.9	-0.7
of which ESD sectors (2013 scope) GHG emissions		8.2	8.7	8.3	7.6	7.6	7.4	7.2	7.1	7.1	7.0		-1.3	-0.4	-0.2
CO_2 Emissions (energy related)	**6.8**	**7.7**	**8.3**	**6.5**	**6.4**	**7.0**	**6.5**	**6.4**	**6.2**	**6.3**	**6.1**	2.0	-2.6	0.2	-0.4
Power generation/District heating	2.6	2.2	2.4	1.2	1.2	1.7	1.5	1.4	1.3	1.3	1.1	-0.9	-6.7	2.2	-1.5
Energy Branch	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industry	1.0	1.1	1.0	0.8	0.8	0.7	0.6	0.5	0.4	0.4	0.3	0.0	-2.8	-2.7	-2.6
Residential	0.3	0.4	0.6	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	6.5	-2.1	-0.7	0.0
Tertiary	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	2.1	-1.8	0.1	-0.4
Transport	2.2	3.2	3.5	3.4	3.3	3.4	3.4	3.4	3.5	3.5	3.6	4.9	-0.6	0.1	0.3
CO_2 Emissions (non energy and non land use related)	**0.2**	**0.2**	**0.5**	**0.7**	**0.7**	**0.7**	**0.7**	**0.6**	**0.5**	**0.5**	**0.5**	10.4	2.8	-0.4	-1.6
Non-CO2 GHG emissions	**3.5**	**3.3**	**3.4**	**3.4**	**3.0**	**2.9**	**2.8**	**2.8**	**2.8**	**2.8**	**2.9**	-0.1	-1.3	-0.5	0.0
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**39.5**	**42.5**	**46.3**	**40.0**	**38.1**	**40.1**	**37.9**	**36.8**	**36.0**	**36.2**	**35.4**	1.6	-1.9	-0.1	-0.3
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.21	0.17	0.16	0.09	0.08	0.11	0.10	0.09	0.08	0.08	0.06	-2.2	-6.5	1.6	-2.1
Final energy demand (t of CO_2/toe)	1.29	1.37	1.45	1.30	1.23	1.24	1.20	1.19	1.20	1.20	1.20	1.1	-1.6	-0.3	0.0
Industry	1.80	1.55	1.34	0.85	0.79	0.73	0.60	0.51	0.46	0.44	0.42	-2.9	-5.2	-2.6	-1.8
Residential	0.22	0.29	0.40	0.35	0.34	0.33	0.33	0.33	0.34	0.34	0.34	6.0	-1.4	-0.5	0.3
Tertiary	1.14	1.10	1.12	0.98	0.93	0.96	0.94	0.94	0.91	0.88	0.86	-0.2	-1.8	0.1	-0.4
Transport	2.93	2.97	2.93	2.90	2.76	2.77	2.75	2.72	2.70	2.68	2.66	0.0	-0.6	0.0	-0.2
RES in Gross Final Energy Consumption [7] (in%)	**33.5**	**32.4**	**30.5**	**37.5**	**40.3**	**40.4**	**41.8**	**42.4**	**43.0**	**43.8**	**46.4**				
RES-H&C share	40.1	43.0	40.9	51.2	51.5	52.9	56.2	58.6	61.0	62.3	63.2				
RES-E share	52.7	43.0	42.1	46.2	53.8	51.5	48.6	46.6	47.6	50.3	61.7				
RES-T share (based on ILUC formula)	2.1	1.5	3.5	5.2	10.1	11.3	12.9	14.6	16.4	18.4	22.1				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	107	86	93	77	86	93	108	109	112	119	126	-1.4	-0.8	2.4	0.8
Average Price of Electricity in Final demand sectors (€'13/MWh	57	66	107	102	115	126	132	141	142	143	144	6.5	0.8	1.3	0.5
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**2.0**	**3.4**	**5.1**	**4.4**	**5.1**	**5.8**	**6.5**	**7.1**	**7.6**	**8.0**	**8.5**	10.0	0.1	2.5	1.3
as % of GDP	**14.8**	**17.3**	**27.0**	**19.0**	**19.3**	**19.9**	**20.8**	**21.2**	**21.1**	**21.1**	**21.2**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Lithuania: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**4**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**2**	-1.1	-1.0	-1.8	-0.7
GDP (in 000 M€13)	**19**	**27**	**29**	**35**	**40**	**42**	**43**	**43**	**46**	**49**	**53**	4.4	3.3	0.7	1.0
Gross Inland Consumption (ktoe)	**7063**	**8711**	**6787**	**6651**	**6546**	**6647**	**7370**	**7096**	**7252**	**7429**	**7489**	-0.4	-0.4	1.2	0.1
Solids	91	185	213	254	199	174	140	95	58	41	31	8.8	-0.7	-3.5	-7.3
Oil	2125	2710	2502	2432	2368	2340	2187	2027	2005	1977	1971	1.6	-0.5	-0.8	-0.5
Natural gas	2064	2477	2492	2122	2082	2477	1845	1751	1714	1667	1645	1.9	-1.8	-1.2	-0.6
Nuclear	2223	2713	0	0	0	0	2010	2010	2010	2010	2010	-100.0	0.0	0.0	0.0
Electricity	-115	-255	515	594	567	393	-115	-156	-183	-195	-290	0.0	1.0	0.0	4.8
Renewable energy forms	675	881	1065	1249	1330	1263	1303	1369	1648	1929	2123	4.7	2.2	-0.2	2.5
Energy Branch Consumption	**610**	**853**	**743**	**680**	**611**	**611**	**594**	**570**	**557**	**543**	**533**	2.0	-1.9	-0.3	-0.5
Non-Energy Uses	**662**	**804**	**714**	**717**	**793**	**788**	**761**	**748**	**752**	**749**	**758**	0.8	1.1	-0.4	0.0
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**3269**	**3900**	**1318**	**1358**	**1461**	**1389**	**3439**	**3504**	**3717**	**3998**	**4193**	-8.7	1.0	8.9	1.0
Solids	12	20	9	19	7	8	8	8	8	8	8	-3.0	-2.1	1.3	0.2
Oil	352	267	125	77	77	73	69	65	0	0	0	-9.9	-4.7	-1.1	-100.0
Natural gas	0	0	0	0	0	0	0	0	0	0	0	4.2	-100.0	0.0	0.0
Nuclear	2223	2713	0	0	0	0	2010	2010	2010	2010	2010	-100.0	0.0	0.0	0.0
Renewable energy sources	682	900	1185	1262	1377	1308	1353	1421	1699	1980	2175	5.7	1.5	-0.2	2.4
Hydro	29	39	46	38	38	38	38	38	42	49	93	4.7	-2.0	0.0	4.6
Biomass & Waste	653	858	1114	1158	1265	1176	1200	1227	1282	1338	1397	5.5	1.3	-0.5	0.8
Wind	0	0	19	60	60	71	71	71	73	129	201	0.0	12.0	1.8	5.3
Solar and others	0	0	0	5	8	7	9	8	9	10	11	0.0	0.0	1.0	1.3
Geothermal	0	3	5	1	6	16	35	76	293	453	473	0.0	3.1	19.1	13.9
Net Imports (ktoe)	**4247**	**5026**	**5668**	**5454**	**5249**	**5424**	**4092**	**3747**	**3691**	**3588**	**3452**	2.9	-0.8	-2.5	-0.8
Solids	80	174	196	235	192	166	132	87	50	33	23	9.4	-0.2	-3.7	-8.4
Oil	2223	2622	2607	2516	2452	2426	2271	2105	2146	2115	2107	1.6	-0.6	-0.8	-0.4
Crude oil and Feedstocks	4760	9029	9339	9639	9124	8654	8095	7523	7110	6633	6172	7.0	-0.2	-1.2	-1.3
Oil products	-2537	-6408	-6732	-7123	-6672	-6228	-5823	-5418	-4963	-4519	-4065	10.3	-0.1	-1.4	-1.8
Natural gas	2065	2493	2485	2122	2085	2483	1853	1763	1729	1686	1665	1.9	-1.7	-1.2	-0.5
Electricity	-115	-255	515	594	567	393	-115	-156	-183	-195	-290	0.0	1.0	0.0	4.8
Import Dependency (%)	59.4	56.8	81.8	80.1	78.2	79.6	54.3	51.7	49.8	47.3	45.2				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**11121**	**14415**	**4994**	**5066**	**5902**	**8422**	**14421**	**15141**	**15237**	**16091**	**17534**	-7.7	1.7	9.3	1.0
Nuclear energy	8419	10337	0	0	0	0	9377	9377	9377	9377	9377	-100.0	0.0	0.0	0.0
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil (including refinery gas)	655	401	647	182	0	0	0	0	0	0	0	-0.1	-100.0	0.0	0.0
Gas (including derived gases)	1707	3217	3436	3028	3978	6295	2739	3334	3290	3230	3200	7.2	1.5	-3.7	0.8
Biomass-waste	0	7	147	657	725	794	972	1097	1169	1342	1474	0.0	17.3	3.0	2.1
Hydro (pumping excluded)	340	451	540	440	440	440	440	440	485	573	1079	4.7	-2.0	0.0	4.6
Wind	0	2	224	695	695	828	828	829	850	1502	2338	0.0	12.0	1.8	5.3
Solar	0	0	0	64	64	64	64	64	66	66	66	0.0	0.0	0.0	0.2
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**5539**	**4135**	**2878**	**3443**	**2424**	**2336**	**3263**	**3048**	**2939**	**2764**	**3282**	-6.3	-1.7	3.0	0.0
Nuclear energy	2880	1440	0	0	0	0	1117	1117	1117	1117	1117	-100.0	0.0	0.0	0.0
Renewable energy	103	118	249	614	614	657	657	657	670	979	1503	9.2	9.4	0.7	4.2
Hydro (pumping excluded)	103	117	116	116	116	116	116	116	128	152	286	1.2	0.0	0.0	4.6
Wind	0	1	133	424	424	467	467	467	468	754	1144	0.0	12.3	1.0	4.6
Solar	0	0	0	74	74	74	74	74	74	74	74	0.0	0.0	0.0	0.0
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	2556	2577	2629	2829	1810	1679	1489	1274	1152	668	661	0.3	-3.7	-1.9	-4.0
of which cogeneration units	650	1038	1100	1799	578	1096	965	745	686	648	655	5.4	-6.2	5.3	-1.9
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	3	3	0	0	0	0	0	0	0	0	0	-100.0	0.0	0.0	0.0
Gas fired	1736	1781	1822	1992	1521	1521	1350	1122	994	501	495	0.5	-1.8	-1.2	-4.9
Oil fired	817	793	770	770	200	48	0	0	0	0	0	-0.6	-12.6	-55.4	-100.0
Biomass-waste fired	0	0	37	67	90	110	139	152	159	167	166	0.0	9.3	4.5	0.9
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	20.1	36.5	18.3	15.0	26.0	38.5	47.8	53.7	56.1	63.2	58.3				
Efficiency of gross thermal power generation (%)	22.0	25.1	28.4	36.6	46.8	47.0	37.7	44.6	44.4	44.2	44.6				
% of gross electricity from CHP	15.5	15.5	34.6	45.5	51.9	43.0	18.0	20.6	20.4	19.5	18.1				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	78.8	74.9	18.2	36.6	32.6	25.3	81.0	78.0	78.4	79.9	81.7				
Fuel Inputs to Thermal Power Generation (GWh_e)	**924**	**1240**	**1282**	**909**	**864**	**1297**	**847**	**854**	**864**	**891**	**901**	3.3	-3.9	-0.2	0.3
Solids	0	0	0	0	0	0	0	0	0	0	0	-100.0	0.0	0.0	0.0
Oil (including refinery gas)	200	178	100	49	0	0	0	0	0	0	0	-6.7	-100.0	0.0	0.0
Gas (including derived gases)	723	1057	1117	725	701	1074	563	538	530	525	517	4.4	-4.6	-2.2	-0.4
Biomass & Waste	1	5	65	135	163	223	284	316	334	365	383	59.7	9.7	5.7	1.5
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**7911**	**12651**	**9987**	**10232**	**9881**	**9445**	**10819**	**10253**	**10064**	**9787**	**9430**	2.4	-0.1	0.9	-0.7
Refineries	5032	9415	9446	9704	9277	8865	8281	7702	7332	6917	6533	6.5	-0.2	-1.1	-1.2
Biofuels and hydrogen production	0	3	45	59	113	105	98	97	98	99	101	0.0	9.7	-1.5	0.2
District heating	656	520	496	468	490	475	431	443	623	760	785	-2.7	-0.1	-1.3	3.0
Derived gases, cokeries etc.	2223	2713	0	0	0	0	2010	2011	2011	2011	2011	0.0	0.0	154.2	0.0

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Lithuania: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**30**	**40**	**38**	**39**	**41**	**44**	**45**	**45**	**46**	**46**	**47**	2.3	1.0	0.8	0.3
Public road transport	3	4	3	3	3	3	3	3	3	3	3	-0.2	0.7	0.2	0.3
Private cars and motorcycles	26	35	33	34	36	38	39	39	39	39	40	2.4	0.8	0.7	0.1
Rail	1	0	0	0	1	1	1	1	1	1	1	-4.8	3.3	1.2	0.9
Aviation [3]	0	1	1	2	2	2	2	3	3	3	4	14.6	4.2	2.5	2.1
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.4	1.2	0.4	0.5
Freight transport activity (Gtkm)	**11**	**17**	**19**	**20**	**24**	**26**	**27**	**28**	**30**	**32**	**34**	5.3	2.6	1.1	1.2
Heavy goods and light commercial vehicles	2	4	5	6	7	7	7	7	8	8	8	9.1	2.8	0.6	0.7
Rail	9	12	13	14	17	19	20	20	22	24	26	4.2	2.5	1.3	1.3
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.4	1.7	0.6	0.9
Energy demand in transport (ktoe) [4]	**1054**	**1413**	**1521**	**1582**	**1631**	**1632**	**1567**	**1506**	**1512**	**1518**	**1533**	3.7	0.7	-0.4	-0.1
Public road transport	40	51	40	41	41	40	39	39	38	38	38	0.0	0.3	-0.4	-0.2
Private cars and motorcycles	705	845	919	881	872	856	805	759	734	722	721	2.7	-0.5	-0.8	-0.5
Heavy goods and light commercial vehicles	204	387	443	517	555	564	558	549	568	577	586	8.1	2.3	0.1	0.2
Rail	76	79	65	67	78	80	79	77	80	81	81	-1.5	1.8	0.1	0.1
Aviation	27	46	49	69	79	85	78	75	85	92	100	6.1	4.9	0.0	1.2
Inland navigation	3	5	6	6	7	7	7	7	7	7	7	7.2	1.1	0.2	0.1
By transport activity															
Passenger transport	777	947	1013	998	998	989	930	880	864	860	866	2.7	-0.1	-0.7	-0.4
Freight transport	277	466	508	584	633	644	637	626	648	658	667	6.2	2.2	0.1	0.2
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.6	0.7	0.8				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.2	3.0	3.8	7.0	6.5	6.3	6.6	6.7	6.7	6.7				
ENERGY EFFICIENCY															
Primary energy consumption	**6401**	**7907**	**6073**	**5934**	**5753**	**5859**	**6609**	**6348**	**6500**	**6680**	**6731**	-0.5	-0.5	1.4	0.1
Final Energy Demand	**3767**	**4601**	**4763**	**4996**	**5021**	**4930**	**4621**	**4367**	**4351**	**4396**	**4420**	2.4	0.5	-0.8	-0.2
by sector															
Industry	780	987	898	1172	1186	1197	1109	977	973	997	1006	1.4	2.8	-0.7	-0.5
Energy intensive industries	363	436	486	689	695	696	646	557	548	552	553	3.0	3.6	-0.7	-0.8
Other industrial sectors	416	551	412	483	491	501	463	420	426	445	453	-0.1	1.8	-0.6	-0.1
Residential	1368	1509	1599	1498	1428	1366	1259	1228	1225	1227	1225	1.6	-1.1	-1.3	-0.1
Tertiary	563	672	720	718	749	709	662	634	619	634	637	2.5	0.4	-1.2	-0.2
Transport[5]	1057	1433	1546	1608	1657	1658	1590	1528	1533	1538	1552	3.9	0.7	-0.4	-0.1
by fuel															
Solids	82	177	208	238	182	156	121	74	40	23	13	9.8	-1.3	-4.0	-10.7
Oil	1356	1616	1613	1664	1693	1673	1567	1483	1469	1458	1459	1.7	0.5	-0.8	-0.4
Gas	363	519	567	649	600	609	556	484	470	474	466	4.6	0.6	-0.8	-0.9
Electricity	533	686	717	832	887	892	876	887	907	966	1003	3.0	2.2	-0.1	0.7
Heat (from CHP and District Heating)	827	905	922	870	914	929	847	786	788	794	782	1.1	-0.1	-0.8	-0.4
Renewable energy forms	605	698	738	743	743	671	652	650	674	677	693	2.0	0.1	-1.3	0.3
Other	0	0	0	0	0	0	1	1	3	4	4	0.0	0.0	12.5	10.7
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	374	317	234	191	164	157	172	163	157	151	142	-4.6	-3.5	0.5	-1.0
Industry (Energy on Value added, index 2000=100)	100	80	66	74	69	67	62	54	52	49	47	-4.1	0.5	-1.1	-1.3
Residential (Energy on Private Income, index 2000=100)	100	72	76	59	49	44	40	38	36	33	31	-2.7	-4.2	-2.1	-1.3
Tertiary (Energy on Value added, index 2000=100)	100	88	87	72	64	57	53	50	45	43	40	-1.3	-3.0	-2.0	-1.3
Passenger transport (toe/Mpkm) [6]	26	23	27	25	24	22	20	19	18	18	18	0.3	-1.2	-1.5	-0.7
Freight transport (toe/Mtkm)	25	27	27	29	26	25	24	23	22	21	20	0.9	-0.3	-1.0	-0.9
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**19.8**	**24.8**	**23.0**	**21.3**	**19.5**	**19.9**	**17.2**	**16.0**	**15.7**	**15.5**	**15.4**	1.5	-1.6	-1.2	-0.6
of which ETS sectors (2013 scope) GHG emissions		11.7	9.4	7.8	7.0	7.8	5.7	5.2	5.0	4.8	4.7		-2.9	-2.0	-1.0
of which ESD sectors (2013 scope) GHG emissions		13.2	13.6	13.4	12.5	12.1	11.5	10.8	10.7	10.7	10.7		-0.8	-0.8	-0.3
CO_2 Emissions (energy related)	**10.3**	**12.4**	**12.3**	**11.4**	**10.7**	**11.4**	**9.4**	**8.5**	**8.2**	**8.0**	**7.8**	1.8	-1.4	-1.3	-0.9
Power generation/District heating	4.0	4.0	3.7	2.4	2.1	3.0	1.7	1.6	1.5	1.4	1.4	-0.8	-5.5	-2.0	-1.1
Energy Branch	1.1	1.7	1.6	1.5	1.4	1.3	1.2	1.0	1.0	1.0	0.9	3.8	-1.4	-1.5	-1.2
Industry	1.1	1.3	1.2	1.5	1.5	1.4	1.2	0.9	0.7	0.7	0.6	0.7	2.3	-2.1	-2.9
Residential	0.5	0.6	0.8	0.8	0.6	0.6	0.5	0.5	0.5	0.4	0.4	3.7	-2.7	-1.1	-1.2
Tertiary	0.5	0.6	0.6	0.6	0.6	0.5	0.4	0.3	0.3	0.3	0.3	2.2	-0.6	-3.4	-1.8
Transport	3.1	4.2	4.5	4.6	4.6	4.6	4.4	4.2	4.2	4.1	4.2	3.7	0.2	-0.5	-0.3
CO_2 Emissions (non energy and non land use related)	**1.5**	**3.1**	**2.8**	**2.3**	**2.4**	**2.3**	**1.9**	**1.7**	**1.7**	**1.6**	**1.6**	6.0	-1.4	-2.5	-0.8
Non-CO2 GHG emissions	**8.0**	**9.3**	**7.9**	**7.6**	**6.4**	**6.2**	**6.0**	**5.8**	**5.8**	**5.9**	**6.0**	0.0	-2.1	-0.7	0.0
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**41.1**	**51.5**	**47.7**	**44.1**	**40.4**	**41.3**	**35.7**	**33.3**	**32.6**	**32.1**	**31.9**	1.5	-1.6	-1.2	-0.6
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.17	0.14	0.21	0.14	0.12	0.15	0.07	0.06	0.06	0.05	0.05	2.3	-5.6	-5.4	-1.4
Final energy demand (t of CO_2/toe)	1.39	1.47	1.48	1.50	1.44	1.44	1.41	1.35	1.30	1.27	1.25	0.6	-0.3	-0.2	-0.6
Industry	1.38	1.35	1.29	1.31	1.22	1.20	1.06	0.89	0.74	0.69	0.65	-0.7	-0.5	-1.5	-2.4
Residential	0.40	0.43	0.50	0.51	0.42	0.42	0.43	0.41	0.38	0.36	0.35	2.1	-1.6	0.2	-1.0
Tertiary	0.88	0.84	0.86	0.82	0.77	0.70	0.62	0.55	0.51	0.47	0.44	-0.3	-1.0	-2.2	-1.6
Transport	2.94	2.94	2.89	2.87	2.76	2.77	2.75	2.73	2.71	2.69	2.68	-0.2	-0.5	0.0	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**15.7**	**17.0**	**19.7**	**22.8**	**24.0**	**22.7**	**24.6**	**26.7**	**28.7**	**31.1**	**34.6**				
RES-H&C share	26.1	30.4	33.2	36.7	38.0	35.6	39.7	44.6	48.7	51.3	53.9				
RES-E share	4.0	3.8	7.4	15.6	15.5	16.5	17.8	18.4	19.8	25.5	35.6				
RES-T share (based on ILUC formula)	0.1	0.3	3.5	4.7	10.3	10.3	10.2	11.0	11.7	13.1	15.1				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€13/MWh)	75	57	174	124	111	106	109	102	104	98	98	8.7	-4.4	-0.2	-0.5
Average Price of Electricity in Final demand sectors (€13/MWh	64	73	112	104	119	133	150	156	161	160	159	5.7	0.6	2.3	0.3
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**2.7**	**4.0**	**5.6**	**5.9**	**7.1**	**7.8**	**8.1**	**8.4**	**8.8**	**9.2**	**9.6**	7.6	2.4	1.4	0.8
as % of GDP	**14.2**	**14.4**	**19.3**	**16.8**	**17.8**	**18.4**	**19.0**	**19.3**	**19.0**	**18.6**	**18.2**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Luxembourg: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	1.5	2.5	2.2	1.4
GDP (in 000 M€13)	**32**	**38**	**41**	**45**	**52**	**60**	**68**	**79**	**91**	**104**	**117**	2.6	2.3	2.8	2.7
Gross Inland Consumption (ktoe)	**3654**	**4800**	**4642**	**4616**	**4719**	**4947**	**5076**	**5427**	**5830**	**6141**	**6292**	2.4	0.2	0.7	1.1
Solids	108	77	66	51	46	36	25	15	8	6	4	-4.8	-3.7	-6.0	-8.4
Oil	2320	3160	2869	2908	2869	2968	3063	3235	3410	3516	3592	2.2	0.0	0.7	0.8
Natural gas	671	1176	1197	1031	1026	1139	1158	1351	1597	1814	1707	6.0	-1.5	1.2	2.0
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	491	280	350	381	385	388	410	375	333	280	420	-3.3	1.0	0.6	0.1
Renewable energy forms	64	106	160	245	394	416	421	451	483	525	568	9.6	9.4	0.7	1.5
Energy Branch Consumption	**26**	**30**	**50**	**51**	**54**	**60**	**67**	**83**	**87**	**97**	**101**	6.9	0.8	2.2	2.1
Non-Energy Uses	**55**	**29**	**33**	**39**	**42**	**45**	**47**	**50**	**53**	**55**	**55**	-5.1	2.5	1.2	0.8
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**64**	**111**	**122**	**148**	**267**	**282**	**281**	**303**	**325**	**356**	**394**	6.7	8.2	0.5	1.7
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil	0	0	0	0	0	0	0	0	0	0	0	11.5	-100.0	0.0	0.0
Natural gas	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	64	111	122	148	267	282	281	303	325	356	394	6.7	8.2	0.5	1.7
Hydro	11	8	9	9	13	13	13	13	13	13	14	-1.4	3.0	0.0	0.5
Biomass & Waste	51	97	105	119	184	190	185	199	211	223	226	7.5	5.8	0.1	1.0
Wind	2	5	5	7	43	42	44	44	45	57	85	7.4	24.8	0.2	3.3
Solar and others	0	2	3	13	27	38	39	47	56	62	68	0.0	25.4	3.7	2.9
Geothermal	0	0	0	0	0	0	0	0	1	1	1	0.0	0.0	14.4	7.1
Net Imports (ktoe)	**3639**	**4671**	**4503**	**4468**	**4452**	**4665**	**4796**	**5124**	**5505**	**5785**	**5897**	2.2	-0.1	0.7	1.0
Solids	108	77	66	51	46	36	25	15	8	6	4	-4.8	-3.7	-6.0	-8.4
Oil	2368	3141	2852	2908	2869	2968	3063	3235	3410	3516	3592	1.9	0.1	0.7	0.8
Crude oil and Feedstocks	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil products	2368	3141	2852	2908	2869	2968	3063	3235	3410	3516	3592	1.9	0.1	0.7	0.8
Natural gas	671	1176	1197	1031	1026	1139	1158	1351	1597	1814	1707	6.0	-1.5	1.2	2.0
Electricity	491	280	350	381	385	388	410	375	333	280	420	-3.3	1.0	0.6	0.1
Import Dependency (%)	99.6	97.3	97.0	96.8	94.3	94.3	94.5	94.4	94.4	94.2	93.7				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**422**	**3348**	**3230**	**2762**	**3176**	**3837**	**4547**	**6189**	**7833**	**9520**	**8860**	22.6	-0.2	3.7	3.4
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil (including refinery gas)	0	1	1	0	3	24	24	24	24	24	1	0.0	11.2	23.7	-15.5
Gas (including derived gases)	215	3107	2916	2304	2230	2857	3503	5158	6747	8223	7227	29.8	-2.6	4.6	3.7
Biomass-waste	56	76	129	158	175	198	239	223	268	305	328	8.7	3.1	3.2	1.6
Hydro (pumping excluded)	124	94	108	110	146	146	146	146	146	155	160	-1.4	3.0	0.0	0.5
Wind	27	52	55	78	501	491	512	515	523	663	990	7.4	24.7	0.2	3.3
Solar	0	17	21	112	121	121	122	122	125	149	154	0.0	19.2	0.1	1.2
Geothermal and other renewables	0	1	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	-100.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**163**	**574**	**597**	**702**	**982**	**960**	**1199**	**1298**	**1533**	**1851**	**1978**	13.8	5.1	2.0	2.5
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	47	93	107	212	478	464	478	478	481	573	693	8.6	16.1	0.0	1.9
Hydro (pumping excluded)	33	34	34	34	45	45	45	45	45	48	49	0.3	2.8	0.0	0.4
Wind	14	35	44	58	302	288	302	302	305	371	485	12.1	21.2	0.0	2.4
Solar	0	24	29	120	131	131	131	131	131	155	160	0.0	16.2	0.0	1.0
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	116	481	490	490	504	497	721	821	1052	1278	1285	15.5	0.3	3.6	2.9
of which cogeneration units	63	101	121	229	192	154	306	179	168	166	186	6.7	4.7	4.8	-2.5
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Gas fired	103	468	469	469	469	457	682	783	1015	1244	1244	16.4	0.0	3.8	3.1
Oil fired	5	5	4	1	2	4	4	4	3	3	3	-2.3	-7.8	10.5	-1.7
Biomass-waste fired	9	9	17	20	34	35	35	34	34	30	37	7.1	7.1	0.3	0.4
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	27.9	66.2	61.4	44.1	36.4	45.0	42.6	53.4	57.3	57.6	50.2				
Efficiency of gross thermal power generation (%)	24.3	47.5	47.4	50.5	49.8	48.9	54.0	59.7	60.9	61.8	61.8				
% of gross electricity from CHP	17.7	10.1	9.6	23.3	16.5	9.7	12.3	7.4	6.4	5.3	6.0				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	49.1	7.2	9.7	16.6	29.7	24.9	22.4	16.3	13.6	13.4	18.4				
Fuel Inputs to Thermal Power Generation (GWh_e)	**96**	**576**	**553**	**419**	**416**	**542**	**599**	**779**	**994**	**1191**	**1051**	19.1	-2.8	3.7	2.8
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil (including refinery gas)	1	0	0	0	0	0	0	0	0	0	0	-100.0	0.0	0.0	0.0
Gas (including derived gases)	66	544	520	383	370	489	548	726	940	1131	992	22.8	-3.3	4.0	3.0
Biomass & Waste	29	32	33	36	46	53	51	53	54	60	59	1.5	3.2	1.2	0.7
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**1**	**3**	**46**	**113**	**153**	**160**	**167**	**179**	**194**	**211**	**227**	57.2	12.8	0.9	1.5
Refineries	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Biofuels and hydrogen production	0	1	42	108	148	155	162	174	189	207	222	0.0	13.4	0.9	1.6
District heating	1	2	4	5	5	5	5	4	4	4	4	23.1	2.3	-1.0	-1.1
Derived gases, cokeries etc.	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	1.0	0.6

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Luxembourg: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**7**	**8**	**9**	**9**	**10**	**12**	**13**	**14**	**15**	**17**	**17**	1.6	2.0	2.0	1.6
Public road transport	1	1	1	1	1	1	1	1	1	2	2	4.2	1.7	1.5	1.2
Private cars and motorcycles	6	6	7	7	8	9	10	11	12	13	13	1.5	2.0	2.0	1.6
Rail	0	0	0	0	0	1	1	1	1	1	1	0.4	3.0	2.5	1.7
Aviation [3]	1	1	1	1	1	1	1	1	1	1	2	-0.5	2.4	2.8	2.1
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Freight transport activity (Gtkm)	**3**	**3**	**3**	**3**	**4**	**5**	**5**	**5**	**6**	**6**	**7**	0.8	3.5	1.8	1.5
Heavy goods and light commercial vehicles	2	2	2	3	3	4	4	4	5	5	5	2.8	4.1	1.6	1.4
Rail	1	0	0	0	0	0	1	1	1	1	1	-6.5	1.9	3.2	2.7
Inland navigation	0	0	0	0	0	0	0	0	1	1	1	-0.5	0.9	1.6	1.3
Energy demand in transport (ktoe) [4]	**1914**	**2781**	**2604**	**2697**	**2767**	**2879**	**2988**	**3182**	**3373**	**3504**	**3602**	3.1	0.6	0.8	0.9
Public road transport	60	92	106	115	122	126	131	138	146	151	154	5.9	1.4	0.7	0.8
Private cars and motorcycles	1153	1521	1341	1311	1221	1271	1307	1425	1512	1542	1567	1.5	-0.9	0.7	0.9
Heavy goods and light commercial vehicles	364	721	709	818	960	983	1011	1036	1098	1162	1207	6.9	3.1	0.5	0.9
Rail	12	11	13	14	16	18	20	22	24	27	28	0.8	1.9	2.3	1.7
Aviation	321	432	431	435	445	478	515	557	589	619	641	3.0	0.3	1.5	1.1
Inland navigation	4	3	4	3	3	3	3	4	4	4	4	-1.0	-1.8	1.4	1.1
By transport activity															
Passenger transport	1535	2046	1880	1863	1790	1876	1955	2122	2249	2314	2365	2.0	-0.5	0.9	1.0
Freight transport	379	735	724	834	977	1003	1033	1060	1125	1191	1238	6.7	3.0	0.6	0.9
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.4	0.6	0.9	1.0				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	1.6	4.0	5.4	5.4	5.4	5.4	5.4	5.6	5.7				
ENERGY EFFICIENCY															
Primary energy consumption	**3599**	**4771**	**4609**	**4576**	**4677**	**4902**	**5029**	**5377**	**5778**	**6086**	**6236**	2.5	0.1	0.7	1.1
Final Energy Demand	**3505**	**4477**	**4327**	**4382**	**4474**	**4627**	**4746**	**5037**	**5357**	**5589**	**5786**	2.1	0.3	0.6	1.0
by sector															
Industry	714	754	739	585	592	566	505	502	516	536	554	0.4	-2.2	-1.6	0.5
Energy intensive industries	583	598	601	438	434	401	339	324	321	323	323	0.3	-3.2	-2.4	-0.2
Other industrial sectors	130	156	139	148	158	165	166	178	194	213	231	0.6	1.3	0.4	1.7
Residential	468	525	508	498	519	557	586	638	705	750	802	0.8	0.2	1.2	1.6
Tertiary	409	418	477	601	595	625	668	715	763	799	828	1.5	2.2	1.2	1.1
Transport[5]	1914	2781	2604	2697	2767	2879	2988	3182	3373	3504	3602	3.1	0.6	0.8	0.9
by fuel															
Solids	108	77	66	51	46	36	25	15	8	6	4	-4.8	-3.7	-6.0	-8.4
Oil	2261	3106	2835	2869	2828	2923	3016	3185	3357	3462	3537	2.3	0.0	0.6	0.8
Gas	605	631	675	645	655	650	609	624	657	683	714	1.1	-0.3	-0.7	0.8
Electricity	497	529	568	557	592	645	716	803	891	968	1035	1.4	0.4	1.9	1.9
Heat (from CHP and District Heating)	13	75	74	80	76	80	80	79	81	82	83	19.2	0.2	0.5	0.2
Renewable energy forms	22	59	108	181	277	293	299	327	356	378	393	17.2	9.8	0.8	1.4
Other	0	0	0	0	1	1	2	4	7	12	20	0.0	0.0	15.9	11.4
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	115	126	113	103	91	83	74	68	64	59	54	-0.1	-2.1	-2.0	-1.6
Industry (Energy on Value added, index 2000=100)	100	101	133	100	92	79	64	57	52	49	46	2.9	-3.6	-3.6	-1.6
Residential (Energy on Private Income, index 2000=100)	100	103	93	90	83	78	71	66	62	57	53	-0.7	-1.2	-1.6	-1.4
Tertiary (Energy on Value added, index 2000=100)	100	85	86	98	84	76	70	64	59	54	50	-1.5	-0.2	-1.8	-1.7
Passenger transport (toe/Mpkm) [6]	204	244	209	188	162	153	144	141	136	130	126	0.3	-2.5	-1.2	-0.7
Freight transport (toe/Mtkm)	139	268	247	245	235	220	208	199	194	189	185	5.9	-0.5	-1.2	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**10.7**	**14.1**	**13.3**	**12.9**	**12.8**	**13.3**	**13.4**	**14.3**	**15.4**	**16.2**	**16.2**	2.2	-0.4	0.5	1.0
of which ETS sectors (2013 scope) GHG emissions		4.2	3.8	3.5	3.4	3.6	3.6	4.1	4.6	5.1	4.8		-1.1	0.7	1.4
of which ESD sectors (2013 scope) GHG emissions		9.9	9.5	9.5	9.4	9.6	9.8	10.2	10.8	11.1	11.4		-0.1	0.4	0.8
CO_2 Emissions (energy related)	**8.9**	**12.6**	**11.8**	**11.4**	**11.3**	**11.8**	**12.1**	**13.0**	**14.1**	**14.9**	**14.8**	2.9	-0.4	0.7	1.0
Power generation/District heating	0.2	1.3	1.2	0.9	0.9	1.1	1.3	1.7	2.2	2.7	2.3	22.6	-3.4	4.0	3.0
Energy Branch	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industry	1.2	1.1	1.0	0.8	0.8	0.7	0.5	0.4	0.4	0.4	0.4	-2.0	-2.7	-4.2	-1.3
Residential	1.1	1.2	1.1	1.1	1.0	1.1	1.1	1.2	1.3	1.3	1.4	0.5	-1.1	1.0	1.2
Tertiary	0.6	0.5	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	-0.6	0.7	-0.8	-0.3
Transport	5.8	8.4	7.8	7.9	8.0	8.3	8.6	9.1	9.6	9.9	10.2	3.1	0.2	0.7	0.9
CO_2 Emissions (non energy and non land use related)	**0.7**	**0.7**	**0.6**	**0.5**	**0.5**	**0.5**	**0.4**	**0.4**	**0.4**	**0.4**	**0.3**	-2.1	-1.1	-2.9	-0.8
Non-CO2 GHG emissions	**1.1**	**0.9**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	-0.9	0.1	-0.3	0.3
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**80.3**	**106.5**	**100.3**	**97.4**	**96.2**	**99.7**	**100.9**	**107.9**	**116.0**	**122.2**	**122.0**	2.2	-0.4	0.5	1.0
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.28	0.30	0.30	0.25	0.21	0.24	0.24	0.24	0.25	0.25	0.24	0.7	-3.3	0.9	0.0
Final energy demand (t of CO_2/toe)	2.49	2.52	2.43	2.40	2.32	2.29	2.27	2.24	2.21	2.19	2.16	-0.2	-0.5	-0.2	-0.2
Industry	1.71	1.47	1.36	1.39	1.29	1.16	0.98	0.86	0.76	0.71	0.68	-2.3	-0.5	-2.7	-1.8
Residential	2.29	2.28	2.22	2.14	1.93	1.91	1.90	1.83	1.80	1.77	1.75	-0.3	-1.4	-0.2	-0.4
Tertiary	1.59	1.25	1.28	1.23	1.10	1.00	0.90	0.80	0.75	0.71	0.68	-2.1	-1.5	-2.0	-1.4
Transport	3.01	3.04	2.99	2.92	2.88	2.87	2.86	2.86	2.85	2.84	2.82	-0.1	-0.4	-0.1	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**0.8**	**1.4**	**2.9**	**5.0**	**8.3**	**8.4**	**8.2**	**8.6**	**8.7**	**9.1**	**9.7**				
RES-H&C share	1.4	3.6	4.8	6.4	12.2	13.2	12.6	15.4	16.2	17.0	17.4				
RES-E share	2.1	3.2	3.8	6.1	12.7	11.7	11.2	9.9	9.3	10.3	12.4				
RES-T share (based on ILUC formula)	0.0	0.0	1.9	7.5	10.1	10.7	11.1	10.8	10.9	11.5	11.9				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	87	63	78	82	96	94	97	90	89	96	102	-1.1	2.2	0.1	0.2
Average Price of Electricity in Final demand sectors (€'13/MWh	108	119	110	116	126	133	137	143	148	143	142	0.1	1.4	0.8	0.2
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**3.0**	**4.4**	**4.6**	**4.7**	**5.9**	**6.6**	**7.5**	**8.4**	**9.4**	**10.0**	**10.6**	4.3	2.5	2.4	1.8
as % of GDP	**9.5**	**11.5**	**11.2**	**10.4**	**11.4**	**11.2**	**10.9**	**10.6**	**10.3**	**9.6**	**9.1**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Malta: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0.9	0.6	0.4	0.1
GDP (in 000 M€13)	**6**	**6**	**7**	**8**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	1.8	2.1	1.9	1.8
Gross Inland Consumption (ktoe)	**802**	**972**	**908**	**675**	**743**	**740**	**750**	**760**	**766**	**791**	**821**	1.3	-2.0	0.1	0.5
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	-3.9	-1.5
Oil	802	972	903	579	341	342	338	342	330	334	334	1.2	-9.3	-0.1	-0.1
Natural gas	0	0	0	0	336	329	337	334	331	342	372	0.0	0.0	0.0	0.5
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	0	0	0	75	16	16	18	20	22	25	14	0.0	0.0	1.2	-1.3
Renewable energy forms	0	1	5	21	49	53	57	65	84	91	101	0.0	25.7	1.4	2.9
Energy Branch Consumption	**10**	**2**	**10**	**6**	**5**	**4**	**4**	**4**	**4**	**4**	**5**	0.5	-7.2	-1.8	0.8
Non-Energy Uses	**0**	**20**	**9**	**11**	**12**	**13**	**12**	**13**	**13**	**14**	**14**	0.0	3.4	0.2	0.7
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**0**	**1**	**4**	**16**	**38**	**41**	**47**	**55**	**73**	**77**	**84**	0.0	24.3	2.2	2.9
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Natural gas	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	0	1	4	16	38	41	47	55	73	77	84	0.0	24.3	2.2	2.9
Hydro	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Biomass & Waste	0	0	1	3	1	2	2	4	4	8	9	0.0	9.0	5.2	6.8
Wind	0	0	0	0	0	0	0	0	0	0	7	0.0	0.0	0.0	0.0
Solar and others	0	1	4	13	36	39	45	51	69	69	67	0.0	25.7	2.0	2.1
Geothermal	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	1.2	1.7
Net Imports (ktoe)	**1458**	**1630**	**2362**	**2099**	**2103**	**2126**	**2177**	**2257**	**2337**	**2445**	**2549**	4.9	-1.2	0.4	0.8
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	-3.9	-1.5
Oil	1458	1630	2361	2019	1727	1747	1782	1843	1905	1994	2065	4.9	-3.1	0.3	0.7
Crude oil and Feedstocks	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil products	1458	1630	2361	2019	1727	1747	1782	1843	1905	1994	2065	4.9	-3.1	0.3	0.7
Natural gas	0	0	0	0	348	351	367	384	400	412	452	0.0	0.0	0.5	1.0
Electricity	0	0	0	75	16	16	18	20	22	25	14	0.0	0.0	1.2	-1.3
Import Dependency (%)	100.3	100.0	99.0	99.2	98.2	98.1	97.9	97.6	97.0	96.9	96.8				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**1917**	**2240**	**2115**	**1402**	**2460**	**2657**	**2788**	**2822**	**2980**	**3109**	**3415**	1.0	1.5	1.3	1.0
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil (including refinery gas)	1917	2240	2113	1293	0	0	0	0	0	0	0	1.0	-100.0	0.0	0.0
Gas (including derived gases)	0	0	0	0	2126	2321	2427	2402	2377	2462	2674	0.0	0.0	1.3	0.5
Biomass-waste	0	0	0	6	8	9	11	17	18	48	57	0.0	0.0	2.7	8.8
Hydro (pumping excluded)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Wind	0	0	0	0	0	0	0	0	0	0	86	0.0	0.0	0.0	0.0
Solar	0	0	0	103	326	327	351	404	585	598	597	0.0	0.0	0.7	2.7
Geothermal and other renewables	0	0	2	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**577**	**577**	**579**	**541**	**781**	**913**	**1057**	**1081**	**1180**	**1166**	**1220**	0.0	3.0	3.1	0.7
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	0	0	2	60	185	185	198	229	328	313	367	0.0	57.2	0.7	3.1
Hydro (pumping excluded)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Wind	0	0	0	0	0	0	0	0	0	0	54	0.0	0.0	0.0	0.0
Solar	0	0	2	60	185	185	198	229	328	313	313	0.0	57.2	0.7	2.3
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	577	577	577	481	596	728	859	853	853	853	853	0.0	0.3	3.7	0.0
of which cogeneration units	0	0	0	1	1	1	1	1	1	3	3	0.0	0.0	-4.4	5.5
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Gas fired	0	0	0	0	233	473	713	713	713	713	713	0.0	0.0	11.8	0.0
Oil fired	577	577	577	479	361	253	144	137	137	137	137	0.0	-4.6	-8.8	-0.3
Biomass-waste fired	0	0	0	2	2	2	2	3	3	3	4	0.0	0.0	1.4	2.4
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	35.6	43.8	39.3	28.2	35.1	32.6	29.6	29.3	28.4	29.9	31.4				
Efficiency of gross thermal power generation (%)	35.4	29.3	31.7	45.4	54.4	60.7	62.0	62.1	62.1	62.2	62.2				
% of gross electricity from CHP	0.0	0.0	0.0	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.2				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	0.0	0.0	0.1	7.7	13.6	12.6	13.0	14.9	20.2	20.8	21.7				
Fuel Inputs to Thermal Power Generation (GWh_e)	**465**	**658**	**573**	**246**	**337**	**330**	**338**	**335**	**331**	**347**	**378**	2.1	-5.2	0.0	0.6
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Oil (including refinery gas)	465	658	573	245	0	0	0	0	0	0	0	2.1	-100.0	0.0	0.0
Gas (including derived gases)	0	0	0	0	336	329	337	334	330	342	372	0.0	0.0	0.0	0.5
Biomass & Waste	0	0	0	1	1	1	1	1	1	5	6	0.0	0.0	-0.1	8.3
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**0**	**0**	**1**	**3**	**7**	**7**	**6**	**6**	**7**	**9**	**10**	0.0	23.4	-2.3	2.6
Refineries	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Biofuels and hydrogen production	0	0	1	3	7	7	6	6	7	9	10	0.0	23.4	-2.3	2.6
District heating	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Derived gases, cokeries etc.	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	17.0	6.1

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)											Malta: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**5**	**5**	**5**	**6**	**7**	**7**	**8**	**8**	**8**	**9**	**9**	1.2	2.2	1.2	0.9
Public road transport	0	0	1	1	1	1	1	1	1	1	1	0.8	0.5	0.3	0.1
Private cars and motorcycles	2	2	2	2	2	2	2	3	3	3	3	2.0	0.5	0.4	0.3
Rail	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Aviation [3]	2	2	3	3	4	4	5	5	5	6	6	0.7	3.8	1.9	1.2
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Freight transport activity (Gtkm)	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	0.3	1.3	1.6	1.5
Heavy goods and light commercial vehicles	0	0	0	0	0	0	0	0	0	0	0	0.3	1.3	1.6	1.5
Rail	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Energy demand in transport (ktoe) [4]	**268**	**242**	**255**	**256**	**270**	**274**	**272**	**283**	**275**	**280**	**284**	-0.5	0.6	0.1	0.2
Public road transport	12	13	12	12	12	11	11	11	11	11	10	-0.3	-0.2	-0.6	-0.2
Private cars and motorcycles	97	105	110	109	102	95	90	88	86	85	83	1.2	-0.7	-1.3	-0.4
Heavy goods and light commercial vehicles	36	37	31	31	34	36	38	40	42	45	47	-1.5	0.8	1.0	1.1
Rail	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Aviation	122	87	102	105	122	132	134	144	136	141	143	-1.8	1.8	0.9	0.3
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
By transport activity															
Passenger transport	232	205	224	225	236	238	235	242	233	236	237	-0.4	0.5	0.0	0.0
Freight transport	36	37	31	31	34	36	38	40	42	45	47	-1.5	0.8	1.0	1.1
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.2	0.5	0.8	1.0	1.4	1.7				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	0.4	1.2	2.7	2.6	2.1	2.2	2.5	3.0	3.3				
ENERGY EFFICIENCY															
Primary energy consumption	**802**	**952**	**899**	**664**	**731**	**728**	**738**	**748**	**753**	**778**	**807**	1.2	-2.1	0.1	0.4
Final Energy Demand	**483**	**478**	**476**	**501**	**545**	**565**	**575**	**586**	**591**	**609**	**625**	-0.1	1.4	0.5	0.4
by sector															
Industry	83	74	48	51	52	49	51	50	52	53	54	-5.4	0.8	-0.1	0.3
Energy intensive industries	13	19	8	8	8	8	8	7	8	8	8	-4.8	0.0	-0.4	0.4
Other industrial sectors	70	55	40	44	44	42	44	42	44	45	46	-5.5	0.9	0.0	0.3
Residential	76	77	80	85	101	109	114	116	123	129	135	0.5	2.4	1.2	0.9
Tertiary	55	85	94	108	122	132	137	138	142	146	152	5.4	2.7	1.2	0.5
Transport[5]	268	242	255	256	270	274	272	283	275	280	284	-0.5	0.6	0.1	0.2
by fuel															
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	-3.9	-1.5
Oil	348	309	316	323	329	330	326	329	317	320	320	-1.0	0.4	-0.1	-0.1
Gas	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	7.6	0.0
Electricity	135	168	155	166	195	211	223	227	241	254	267	1.4	2.3	1.3	0.9
Heat (from CHP and District Heating)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.3	-0.7
Renewable energy forms	0	1	5	11	20	23	25	29	32	34	36	0.0	14.2	2.4	1.8
Other	0	0	0	0	0	0	0	0	0	0	1	0.0	0.0	21.9	15.5
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	142	162	134	89	89	81	74	68	63	60	58	-0.6	-4.0	-1.8	-1.3
Industry (Energy on Value added, index 2000=100)	100	116	74	73	67	60	58	52	51	50	49	-2.9	-1.0	-1.6	-0.8
Residential (Energy on Private Income, index 2000=100)	100	93	89	91	97	93	87	79	75	72	69	-1.1	0.8	-1.0	-1.2
Tertiary (Energy on Value added, index 2000=100)	100	137	123	125	128	125	117	106	98	93	89	2.1	0.4	-0.9	-1.4
Passenger transport (toe/Mpkm) [6]	45	40	39	37	33	31	29	28	26	25	24	-1.3	-1.8	-1.3	-0.8
Freight transport (toe/Mtkm)	139	135	116	113	110	108	104	101	99	97	96	-1.7	-0.5	-0.6	-0.4
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**2.8**	**3.3**	**3.1**	**2.1**	**2.1**	**2.0**	**2.0**	**2.0**	**2.0**	**2.0**	**2.1**	1.0	-3.9	-0.5	0.2
of which ETS sectors (2013 scope) GHG emissions		2.4	2.1	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.3		-6.0	0.3	0.4
of which ESD sectors (2013 scope) GHG emissions		1.0	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.8	0.8		-0.4	-1.5	-0.1
CO_2 Emissions (energy related)	**2.5**	**3.0**	**2.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.8**	**1.7**	**1.8**	**1.8**	0.9	-4.4	0.0	0.2
Power generation/District heating	1.5	2.1	1.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.9	2.1	-8.1	0.0	0.5
Energy Branch	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Industry	0.1	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-9.7	0.4	-3.9	-5.2
Residential	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-1.2	2.2	0.0	-0.2
Tertiary	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	6.2	-0.7	-0.9	-0.8
Transport	0.8	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	-0.5	0.3	0.1	0.1
CO_2 Emissions (non energy and non land use related)	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	1.7	-17.5	1.7	0.7
Non-CO2 GHG emissions	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	1.6	-0.5	-3.3	0.5
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**127.9**	**150.8**	**141.1**	**95.1**	**94.4**	**91.8**	**90.1**	**90.1**	**88.5**	**90.5**	**94.1**	1.0	-3.9	-0.5	0.2
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.78	0.95	0.87	0.56	0.32	0.29	0.28	0.28	0.26	0.26	0.26	1.1	-9.5	-1.2	-0.5
Final energy demand (t of CO_2/toe)	2.17	1.94	1.99	1.93	1.81	1.75	1.70	1.68	1.61	1.57	1.54	-0.9	-0.9	-0.6	-0.5
Industry	1.55	1.43	0.97	1.00	0.94	0.75	0.63	0.38	0.28	0.23	0.21	-4.6	-0.4	-3.8	-5.5
Residential	1.02	0.80	0.86	0.91	0.85	0.80	0.75	0.72	0.64	0.64	0.61	-1.7	-0.2	-1.2	-1.1
Tertiary	0.67	0.40	0.72	0.73	0.51	0.46	0.42	0.40	0.38	0.35	0.32	0.7	-3.3	-2.0	-1.3
Transport	3.00	3.00	2.99	2.96	2.92	2.92	2.94	2.93	2.92	2.90	2.89	0.0	-0.2	0.1	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**0.0**	**0.1**	**1.0**	**6.0**	**11.8**	**12.2**	**13.0**	**14.3**	**17.5**	**18.0**	**19.2**				
RES-H&C share	0.0	1.0	7.0	17.5	24.2	28.0	32.6	36.0	39.6	39.5	40.6				
RES-E share	0.0	0.0	0.1	4.8	12.6	11.8	12.1	13.8	18.7	19.0	20.7				
RES-T share (based on ILUC formula)	0.0	0.0	0.5	4.2	10.0	10.0	8.6	9.4	10.6	13.3	14.9				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	78	111	173	117	91	95	105	108	106	103	103	8.4	-6.3	1.5	-0.1
Average Price of Electricity in Final demand sectors (€'13/MWh	75	84	201	177	170	164	161	159	156	147	137	10.4	-1.7	-0.5	-0.8
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**0.4**	**0.5**	**0.8**	**0.8**	**1.1**	**1.2**	**1.3**	**1.3**	**1.4**	**1.5**	**1.5**	8.2	2.3	1.8	0.8
as % of GDP	**6.8**	**8.9**	**12.5**	**11.2**	**12.7**	**12.9**	**12.6**	**12.0**	**11.6**	**11.0**	**10.4**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Netherlands: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**16**	**16**	**17**	**17**	**17**	**17**	**18**	**18**	**18**	**18**	**17**	0.4	0.3	0.2	-0.1
GDP (in 000 M€13)	**537**	**573**	**613**	**620**	**668**	**706**	**738**	**782**	**836**	**898**	**966**	1.3	0.9	1.0	1.4
Gross Inland Consumption (ktoe)	**75572**	**81469**	**86612**	**83760**	**83387**	**82173**	**79375**	**76635**	**75962**	**75747**	**74929**	1.4	-0.4	-0.5	-0.3
Solids	7852	8195	7596	9274	7908	7897	6254	5109	4133	2282	1085	-0.3	0.4	-2.3	-8.4
Oil	28245	32464	34649	34892	34377	33935	33251	32809	32557	32308	31692	2.1	-0.1	-0.3	-0.2
Natural gas	35009	35334	39309	33859	30886	30595	29122	28748	28750	30144	29862	1.2	-2.4	-0.6	0.1
Nuclear	1013	1031	1024	956	956	990	990	0	0	0	0	0.1	-0.7	0.4	-100.0
Electricity	1626	1573	239	872	77	-646	-567	-753	-725	-653	-634	-17.5	-10.7	0.0	0.6
Renewable energy forms	1827	2872	3796	3906	9183	9402	10325	10723	11247	11667	12923	7.6	9.2	1.2	1.1
Energy Branch Consumption	**5353**	**6336**	**5088**	**5606**	**5434**	**5073**	**4774**	**4450**	**4321**	**4260**	**4140**	-0.5	0.7	-1.3	-0.7
Non-Energy Uses	**10491**	**13013**	**17582**	**13895**	**14823**	**15315**	**15548**	**15585**	**15739**	**15804**	**15399**	5.3	-1.7	0.5	0.0
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**57555**	**62220**	**70219**	**51471**	**52921**	**46185**	**39258**	**28019**	**28075**	**29202**	**30227**	2.0	-2.8	-2.9	-1.3
Solids	7	8	6	0	0	0	0	0	0	0	0	-2.0	-100.0	0.0	0.0
Oil	2405	2328	1985	1381	1414	961	752	647	639	616	592	-1.9	-3.3	-6.1	-1.2
Natural gas	52203	56276	63534	44126	40610	33871	26110	15493	14942	15516	15162	2.0	-4.4	-4.3	-2.7
Nuclear	1013	1031	1024	956	956	990	990	0	0	0	0	0.1	-0.7	0.4	-100.0
Renewable energy sources	1926	2577	3671	5009	9941	10363	11406	11879	12494	13070	14473	6.7	10.5	1.4	1.2
Hydro	12	8	9	9	9	9	9	9	9	9	9	-3.0	-0.1	0.1	0.0
Biomass & Waste	1831	2371	3282	4236	6972	7297	8151	8490	9034	9463	9916	6.0	7.8	1.6	1.0
Wind	71	178	343	618	2373	2373	2373	2389	2411	2486	3384	17.0	21.3	0.0	1.8
Solar and others	11	21	29	123	547	627	800	911	954	1019	1067	9.8	34.1	3.9	1.5
Geothermal	0	0	8	24	41	56	72	80	86	93	97	0.0	18.2	5.9	1.5
Net Imports (ktoe)	**33759**	**37076**	**30549**	**47678**	**45843**	**52055**	**57277**	**66532**	**66853**	**66667**	**66021**	-1.0	4.1	2.3	0.7
Solids	7998	8312	9228	9274	7908	7897	6254	5109	4133	2282	1085	1.4	-1.5	-2.3	-8.4
Oil	41425	47836	45167	48901	48061	48526	49038	49011	49372	49837	50141	0.9	0.6	0.2	0.1
Crude oil and Feedstocks	61018	61724	60676	53468	50717	48551	46584	44929	43178	41535	39926	-0.1	-1.8	-0.8	-0.8
Oil products	-19594	-13888	-15508	-4567	-2656	-25	2453	4082	6193	8301	10215	-2.3	-16.2	0.0	7.4
Natural gas	-17191	-20941	-24211	-10267	-9444	-2761	3633	14321	15321	16605	16979	3.5	-9.0	0.0	8.0
Electricity	1626	1573	239	872	77	-646	-567	-753	-725	-653	-634	-17.5	-10.7	0.0	0.6
Import Dependency (%)	38.0	37.7	30.4	48.1	46.4	53.0	59.3	70.4	70.4	69.5	68.6				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**89631**	**100219**	**118140**	**107587**	**122529**	**135634**	**136741**	**141031**	**145855**	**150288**	**156295**	2.8	0.4	1.1	0.7
Nuclear energy	3926	3997	3969	3907	3907	4047	4047	0	0	0	0	0.1	-0.2	0.4	-100.0
Solids	24276	23500	22588	29437	23753	24222	20754	18462	15953	7829	2097	-0.7	0.5	-1.3	-10.8
Oil (including refinery gas)	2641	2262	1253	799	0	57	57	501	443	224	109	-7.2	-100.0	0.0	3.3
Gas (including derived gases)	54606	61588	77566	56702	46305	58572	61569	70684	77075	87907	87522	3.6	-5.0	2.9	1.8
Biomass-waste	3203	6683	8606	8343	15859	16030	17607	18501	19144	19995	21693	10.4	6.3	1.1	1.0
Hydro (pumping excluded)	142	88	105	100	104	105	105	105	105	105	105	-3.0	-0.1	0.1	0.0
Wind	829	2067	3993	7185	27598	27598	27598	27773	28031	28907	39353	17.0	21.3	0.0	1.8
Solar	8	34	60	1113	5003	5003	5004	5005	5105	5321	5416	22.2	55.5	0.0	0.4
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	12.8	-100.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**21048**	**21728**	**25072**	**30866**	**38329**	**37206**	**35295**	**35564**	**36773**	**38364**	**42701**	1.8	4.3	-0.8	1.0
Nuclear energy	485	485	485	485	485	485	485	0	0	0	0	0.0	0.0	0.0	-100.0
Renewable energy	497	1312	2362	4706	15719	15719	15719	15719	15788	16209	18714	16.9	20.9	0.0	0.9
Hydro (pumping excluded)	37	37	37	37	37	37	37	37	37	37	37	0.0	0.0	0.0	0.0
Wind	447	1224	2237	3431	10096	10096	10096	10096	10095	10408	12806	17.5	16.3	0.0	1.2
Solar	13	51	88	1238	5586	5586	5586	5586	5656	5764	5871	21.1	51.4	0.0	0.2
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	20066	19931	22225	25674	22126	21002	19092	19845	20985	22155	23987	1.0	0.0	-1.5	1.1
of which cogeneration units	7372	7162	9300	8514	2422	4911	5014	5347	5126	5268	5617	2.4	-12.6	7.5	0.6
of which CCS units	0	0	0	0	0	250	250	250	250	250	250	0.0	0.0	0.0	0.0
Solids fired	4394	4394	4394	6975	5388	5054	4429	4037	3485	3485	3496	0.0	2.1	-1.9	-1.2
Gas fired	14667	14529	16575	17356	14406	13614	12289	13414	15005	16104	17788	1.2	-1.4	-1.6	1.9
Oil fired	490	218	218	204	77	77	66	60	61	44	58	-7.8	-9.9	-1.6	-0.6
Biomass-waste fired	514	790	1037	1138	2254	2257	2308	2334	2434	2522	2644	7.3	8.1	0.2	0.7
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	-100.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	46.7	50.5	52.1	38.3	35.3	40.1	42.7	43.8	44.0	43.5	40.8				
Efficiency of gross thermal power generation (%)	41.6	41.4	44.5	45.4	43.6	44.0	44.8	46.9	49.0	51.0	51.9				
% of gross electricity from CHP	37.6	29.4	33.2	37.8	17.0	25.2	29.1	31.6	30.8	31.1	31.3				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	1.4	1.5	1.5	1.4	1.3	1.3				
% of carbon free (RES, nuclear) gross electricity generation	9.0	12.8	14.2	19.2	42.8	38.9	39.8	36.4	35.9	36.1	42.6				
Fuel Inputs to Thermal Power Generation (GWh_e)	**17516**	**19517**	**21244**	**18047**	**16937**	**19346**	**19186**	**19847**	**19759**	**19560**	**18471**	1.9	-2.2	1.3	-0.2
Solids	4998	4958	4669	6490	4844	4898	4141	3659	3141	1522	427	-0.7	0.4	-1.6	-10.7
Oil (including refinery gas)	634	553	342	177	0	20	20	107	95	51	28	-6.0	-80.0	276.3	1.8
Gas (including derived gases)	10671	11953	13773	9489	7648	10018	10161	11105	11338	12703	12537	2.6	-5.7	2.9	1.1
Biomass & Waste	1213	2052	2460	1892	4446	4410	4865	4975	5185	5284	5479	7.3	6.1	0.9	0.6
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**86454**	**91417**	**68924**	**63771**	**61733**	**60096**	**57380**	**53996**	**51923**	**50147**	**48286**	-2.2	-1.1	-0.7	-0.9
Refineries	82233	86869	64188	58847	56713	55191	53394	51572	49807	48167	46364	-2.4	-1.2	-0.6	-0.7
Biofuels and hydrogen production	0	0	230	579	486	486	506	535	621	723	810	0.0	7.8	0.4	2.4
District heating	398	436	499	366	339	318	303	282	260	253	237	2.3	-3.8	-1.1	-1.2
Derived gases, cokeries etc.	3824	4113	4007	3979	4195	4101	3177	1607	1235	1004	875	0.5	0.5	-2.7	-6.2

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Netherlands: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**184**	**195**	**183**	**191**	**200**	**208**	**216**	**222**	**231**	**238**	**244**	-0.1	0.9	0.8	0.6
Public road transport	11	12	12	13	13	14	14	15	15	16	16	0.8	0.9	0.7	0.6
Private cars and motorcycles	143	152	138	141	147	150	155	158	163	166	169	-0.4	0.6	0.6	0.4
Rail	16	17	17	19	21	22	23	24	26	27	28	0.5	1.9	1.3	0.9
Aviation [3]	13	14	15	17	18	20	22	24	26	28	31	1.1	2.4	1.9	1.6
Inland navigation	1	1	1	1	1	1	1	1	1	1	1	0.1	1.0	0.9	0.7
Freight transport activity (Gtkm)	**94**	**100**	**106**	**111**	**121**	**128**	**134**	**138**	**143**	**146**	**149**	1.3	1.3	1.0	0.6
Heavy goods and light commercial vehicles	48	51	54	55	61	65	67	69	72	73	75	1.2	1.3	1.0	0.5
Rail	5	6	6	6	7	7	8	8	9	9	9	2.7	1.5	1.5	0.8
Inland navigation	41	42	47	50	53	56	58	60	62	64	65	1.2	1.3	1.0	0.5
Energy demand in transport (ktoe) [4]	**14297**	**15197**	**14986**	**14817**	**14233**	**13736**	**13377**	**13292**	**13427**	**13531**	**13643**	0.5	-0.5	-0.6	0.1
Public road transport	212	224	260	267	271	270	267	268	271	274	277	2.1	0.4	-0.1	0.2
Private cars and motorcycles	8007	8288	8206	7708	6915	6388	6186	6129	6089	6019	5945	0.2	-1.7	-1.1	-0.2
Heavy goods and light commercial vehicles	2184	2594	2715	2594	2759	2807	2814	2814	2851	2871	2882	2.2	0.2	0.2	0.1
Rail	184	172	182	189	203	214	220	221	220	218	221	-0.1	1.1	0.8	0.0
Aviation	3382	3712	3463	3821	3832	3793	3613	3578	3704	3854	4020	0.2	1.0	-0.6	0.5
Inland navigation	328	207	159	239	252	264	276	282	291	295	298	-7.0	4.7	0.9	0.4
By transport activity															
Passenger transport	11703	12265	11985	11861	11087	10524	10142	10052	10143	10226	10320	0.2	-0.8	-0.9	0.1
Freight transport	2594	2933	3001	2957	3146	3212	3234	3240	3284	3306	3323	1.5	0.5	0.3	0.1
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.4	0.7	1.1	1.5	1.9	2.3	2.6				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	1.5	4.0	3.6	3.8	4.0	4.1	4.3	4.6	4.7				
ENERGY EFFICIENCY															
Primary energy consumption	**65081**	**68457**	**69030**	**69864**	**68564**	**66858**	**63827**	**61050**	**60223**	**59943**	**59530**	0.6	-0.1	-0.7	-0.3
Final Energy Demand	**50505**	**51654**	**51835**	**50854**	**50357**	**48018**	**45953**	**44373**	**44460**	**44854**	**45371**	0.3	-0.3	-0.9	-0.1
by sector															
Industry	14804	14814	12208	12815	13650	12347	11321	10266	10241	10405	10631	-1.9	1.1	-1.9	-0.3
Energy intensive industries	10277	10532	8224	8734	9356	8500	7767	6934	6926	6946	6989	-2.2	1.3	-1.8	-0.5
Other industrial sectors	4527	4281	3984	4082	4294	3847	3554	3332	3315	3459	3641	-1.3	0.8	-1.9	0.1
Residential	10299	10143	11518	10892	10494	10566	10416	10376	10382	10516	10645	1.1	-0.9	-0.1	0.1
Tertiary	11104	11499	13124	12329	11980	11369	10840	10439	10410	10402	10452	1.7	-0.9	-1.0	-0.2
Transport[5]	14297	15198	14985	14817	14233	13736	13377	13292	13427	13531	13643	0.5	-0.5	-0.6	0.1
by fuel															
Solids	1330	1515	1270	1402	1587	1604	1133	735	450	333	290	-0.5	2.3	-3.3	-6.6
Oil	16505	17382	16113	15746	14908	14248	13618	13301	13167	13065	13014	-0.2	-0.8	-0.9	-0.2
Gas	21011	20346	22378	21405	20371	17963	16279	15036	14735	14677	14611	0.6	-0.9	-2.2	-0.5
Electricity	8408	8986	9189	9034	9503	9834	10001	10196	10583	10962	11422	0.9	0.3	0.5	0.7
Heat (from CHP and District Heating)	2893	2981	2106	2038	2157	2309	2459	2403	2497	2532	2526	-3.1	0.2	1.3	0.1
Renewable energy forms	358	444	780	1223	1804	2016	2394	2622	2892	3098	3253	8.1	8.8	2.9	1.5
Other	0	0	0	8	27	45	69	81	135	187	255	-100.0	0.0	9.9	6.8
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	141	142	141	135	125	116	108	98	91	84	78	0.0	-1.2	-1.5	-1.6
Industry (Energy on Value added, index 2000=100)	100	96	75	75	74	63	56	48	46	44	42	-2.9	-0.1	-2.8	-1.4
Residential (Energy on Private Income, index 2000=100)	100	94	106	98	87	81	75	70	64	59	55	0.6	-2.0	-1.4	-1.6
Tertiary (Energy on Value added, index 2000=100)	100	96	101	94	85	76	69	62	57	53	49	0.1	-1.7	-2.1	-1.6
Passenger transport (toe/Mpkm) [6]	42	41	40	37	32	28	26	24	23	22	21	-0.4	-2.3	-2.2	-1.0
Freight transport (toe/Mtkm)	28	29	28	27	26	25	24	24	23	23	22	0.2	-0.8	-0.7	-0.4
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**222.8**	**221.6**	**216.9**	**209.7**	**192.8**	**187.6**	**172.6**	**164.9**	**159.8**	**154.6**	**148.0**	-0.3	-1.2	-1.1	-0.8
of which ETS sectors (2013 scope) GHG emissions		103.3	95.6	95.8	84.7	85.8	75.4	70.4	66.6	61.9	56.4		-1.2	-1.2	-1.4
of which ESD sectors (2013 scope) GHG emissions		118.2	121.4	113.8	108.1	101.8	97.2	94.5	93.2	92.6	91.5		-1.2	-1.1	-0.3
CO_2 Emissions (energy related)	**168.5**	**175.7**	**175.0**	**171.3**	**155.7**	**151.2**	**136.5**	**128.7**	**123.2**	**117.8**	**111.7**	0.4	-1.2	-1.3	-1.0
Power generation/District heating	51.9	55.5	57.7	54.3	43.0	48.4	43.0	42.2	39.7	35.9	30.6	1.1	-2.9	0.0	-1.7
Energy Branch	11.1	12.3	8.8	10.4	9.9	8.8	7.9	7.0	6.6	6.4	6.2	-2.3	1.2	-2.2	-1.2
Industry	26.6	26.5	22.9	26.6	28.0	22.8	17.9	13.5	11.6	10.7	10.7	-1.5	2.0	-4.4	-2.6
Residential	18.9	17.9	20.6	19.1	17.4	17.1	16.4	16.1	15.7	15.5	15.4	0.9	-1.7	-0.6	-0.3
Tertiary	17.5	18.3	21.1	18.7	16.6	15.0	13.6	12.8	12.5	12.1	11.8	1.9	-2.4	-2.0	-0.7
Transport	42.4	45.3	43.9	42.3	40.7	39.0	37.7	37.2	37.2	37.1	37.1	0.4	-0.8	-0.8	-0.1
CO_2 Emissions (non energy and non land use related)	**7.1**	**8.8**	**8.6**	**8.5**	**8.8**	**8.9**	**8.8**	**8.8**	**8.8**	**8.7**	**7.8**	2.0	0.3	0.0	-0.6
Non-CO2 GHG emissions	**47.3**	**37.0**	**33.3**	**29.9**	**28.3**	**27.5**	**27.2**	**27.4**	**27.8**	**28.0**	**28.5**	-3.4	-1.6	-0.4	0.2
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**99.0**	**98.4**	**96.4**	**93.2**	**85.7**	**83.3**	**76.7**	**73.3**	**71.0**	**68.7**	**65.7**	-0.3	-1.2	-1.1	-0.8
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.40	0.38	0.37	0.38	0.27	0.28	0.24	0.23	0.21	0.19	0.16	-0.6	-3.1	-1.1	-2.2
Final energy demand (t of CO_2/toe)	2.09	2.09	2.09	2.10	2.04	1.96	1.86	1.79	1.73	1.68	1.65	0.0	-0.3	-0.9	-0.6
Industry	1.80	1.79	1.87	2.07	2.05	1.85	1.58	1.32	1.13	1.03	1.00	0.4	0.9	-2.6	-2.3
Residential	1.84	1.77	1.79	1.75	1.66	1.62	1.57	1.55	1.51	1.48	1.44	-0.2	-0.7	-0.5	-0.4
Tertiary	1.58	1.59	1.61	1.51	1.39	1.32	1.25	1.22	1.20	1.17	1.13	0.2	-1.5	-1.0	-0.5
Transport	2.97	2.98	2.93	2.86	2.86	2.84	2.82	2.80	2.77	2.74	2.72	-0.1	-0.3	-0.1	-0.2
RES in Gross Final Energy Consumption [7] (in%)	**1.3**	**2.3**	**3.9**	**5.2**	**13.0**	**14.2**	**15.8**	**17.0**	**17.6**	**18.7**	**21.6**				
RES-H&C share	1.5	2.1	2.9	2.9	7.7	9.2	11.3	12.9	13.9	15.5	17.1				
RES-E share	2.6	6.3	9.7	12.9	38.1	36.8	37.5	37.7	37.0	37.0	43.6				
RES-T share (based on ILUC formula)	0.1	0.2	3.1	9.3	10.7	11.9	13.4	14.7	15.9	17.9	20.2				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	50	58	65	73	84	89	96	99	93	96	95	2.7	2.5	1.3	0.0
Average Price of Electricity in Final demand sectors (€'13/MWh	118	130	129	120	137	144	153	161	164	161	160	0.9	0.6	1.1	0.2
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**47.8**	**60.9**	**67.3**	**65.0**	**78.0**	**83.2**	**87.1**	**90.9**	**95.5**	**98.0**	**101.3**	3.5	1.5	1.1	0.8
as % of GDP	**8.9**	**10.6**	**11.0**	**10.5**	**11.7**	**11.8**	**11.8**	**11.6**	**11.4**	**10.9**	**10.5**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Poland: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**38**	**38**	**38**	**38**	**38**	**38**	**37**	**37**	**36**	**35**	**35**	0.0	0.1	-0.2	-0.4
GDP (in 000 M€13)	**253**	**294**	**371**	**425**	**492**	**559**	**623**	**677**	**726**	**766**	**793**	3.9	2.9	2.4	1.2
Gross Inland Consumption (ktoe)	**88648**	**92226**	**100730**	**101934**	**105341**	**106102**	**106769**	**106394**	**106693**	**107964**	**109872**	1.3	0.4	0.1	0.1
Solids	56291	54612	54608	53011	50107	46480	43287	34117	25519	21606	20162	-0.3	-0.9	-1.5	-3.7
Oil	19037	21696	25747	25895	26642	27098	27363	27777	27980	27883	27904	3.1	0.3	0.3	0.1
Natural gas	9964	12237	12807	13159	16207	18254	20511	22039	24292	25091	24522	2.5	2.4	2.4	0.9
Nuclear	0	0	0	0	0	0	0	5937	8906	11875	14843	0.0	0.0	0.0	0.0
Electricity	-548	-962	-116	6	63	167	117	89	148	142	127	-14.4	0.0	6.3	0.4
Renewable energy forms	3905	4643	7684	9863	12322	14104	15492	16434	19848	21369	22313	7.0	4.8	2.3	1.8
Energy Branch Consumption	**6664**	**6104**	**6095**	**6243**	**6126**	**5624**	**5337**	**5178**	**4920**	**5182**	**5538**	-0.9	0.1	-1.4	0.2
Non-Energy Uses	**4357**	**4573**	**4961**	**5545**	**6359**	**6937**	**7462**	**7824**	**8157**	**8339**	**8536**	1.3	2.5	1.6	0.7
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**79590**	**78592**	**67394**	**70900**	**70094**	**65955**	**64318**	**64660**	**64363**	**66919**	**70925**	-1.6	0.4	-0.9	0.5
Solids	71299	68857	55381	55586	51818	45297	39437	30891	22694	19455	18416	-2.5	-0.7	-2.7	-3.7
Oil	1062	1143	1063	1539	1583	1565	1543	1490	1352	1222	1106	0.0	4.1	-0.3	-1.7
Natural gas	3317	3887	3696	3947	4591	5064	7907	9973	11614	13058	14312	1.1	2.2	5.6	3.0
Nuclear	0	0	0	0	0	0	0	5937	8906	11875	14843	0.0	0.0	0.0	0.0
Renewable energy sources	3912	4705	7254	9829	12102	14029	15431	16369	19797	21309	22247	6.4	5.3	2.5	1.8
Hydro	181	189	251	206	209	220	238	238	279	346	379	3.3	-1.8	1.3	2.4
Biomass & Waste	3728	4493	6838	8749	10788	11831	12748	13216	13778	14291	14455	6.3	4.7	1.7	0.6
Wind	0	12	143	832	984	1732	1863	1865	2787	3188	3867	80.0	21.3	6.6	3.7
Solar and others	0	0	8	22	82	199	251	365	471	549	598	0.0	25.6	11.8	4.4
Geothermal	3	11	13	21	39	47	331	685	2481	2935	2948	16.1	11.3	23.8	11.5
Net Imports (ktoe)	**8773**	**15932**	**31567**	**31285**	**35539**	**40465**	**42793**	**42095**	**42713**	**41449**	**39365**	13.7	1.2	1.9	-0.4
Solids	-16353	-13039	-2814	-2575	-1712	1182	3850	3226	2825	2150	1746	-16.1	-4.9	0.0	-3.9
Oil	19067	21466	25187	24607	25346	25844	26152	26633	26989	27036	27184	2.8	0.1	0.3	0.2
Crude oil and Feedstocks	17616	17893	22965	24633	24854	24779	24488	24491	24273	23769	23421	2.7	0.8	-0.1	-0.2
Oil products	1451	3573	2222	-26	492	1065	1664	2142	2716	3268	3762	4.4	-14.0	12.9	4.2
Natural gas	6607	8531	8874	9213	11620	13198	12615	12082	12700	12061	10242	3.0	2.7	0.8	-1.0
Electricity	-548	-962	-116	6	63	167	117	89	148	142	127	-14.4	0.0	6.3	0.4
Import Dependency (%)	9.9	17.2	31.3	30.6	33.6	38.0	40.0	39.4	39.9	38.2	35.7				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**143174**	**155359**	**157089**	**162367**	**176244**	**188413**	**203166**	**211552**	**219228**	**232175**	**245347**	0.9	1.2	1.4	0.9
Nuclear energy	0	0	0	0	0	0	0	27703	41555	55407	69258	0.0	0.0	0.0	0.0
Solids	135888	142161	136592	137628	141228	131372	132075	105487	76601	69230	63563	0.1	0.3	-0.7	-3.6
Oil (including refinery gas)	1916	2757	2892	9	0	471	471	447	283	279	292	4.2	-100.0	0.0	-2.4
Gas (including derived gases)	2961	6573	6689	2968	9649	20733	30214	35886	43646	45154	41710	8.5	3.7	12.1	1.6
Biomass-waste	298	1532	6332	9667	11436	13082	15892	17444	21299	20772	20850	35.7	6.1	3.3	1.4
Hydro (pumping excluded)	2106	2201	2920	2397	2427	2553	2765	2766	3243	4019	4403	3.3	-1.8	1.3	2.4
Wind	5	135	1664	9669	11437	20135	21665	21687	32411	37073	44968	78.7	21.3	6.6	3.7
Solar	0	0	0	29	67	67	84	132	190	241	303	0.0	0.0	2.3	6.6
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**30310**	**31721**	**33411**	**38260**	**33583**	**36938**	**39845**	**41078**	**44321**	**45905**	**51109**	1.0	0.1	1.7	1.3
Nuclear energy	0	0	0	0	0	0	0	3300	4950	6600	8250	0.0	0.0	0.0	0.0
Renewable energy	821	1036	2044	6084	6756	10737	11478	11533	16038	16897	20654	9.6	12.7	5.4	3.0
Hydro (pumping excluded)	817	915	936	949	949	988	1039	1039	1155	1342	1427	1.4	0.1	0.9	1.6
Wind	4	121	1108	5100	5728	9669	10339	10339	14664	15276	18877	75.5	17.9	6.1	3.1
Solar	0	0	0	35	79	79	99	155	220	278	350	0.0	0.0	2.3	6.5
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	29489	30685	31367	32176	26827	26202	28367	26245	23333	22408	22205	0.6	-1.6	0.6	-1.2
of which cogeneration units	9354	8313	8693	6566	6383	6968	7816	7981	8197	9161	9530	-0.7	-3.0	2.0	1.0
of which CCS units	0	0	0	0	0	0	0	0	0	2640	4950	0.0	0.0	0.0	0.0
Solids fired	28214	28608	29158	28543	22967	20695	20704	17464	12708	9952	9983	0.3	-2.4	-1.0	-3.6
Gas fired	764	1548	1592	1659	1712	3290	5403	6518	8036	9237	9143	7.6	0.7	12.2	2.7
Oil fired	396	396	396	398	171	162	155	148	96	68	63	0.0	-8.1	-0.9	-4.4
Biomass-waste fired	115	133	221	1574	1978	2055	2105	2115	2494	3151	3016	6.8	24.5	0.6	1.8
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	49.0	51.1	48.8	44.3	55.0	54.0	54.2	55.1	53.3	53.7	50.3				
Efficiency of gross thermal power generation (%)	33.1	33.9	34.2	35.2	37.4	37.7	38.8	40.3	41.6	43.6	42.6				
% of gross electricity from CHP	16.1	16.8	17.6	18.2	21.0	17.3	18.7	17.5	19.2	23.1	23.5				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.1	21.4				
% of carbon free (RES, nuclear) gross electricity generation	1.7	2.5	6.9	13.4	14.4	19.0	19.9	33.0	45.0	50.6	57.0				
Fuel Inputs to Thermal Power Generation (GWh_e)	**36625**	**38771**	**38341**	**36695**	**37352**	**37789**	**39612**	**34022**	**29305**	**26708**	**25496**	0.5	-0.3	0.6	-2.2
Solids	35247	36349	34345	33735	32978	31263	31440	24900	18609	15611	14408	-0.3	-0.4	-0.5	-3.8
Oil (including refinery gas)	245	184	171	2	0	154	154	146	92	72	75	-3.5	-74.4	286.7	-3.5
Gas (including derived gases)	1032	1805	2179	913	1917	3647	4806	5485	6575	6828	6391	7.8	-1.3	9.6	1.4
Biomass & Waste	102	434	1645	2046	2457	2725	3212	3490	4029	4197	4623	32.1	4.1	2.7	1.8
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**32964**	**31279**	**38702**	**40301**	**40550**	**39826**	**37154**	**42082**	**45410**	**47540**	**49734**	1.6	0.5	-0.9	1.5
Refineries	18969	18975	24192	27120	27471	27438	27167	27150	26833	26216	25778	2.5	1.3	-0.1	-0.3
Biofuels and hydrogen production	0	49	887	1100	1397	1456	1427	1496	1477	1517	1539	0.0	4.7	0.2	0.4
District heating	4179	3465	3716	3183	3590	3377	3561	3937	5511	5854	5779	-1.2	-0.3	-0.1	2.5
Derived gases, cokeries etc.	9816	8789	9908	8898	8091	7555	4999	9499	11588	13953	16638	0.1	-2.0	-4.7	6.2

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Poland: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**225**	**233**	**268**	**302**	**344**	**377**	**410**	**438**	**463**	**482**	**497**	1.7	2.6	1.8	1.0
Public road transport	59	49	42	44	47	48	50	52	53	53	54	-3.4	1.1	0.8	0.3
Private cars and motorcycles	134	156	194	223	254	276	296	315	332	345	355	3.8	2.7	1.5	0.9
Rail	29	23	22	24	30	37	44	48	51	54	55	-2.5	3.1	3.9	1.1
Aviation [3]	3	5	9	11	13	16	20	23	26	30	33	12.8	3.6	4.4	2.5
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	-0.9	1.8	1.6	0.8
Freight transport activity (Gtkm)	**114**	**140**	**170**	**201**	**228**	**258**	**286**	**308**	**328**	**342**	**350**	4.0	3.0	2.3	1.0
Heavy goods and light commercial vehicles	59	90	121	150	167	189	209	225	241	251	258	7.4	3.3	2.3	1.1
Rail	54	50	49	51	61	69	77	82	87	90	92	-1.0	2.2	2.4	0.9
Inland navigation	1	0	0	0	0	0	0	0	0	0	0	-16.7	2.7	2.8	1.4
Energy demand in transport (ktoe) [4]	**9830**	**12265**	**17459**	**18691**	**19806**	**20199**	**20542**	**21261**	**21880**	**22051**	**22122**	5.9	1.3	0.4	0.4
Public road transport	654	581	610	632	671	684	688	693	703	702	702	-0.7	1.0	0.2	0.1
Private cars and motorcycles	6314	7213	9660	10120	10625	10490	10454	10637	10833	10769	10747	4.3	1.0	-0.2	0.1
Heavy goods and light commercial vehicles	2041	3678	6307	6957	7386	7778	7996	8382	8660	8782	8844	11.9	1.6	0.8	0.5
Rail	541	469	372	366	427	468	512	540	565	582	588	-3.7	1.4	1.8	0.7
Aviation	274	319	508	613	693	776	889	1004	1115	1212	1237	6.4	3.2	2.5	1.7
Inland navigation	6	5	3	3	4	4	4	5	5	5	5	-7.4	2.2	2.0	0.9
By transport activity															
Passenger transport	7317	8170	10823	11407	12042	12013	12105	12415	12735	12769	12773	4.0	1.1	0.1	0.3
Freight transport	2514	4095	6636	7283	7764	8186	8438	8846	9145	9282	9349	10.2	1.6	0.8	0.5
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.6	0.9	1.2				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.4	5.2	6.0	7.2	7.4	7.1	7.2	6.8	6.9	6.9				
ENERGY EFFICIENCY															
Primary energy consumption	**84291**	**87654**	**95769**	**96389**	**98982**	**99165**	**99307**	**98570**	**98536**	**99625**	**101337**	1.3	0.3	0.0	0.1
Final Energy Demand	**55260**	**58986**	**67070**	**68144**	**71659**	**72248**	**72935**	**72951**	**73836**	**74461**	**74647**	2.0	0.7	0.2	0.1
by sector															
Industry	18504	16147	14193	16600	17563	18142	17816	17287	17378	17640	17490	-2.6	2.2	0.1	-0.1
Energy intensive industries	13031	10951	9372	10814	11226	11123	10375	9894	9912	9988	9813	-3.2	1.8	-0.8	-0.3
Other industrial sectors	5473	5196	4821	5786	6337	7019	7441	7393	7465	7652	7677	-1.3	2.8	1.6	0.2
Residential	17193	19454	22501	20556	21306	20968	21338	21202	21374	21554	21806	2.7	-0.5	0.0	0.1
Tertiary	9644	10846	12664	12057	12710	12654	12939	12892	12882	12892	12912	2.8	0.0	0.2	0.0
Transport[5]	9919	12539	17712	18930	20079	20484	20841	21570	22202	22375	22440	6.0	1.3	0.4	0.4
by fuel															
Solids	13215	12285	14494	13387	11234	9948	7903	5709	4045	3398	3118	0.9	-2.5	-3.5	-4.5
Oil	15500	17844	20727	21289	21541	21687	21837	22081	22331	22304	22219	2.9	0.4	0.1	0.1
Gas	7574	8780	9468	9673	11180	11247	11651	12086	12848	13130	13097	2.3	1.7	0.4	0.6
Electricity	8482	9064	10238	11011	12206	13416	14472	15226	15988	16720	17395	1.9	1.8	1.7	0.9
Heat (from CHP and District Heating)	6886	7056	6547	6063	6945	6820	7850	8366	9106	8990	9112	-0.5	0.6	1.2	0.7
Renewable energy forms	3602	3957	5596	6721	8551	9127	9214	9468	9488	9876	9645	4.5	4.3	0.7	0.2
Other	0	0	0	1	1	3	8	15	30	45	62	0.0	0.0	20.3	10.6
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	350	313	272	240	214	190	171	157	147	141	138	-2.5	-2.4	-2.2	-1.1
Industry (Energy on Value added, index 2000=100)	100	64	36	36	32	29	25	22	20	19	18	-9.7	-1.2	-2.5	-1.5
Residential (Energy on Private Income, index 2000=100)	100	98	93	74	66	56	51	47	44	42	40	-0.8	-3.4	-2.5	-1.2
Tertiary (Energy on Value added, index 2000=100)	100	100	100	83	76	66	61	56	52	49	48	0.0	-2.8	-2.1	-1.2
Passenger transport (toe/Mpkm) [6]	32	34	39	36	34	31	28	27	26	25	24	2.0	-1.5	-1.8	-0.8
Freight transport (toe/Mtkm)	22	29	39	36	34	32	29	29	28	27	27	5.9	-1.4	-1.4	-0.5
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**400.5**	**403.1**	**411.9**	**407.8**	**399.3**	**387.2**	**375.8**	**339.7**	**306.2**	**265.1**	**236.4**	0.3	-0.3	-0.6	-2.3
of which ETS sectors (2013 scope) GHG emissions		222.2	210.3	208.8	205.6	199.3	194.0	163.1	134.3	95.9	68.4		-0.2	-0.6	-5.1
of which ESD sectors (2013 scope) GHG emissions		180.9	201.6	199.0	193.7	187.9	181.9	176.6	171.9	169.3	168.0		-0.4	-0.6	-0.4
CO_2 Emissions (energy related)	**303.3**	**307.5**	**320.7**	**311.8**	**306.4**	**296.3**	**287.2**	**253.0**	**222.4**	**183.4**	**155.2**	0.6	-0.5	-0.6	-3.0
Power generation/District heating	167.4	171.0	165.6	157.9	157.2	154.4	153.5	126.9	101.1	64.5	37.8	-0.1	-0.5	-0.2	-6.8
Energy Branch	10.2	7.7	8.5	9.6	9.1	8.1	7.5	7.4	7.1	6.9	7.0	-1.8	0.7	-2.0	-0.3
Industry	51.9	36.9	30.4	35.0	32.6	29.6	25.0	20.4	17.9	16.4	15.8	-5.2	0.7	-2.6	-2.3
Residential	27.4	35.5	44.9	37.8	34.5	32.1	29.2	25.9	23.4	23.3	23.0	5.1	-2.6	-1.6	-1.2
Tertiary	18.4	20.7	21.9	19.1	18.1	16.2	15.1	13.8	12.7	12.1	11.6	1.7	-1.9	-1.8	-1.3
Transport	28.0	35.8	49.3	52.4	54.9	55.9	56.8	58.5	60.1	60.2	60.1	5.8	1.1	0.3	0.3
CO_2 Emissions (non energy and non land use related)	**22.3**	**20.8**	**20.2**	**22.9**	**25.4**	**26.3**	**26.6**	**26.1**	**24.4**	**22.6**	**21.6**	-1.0	2.3	0.5	-1.0
Non-CO2 GHG emissions	**75.0**	**74.7**	**71.0**	**73.2**	**67.5**	**64.6**	**62.1**	**60.6**	**59.4**	**59.2**	**59.6**	-0.5	-0.5	-0.8	-0.2
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**84.4**	**84.9**	**86.8**	**85.9**	**84.2**	**81.6**	**79.2**	**71.6**	**64.5**	**55.9**	**49.8**	0.3	-0.3	-0.6	-2.3
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.71	0.69	0.67	0.65	0.59	0.56	0.50	0.40	0.30	0.19	0.10	-0.6	-1.2	-1.6	-7.6
Final energy demand (t of CO_2/toe)	2.27	2.18	2.19	2.12	1.95	1.85	1.73	1.63	1.55	1.50	1.48	-0.4	-1.1	-1.2	-0.8
Industry	2.81	2.28	2.14	2.11	1.86	1.63	1.40	1.18	1.03	0.93	0.90	-2.6	-1.4	-2.7	-2.2
Residential	1.59	1.83	2.00	1.84	1.62	1.53	1.37	1.22	1.10	1.08	1.06	2.3	-2.1	-1.7	-1.3
Tertiary	1.91	1.91	1.73	1.59	1.42	1.28	1.17	1.07	0.99	0.94	0.90	-1.0	-1.9	-1.9	-1.3
Transport	2.82	2.85	2.79	2.77	2.73	2.73	2.72	2.71	2.71	2.69	2.68	-0.1	-0.2	0.0	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**6.5**	**6.9**	**9.2**	**11.8**	**15.1**	**16.4**	**17.5**	**18.3**	**20.3**	**22.4**	**23.7**				
RES-H&C share	9.6	10.2	11.6	13.8	19.0	19.7	21.7	23.4	25.0	28.7	30.3				
RES-E share	1.6	2.7	6.6	13.4	14.3	18.8	19.8	19.8	25.9	26.6	28.6				
RES-T share (based on ILUC formula)	0.2	0.7	6.1	7.5	10.1	10.7	10.7	10.4	11.2	11.9	12.8				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	38	40	49	67	73	81	90	94	99	100	99	2.6	4.1	2.1	0.5
Average Price of Electricity in Final demand sectors (€'13/MWh	77	93	128	121	132	140	149	156	158	156	157	5.2	0.3	1.2	0.3
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**34.0**	**46.3**	**66.0**	**71.1**	**93.1**	**108.1**	**117.9**	**128.4**	**137.6**	**145.0**	**151.3**	6.9	3.5	2.4	1.3
as % of GDP	**13.4**	**15.7**	**17.8**	**16.7**	**18.9**	**19.3**	**18.9**	**19.0**	**18.9**	**18.9**	**19.1**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Portugal: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**10**	**10**	**11**	**10**	**10**	**10**	**10**	**10**	**9**	**9**	**9**	0.3	-0.4	-0.4	-0.5
GDP (in 000 M€13)	**169**	**176**	**181**	**174**	**187**	**204**	**217**	**230**	**240**	**249**	**259**	0.7	0.4	1.5	0.9
Gross Inland Consumption (ktoe)	**25285**	**27475**	**24205**	**22984**	**21377**	**21164**	**20049**	**19681**	**19320**	**19177**	**18976**	-0.4	-1.2	-0.6	-0.3
Solids	3805	3349	1658	3347	815	11	5	3	1	1	1	-8.0	-6.9	-39.4	-10.4
Oil	15475	16174	12215	10669	10400	10356	10166	9988	9649	9424	9302	-2.3	-1.6	-0.2	-0.4
Natural gas	2078	3751	4489	3446	3425	3761	2574	2447	2257	2263	1934	8.0	-2.7	-2.8	-1.4
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Electricity	80	587	226	195	451	501	442	492	481	383	339	10.9	7.2	-0.2	-1.3
Renewable energy forms	3846	3615	5618	5328	6286	6536	6861	6752	6932	7107	7401	3.9	1.1	0.9	0.4
Energy Branch Consumption	**1028**	**1235**	**1195**	**1417**	**1210**	**1255**	**1208**	**1178**	**1152**	**1141**	**1120**	1.5	0.1	0.0	-0.4
Non-Energy Uses	**2393**	**2587**	**1728**	**1470**	**1485**	**1519**	**1534**	**1551**	**1584**	**1567**	**1623**	-3.2	-1.5	0.3	0.3
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**3891**	**3615**	**5800**	**5217**	**6154**	**6406**	**6709**	**6597**	**6790**	**6985**	**7280**	4.1	0.6	0.9	0.4
Solids	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Oil	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Natural gas	45	0	0	0	0	0	0	0	0	0	0	-96.1	-100.0	0.0	0.0
Nuclear	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy sources	3846	3615	5800	5217	6154	6406	6709	6597	6790	6985	7280	4.2	0.6	0.9	0.4
Hydro	974	407	1389	820	1594	1563	1623	1625	1629	1629	1646	3.6	1.4	0.2	0.1
Biomass & Waste	2770	2967	3375	3181	3271	3454	3108	2933	2870	2949	2941	2.0	-0.3	-0.5	-0.3
Wind	14	153	790	1004	1012	1013	1341	1358	1447	1530	1653	49.2	2.5	2.9	1.1
Solar and others	19	23	66	136	200	299	558	600	762	792	956	13.6	11.7	10.8	2.7
Geothermal	70	66	181	76	76	77	79	81	82	84	84	10.0	-8.3	0.4	0.3
Net Imports (ktoe)	**22072**	**24845**	**18588**	**18330**	**15795**	**15334**	**13909**	**13665**	**13111**	**12773**	**12283**	-1.7	-1.6	-1.3	-0.6
Solids	3914	3225	1629	3347	815	11	5	3	1	1	1	-8.4	-6.7	-39.4	-10.4
Oil	16039	17140	12436	11231	10966	10919	10721	10543	10195	9969	9850	-2.5	-1.3	-0.2	-0.4
Crude oil and Feedstocks	12316	13795	11875	14608	14099	13764	13333	12921	12340	11855	11453	-0.4	1.7	-0.6	-0.8
Oil products	3723	3345	561	-3376	-3133	-2845	-2612	-2378	-2145	-1886	-1603	-17.2	0.0	-1.8	-2.4
Natural gas	2039	3893	4505	3446	3431	3772	2589	2472	2291	2297	1973	8.2	-2.7	-2.8	-1.4
Electricity	80	587	226	195	451	501	442	492	481	383	339	10.9	7.2	-0.2	-1.3
Import Dependency (%)	85.1	88.6	75.1	77.8	72.0	70.5	67.5	67.4	65.9	64.6	62.8				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**43372**	**46188**	**53688**	**50199**	**48507**	**47988**	**48243**	**48076**	**49145**	**51140**	**52086**	2.2	-1.0	-0.1	0.4
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids	14595	15226	7100	14862	3528	0	0	0	0	0	0	-7.0	-6.8	-100.0	0.0
Oil (including refinery gas)	8421	8791	3008	770	1969	1457	1289	1045	547	633	476	-9.8	-4.2	-4.1	-4.9
Gas (including derived gases)	7231	13606	14900	9528	8632	10868	5139	4852	3560	3501	1379	7.5	-5.3	-5.1	-6.4
Biomass-waste	1553	1987	2942	2936	3074	3739	2919	3050	3243	4052	3985	6.6	0.4	-0.5	1.6
Hydro (pumping excluded)	11323	4731	16148	9540	18540	18170	18871	18892	18936	18944	19136	3.6	1.4	0.2	0.1
Wind	168	1773	9182	11676	11767	11781	15588	15794	16820	17789	19219	49.2	2.5	2.9	1.1
Solar	1	3	212	680	789	1766	4229	4236	5830	6012	7682	68.3	14.1	18.3	3.0
Geothermal and other renewables	80	71	196	208	208	208	208	208	208	208	208	9.4	0.6	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**10989**	**13461**	**18921**	**21094**	**21851**	**21384**	**24198**	**23181**	**21436**	**21517**	**22092**	5.6	1.5	1.0	-0.5
Nuclear energy	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Renewable energy	4619	6083	9036	12611	14827	15539	18446	18446	19374	19922	20741	6.9	5.1	2.2	0.6
Hydro (pumping excluded)	4535	5017	5106	7065	9183	9408	9971	9971	9971	9971	9971	1.2	6.0	0.8	0.0
Wind	83	1064	3796	5079	5113	5113	6302	6302	6534	7003	7103	46.6	3.0	2.1	0.6
Solar	1	2	134	467	531	1017	2172	2172	2869	2948	3666	63.2	14.8	15.1	2.7
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	6370	7378	9885	8484	7024	5845	5752	4736	2062	1595	1351	4.5	-3.4	-2.0	-7.0
of which cogeneration units	1676	1079	1310	1491	1785	1698	1546	1453	1253	1147	1192	-2.4	3.1	-1.4	-1.3
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	1774	1728	1728	1728	578	0	0	0	0	0	0	-0.3	-10.4	-100.0	0.0
Gas fired	1542	2477	4799	5062	4991	4444	4368	3406	1019	751	631	12.0	0.4	-1.3	-9.2
Oil fired	2819	2915	2990	1144	783	717	691	634	336	153	123	0.6	-12.5	-1.2	-8.3
Biomass-waste fired	221	244	343	521	643	655	664	667	678	661	569	4.5	6.5	0.3	-0.8
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	14	14	25	29	29	29	29	29	29	29	29	6.0	1.5	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	43.5	37.8	31.6	26.3	24.9	25.2	22.5	23.4	25.9	26.8	26.7				
Efficiency of gross thermal power generation (%)	42.0	43.1	41.8	42.2	43.6	43.5	39.0	39.9	38.9	40.4	36.0				
% of gross electricity from CHP	10.0	11.6	11.8	17.0	22.7	21.0	19.3	18.3	14.9	15.9	11.2				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	30.3	18.5	53.4	49.9	70.9	74.3	86.7	87.7	91.6	91.9	96.4				
Fuel Inputs to Thermal Power Generation (GWh_e)	**6520**	**7914**	**5787**	**5770**	**3434**	**3220**	**2105**	**1971**	**1671**	**1788**	**1444**	-1.2	-5.1	-4.8	-1.9
Solids	3198	3319	1597	3329	800	0	0	0	0	0	0	-6.7	-6.7	-100.0	0.0
Oil (including refinery gas)	1683	1793	574	185	467	344	305	247	129	149	112	-10.2	-2.0	-4.2	-4.9
Gas (including derived gases)	1215	2309	2775	1560	1428	1838	878	804	595	581	258	8.6	-6.4	-4.7	-5.9
Biomass & Waste	356	428	662	621	665	963	848	845	872	983	999	6.4	0.0	2.5	0.8
Geothermal heat	69	65	180	75	75	75	75	75	75	75	75	10.1	-8.4	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**13004**	**13953**	**12457**	**15231**	**14719**	**14367**	**13910**	**13493**	**12916**	**12447**	**12060**	-0.4	1.7	-0.6	-0.7
Refineries	12555	13953	12148	14807	14292	13949	13502	13073	12479	11986	11578	-0.3	1.6	-0.6	-0.8
Biofuels and hydrogen production	0	0	309	422	423	412	400	412	429	453	475	0.0	3.2	-0.6	0.9
District heating	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Derived gases, cokeries etc.	449	0	0	1	4	6	8	8	8	8	7	0.0	0.0	6.8	-0.3

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Portugal: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**105**	**115**	**116**	**121**	**125**	**135**	**143**	**150**	**155**	**160**	**165**	1.0	0.8	1.4	0.7
Public road transport	12	6	6	6	6	7	7	8	8	8	9	-6.4	0.5	1.2	0.9
Private cars and motorcycles	73	87	86	86	86	92	98	101	104	107	110	1.7	0.1	1.2	0.6
Rail	5	5	5	5	6	7	7	8	8	9	9	1.4	1.5	1.9	1.2
Aviation [3]	16	17	18	23	26	29	31	33	34	35	36	1.6	3.3	2.0	0.8
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	1.0	0.7	0.7	0.5
Freight transport activity (Gtkm)	**26**	**32**	**27**	**28**	**30**	**32**	**34**	**36**	**37**	**38**	**39**	0.5	0.9	1.4	0.7
Heavy goods and light commercial vehicles	20	25	20	20	21	23	25	26	27	27	28	-0.4	0.9	1.4	0.7
Rail	2	2	2	2	3	3	3	4	4	4	4	0.6	1.5	2.1	0.9
Inland navigation	4	5	5	6	6	6	6	7	7	7	7	4.6	0.6	1.0	0.5
Energy demand in transport (ktoe) [4]	**6636**	**7188**	**7226**	**6867**	**6645**	**6682**	**6725**	**6804**	**6775**	**6720**	**6707**	0.9	-0.8	0.1	0.0
Public road transport	237	135	129	129	129	134	142	149	155	160	167	-5.9	0.0	1.0	0.8
Private cars and motorcycles	4590	5056	5149	4730	4389	4250	4219	4201	4161	4113	4104	1.2	-1.6	-0.4	-0.1
Heavy goods and light commercial vehicles	891	1026	835	797	848	888	900	917	930	935	940	-0.6	0.2	0.6	0.2
Rail	89	67	57	50	55	57	60	62	64	65	67	-4.3	-0.3	0.8	0.6
Aviation	784	888	1012	1124	1185	1312	1362	1433	1422	1403	1385	2.6	1.6	1.4	0.1
Inland navigation	45	18	45	37	38	40	41	42	43	43	44	0.1	-1.5	0.8	0.2
By transport activity															
Passenger transport	5689	6109	6318	6007	5730	5722	5750	5810	5765	5705	5686	1.1	-1.0	0.0	-0.1
Freight transport	947	1079	908	860	915	960	975	994	1009	1014	1020	-0.4	0.1	0.6	0.2
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.8	1.2	1.8	2.3				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	4.3	6.2	6.5	6.3	6.1	6.2	6.4	6.7	6.9				
ENERGY EFFICIENCY															
Primary energy consumption	**22892**	**24889**	**22477**	**21514**	**19893**	**19646**	**18515**	**18130**	**17737**	**17610**	**17354**	-0.2	-1.2	-0.7	-0.3
Final Energy Demand	**17919**	**19009**	**18022**	**16789**	**16831**	**16655**	**16266**	**15964**	**15804**	**15654**	**15574**	0.1	-0.7	-0.3	-0.2
by sector															
Industry	6323	5796	5453	5066	5193	4943	4603	4239	4086	3997	3958	-1.5	-0.5	-1.2	-0.8
Energy intensive industries	4179	3889	3634	3613	3713	3525	3222	2923	2788	2699	2653	-1.4	0.2	-1.4	-1.0
Other industrial sectors	2144	1907	1819	1452	1480	1418	1380	1315	1298	1298	1305	-1.6	-2.0	-0.7	-0.3
Residential	2804	3224	2976	2632	2742	2780	2766	2751	2734	2720	2705	0.6	-0.8	0.1	-0.1
Tertiary	2157	2801	2368	2224	2251	2250	2172	2169	2209	2218	2204	0.9	-0.5	-0.4	0.1
Transport[5]	6636	7188	7226	6867	6645	6682	6725	6804	6775	6720	6707	0.9	-0.8	0.1	0.0
by fuel															
Solids	466	17	50	17	15	11	5	3	1	1	1	-20.0	-11.2	-9.8	-10.4
Oil	10713	10812	9199	8142	7717	7695	7547	7424	7214	7028	6905	-1.5	-1.7	-0.2	-0.4
Gas	873	1307	1564	1691	1809	1740	1520	1472	1500	1525	1526	6.0	1.5	-1.7	0.0
Electricity	3300	3983	4290	3865	4051	4100	4107	4166	4261	4343	4388	2.7	-0.6	0.1	0.3
Heat (from CHP and District Heating)	134	328	338	325	366	338	474	412	408	366	358	9.7	0.8	2.6	-1.4
Renewable energy forms	2434	2563	2581	2748	2868	2764	2603	2477	2401	2365	2361	0.6	1.1	-1.0	-0.5
Other	0	0	0	1	4	6	9	11	18	26	36	0.0	0.0	8.0	7.3
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	150	156	134	132	114	104	92	86	80	77	73	-1.1	-1.6	-2.1	-1.1
Industry (Energy on Value added, index 2000=100)	100	93	89	85	83	74	67	59	56	54	52	-1.2	-0.7	-2.1	-1.2
Residential (Energy on Private Income, index 2000=100)	100	108	94	87	85	79	73	69	65	63	60	-0.6	-1.0	-1.5	-1.0
Tertiary (Energy on Value added, index 2000=100)	100	120	94	91	85	78	70	66	64	62	59	-0.6	-1.0	-1.9	-0.9
Passenger transport (toe/Mpkm) [6]	48	47	46	41	37	34	32	31	29	28	27	-0.3	-2.2	-1.6	-0.8
Freight transport (toe/Mtkm)	36	33	33	31	31	30	28	28	27	27	26	-0.9	-0.8	-0.7	-0.4
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**86.9**	**90.7**	**73.4**	**73.2**	**59.7**	**56.6**	**51.4**	**49.4**	**47.7**	**46.9**	**45.5**	-1.7	-2.0	-1.5	-0.6
of which ETS sectors (2013 scope) GHG emissions		40.6	27.7	32.3	22.1	19.8	16.7	15.4	14.1	13.8	12.6		-2.2	-2.7	-1.4
of which ESD sectors (2013 scope) GHG emissions		50.1	45.7	40.9	37.7	36.8	34.7	33.9	33.6	33.2	32.9		-1.9	-0.8	-0.3
CO_2 Emissions (energy related)	**61.0**	**64.6**	**49.6**	**50.1**	**38.8**	**36.0**	**32.5**	**31.5**	**29.9**	**29.2**	**27.9**	-2.1	-2.4	-1.8	-0.8
Power generation/District heating	21.7	24.9	14.9	18.0	8.2	5.4	3.0	2.7	1.8	1.8	1.0	-3.6	-5.9	-9.4	-5.6
Energy Branch	2.5	3.1	2.5	3.1	2.6	2.8	2.8	2.7	2.6	2.4	2.4	-0.2	0.6	0.5	-0.8
Industry	11.6	8.2	6.3	5.7	5.6	5.2	4.2	3.6	3.3	3.3	3.2	-5.9	-1.2	-2.8	-1.4
Residential	2.0	2.3	2.6	2.0	2.0	2.1	2.1	2.0	2.0	2.0	1.9	2.5	-2.6	0.4	-0.4
Tertiary	3.4	4.4	2.4	2.0	1.7	1.6	1.4	1.3	1.2	1.2	1.1	-3.2	-3.3	-1.9	-1.5
Transport	19.9	21.7	20.9	19.5	18.8	18.9	19.0	19.1	18.9	18.6	18.4	0.5	-1.1	0.1	-0.2
CO_2 Emissions (non energy and non land use related)	**6.6**	**7.0**	**5.4**	**6.1**	**6.1**	**6.2**	**6.0**	**5.0**	**4.8**	**4.7**	**4.4**	-2.0	1.1	0.0	-1.6
Non-CO2 GHG emissions	**19.3**	**19.1**	**18.4**	**16.9**	**14.8**	**14.3**	**12.8**	**12.8**	**13.0**	**13.1**	**13.2**	-0.4	-2.1	-1.4	0.1
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**139.7**	**145.8**	**118.0**	**117.7**	**96.1**	**91.0**	**82.7**	**79.4**	**76.7**	**75.5**	**73.1**	-1.7	-2.0	-1.5	-0.6
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.48	0.50	0.25	0.32	0.15	0.10	0.05	0.05	0.03	0.03	0.02	-6.3	-5.1	-9.5	-5.8
Final energy demand (t of CO_2/toe)	2.05	1.92	1.78	1.73	1.67	1.67	1.64	1.64	1.61	1.59	1.58	-1.4	-0.7	-0.1	-0.2
Industry	1.83	1.42	1.15	1.12	1.07	1.05	0.92	0.86	0.82	0.81	0.81	-4.5	-0.7	-1.6	-0.6
Residential	0.71	0.72	0.86	0.75	0.72	0.75	0.74	0.73	0.72	0.72	0.71	1.9	-1.8	0.3	-0.2
Tertiary	1.55	1.56	1.02	0.88	0.76	0.72	0.66	0.61	0.57	0.52	0.48	-4.1	-2.8	-1.5	-1.6
Transport	3.00	3.01	2.89	2.84	2.83	2.83	2.83	2.81	2.79	2.77	2.74	-0.4	-0.2	0.0	-0.2
RES in Gross Final Energy Consumption [7] (in%)	**19.1**	**19.4**	**24.3**	**25.3**	**33.4**	**34.4**	**37.9**	**38.6**	**40.3**	**41.6**	**43.7**				
RES-H&C share	30.4	32.1	33.9	36.8	38.6	39.3	40.4	41.9	42.3	42.9	43.6				
RES-E share	28.3	27.7	40.7	47.4	63.7	66.0	78.2	78.2	82.1	84.4	89.7				
RES-T share (based on ILUC formula)	0.4	0.4	5.7	1.3	11.0	11.7	13.1	14.7	17.1	20.5	23.4				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€13/MWh)	67	76	79	98	113	118	108	102	92	92	84	1.6	3.7	-0.5	-1.2
Average Price of Electricity in Final demand sectors (€13/MWh	118	120	104	128	140	145	149	151	146	144	143	-1.3	3.0	0.6	-0.2
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**16.8**	**22.3**	**24.4**	**23.5**	**28.5**	**31.1**	**33.3**	**35.0**	**36.2**	**37.2**	**38.0**	3.8	1.6	1.6	0.7
as % of GDP	**10.0**	**12.7**	**13.5**	**13.5**	**15.2**	**15.2**	**15.3**	**15.2**	**15.1**	**14.9**	**14.7**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Romania: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**22**	**21**	**20**	**20**	**20**	**19**	**19**	**19**	**18**	**18**	**18**	-1.0	-0.3	-0.4	-0.3
GDP (in 000 M€13)	**87**	**114**	**130**	**145**	**163**	**181**	**195**	**209**	**225**	**242**	**260**	4.1	2.3	1.8	1.4
Gross Inland Consumption (ktoe)	**36650**	**39207**	**35800**	**33091**	**35046**	**35775**	**34700**	**34338**	**35266**	**35766**	**36975**	-0.2	-0.2	-0.1	0.3
Solids	7493	8788	7008	6207	6474	5042	3140	1913	1673	1397	2197	-0.7	-0.8	-7.0	-1.8
Oil	9992	10286	9310	8775	8547	8744	8746	8869	9084	9199	9394	-0.7	-0.9	0.2	0.4
Natural gas	13680	13923	10788	9688	10917	9890	10042	10330	10428	10490	10648	-2.3	0.1	-0.8	0.3
Nuclear	1407	1433	2998	2838	2846	5749	5749	5749	5749	5749	5749	7.9	-0.5	7.3	0.0
Electricity	-60	-250	-196	-716	-663	-979	-940	-918	-895	-930	-990	12.6	13.0	3.6	0.3
Renewable energy forms	4137	5026	5891	6299	6926	7329	7964	8397	9227	9862	9978	3.6	1.6	1.4	1.1
Energy Branch Consumption	**3675**	**4105**	**2839**	**2480**	**2453**	**2372**	**2229**	**2174**	**2165**	**2148**	**2426**	-2.5	-1.4	-1.0	0.4
Non-Energy Uses	**1883**	**2467**	**1473**	**1754**	**2001**	**2176**	**2342**	**2485**	**2654**	**2815**	**3038**	-2.4	3.1	1.6	1.3
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**28465**	**28224**	**27824**	**26642**	**28452**	**30520**	**29665**	**29523**	**30294**	**30799**	**32217**	-0.2	0.2	0.4	0.4
Solids	5604	5795	5904	5042	5113	3841	2137	1219	1065	862	1937	0.5	-1.4	-8.4	-0.5
Oil	6355	6226	4565	3643	3647	3732	3753	3825	3948	4024	4131	-3.3	-2.2	0.3	0.5
Natural gas	10968	9701	8619	8848	10107	10049	10238	10502	10536	10562	10692	-2.4	1.6	0.1	0.2
Nuclear	1407	1433	2998	2838	2846	5749	5749	5749	5749	5749	5749	7.9	-0.5	7.3	0.0
Renewable energy sources	4131	5070	5739	6271	6740	7149	7788	8228	8997	9603	9709	3.3	1.6	1.5	1.1
Hydro	1271	1738	1710	1386	1438	1443	1443	1444	1460	1459	1463	3.0	-1.7	0.0	0.1
Biomass & Waste	2854	3314	3980	4135	4513	4520	4722	4952	5160	5391	5346	3.4	1.3	0.5	0.6
Wind	0	0	26	557	560	910	1143	1192	1245	1336	1413	0.0	35.8	7.4	1.1
Solar and others	0	0	0	163	182	205	310	359	412	663	705	0.0	111.8	5.5	4.2
Geothermal	7	18	23	30	46	72	171	281	720	754	782	13.1	7.2	14.0	7.9
Net Imports (ktoe)	**8009**	**10867**	**7827**	**6473**	**6626**	**5292**	**5077**	**4859**	**5019**	**5018**	**4810**	-0.2	-1.7	-2.6	-0.3
Solids	1920	2939	1234	1165	1361	1201	1003	694	608	535	260	-4.3	1.0	-3.0	-6.5
Oil	3437	3988	4838	5156	4930	5048	5033	5085	5182	5223	5312	3.5	0.2	0.2	0.3
Crude oil and Feedstocks	4801	8857	6233	5504	5006	4807	4570	4385	4222	4021	3825	2.6	-2.2	-0.9	-0.9
Oil products	-1364	-4870	-1395	-348	-76	241	463	700	960	1202	1487	0.2	-25.2	0.0	6.0
Natural gas	2712	4190	1816	839	811	-158	-195	-171	-105	-70	-41	-3.9	-7.7	0.0	-7.5
Electricity	-60	-250	-196	-716	-663	-979	-940	-918	-895	-930	-990	12.6	13.0	3.6	0.3
Import Dependency (%)	21.8	27.7	21.9	19.5	18.9	14.8	14.6	14.1	14.2	14.0	13.0				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**51560**	**59413**	**60619**	**67528**	**71417**	**75947**	**75464**	**76387**	**78699**	**81800**	**88115**	1.6	1.7	0.6	0.8
Nuclear energy	5456	5555	11623	11890	11922	23792	23606	23606	23419	23419	23419	7.9	0.3	7.1	0.0
Solids	18926	21916	20681	21982	22415	16311	9020	4869	4414	3730	8511	0.9	0.8	-8.7	-0.3
Oil (including refinery gas)	3399	1894	692	625	405	238	226	216	231	231	217	-14.7	-5.2	-5.7	-0.2
Gas (including derived gases)	9001	9834	7323	8032	10726	5443	8622	12186	13135	12402	13025	-2.0	3.9	-2.2	2.1
Biomass-waste	0	7	111	522	763	854	1155	1960	3001	3961	3841	0.0	21.3	4.2	6.2
Hydro (pumping excluded)	14778	20207	19883	16112	16724	16778	16778	16796	16972	16962	17015	3.0	-1.7	0.0	0.1
Wind	0	0	306	6473	6512	10579	13287	13859	14478	15532	16428	0.0	35.8	7.4	1.1
Solar	0	0	0	1891	1950	1950	2770	2895	3048	5562	5657	0.0	0.0	3.6	3.6
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**20197**	**19153**	**20120**	**24896**	**23990**	**24313**	**24414**	**21439**	**21866**	**23694**	**25669**	0.0	1.8	0.2	0.3
Nuclear energy	672	672	1344	1414	1414	2828	2828	2828	2828	2828	2828	7.2	0.5	7.2	0.0
Renewable energy	6242	6289	6863	11413	11457	13300	14885	15214	15559	17563	18278	1.0	5.3	2.7	1.0
Hydro (pumping excluded)	6242	6289	6474	6645	6645	6645	6645	6645	6686	6686	6686	0.4	0.3	0.0	0.0
Wind	0	0	389	2976	2989	4832	6017	6264	6498	6803	7450	0.0	22.6	7.2	1.1
Solar	0	0	0	1792	1824	1824	2223	2305	2375	4075	4143	0.0	0.0	2.0	3.2
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	13283	12192	11913	12070	11118	8185	6701	3398	3480	3303	4563	-1.1	-0.7	-4.9	-1.9
of which cogeneration units	3431	5246	4582	4234	4099	2728	2711	2732	2896	2888	3577	2.9	-1.1	-4.0	1.4
of which CCS units	0	0	0	0	0	0	0	0	0	0	1860	0.0	0.0	0.0	0.0
Solids fired	7602	7057	6643	6441	5626	3094	1909	861	770	666	885	-1.3	-1.6	-10.2	-3.8
Gas fired	3728	3439	3488	4173	4221	4170	3959	2248	2338	2205	3257	-0.7	1.9	-0.6	-1.0
Oil fired	1806	1691	1759	1360	1132	771	676	119	119	119	115	-0.3	-4.3	-5.0	-8.5
Biomass-waste fired	147	5	23	96	139	150	157	169	252	313	306	-16.9	19.7	1.2	3.4
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	27.5	33.1	31.5	28.5	31.4	33.4	33.7	39.2	39.8	38.3	36.9				
Efficiency of gross thermal power generation (%)	25.3	28.0	28.6	39.2	39.2	37.8	40.1	43.7	44.6	43.5	44.2				
% of gross electricity from CHP	32.3	26.2	10.8	12.0	12.3	8.9	10.0	11.4	11.9	11.2	13.0				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	19.2				
% of carbon free (RES, nuclear) gross electricity generation	39.2	43.4	52.7	54.6	53.0	71.0	76.3	77.4	77.4	80.0	75.3				
Fuel Inputs to Thermal Power Generation (GWh_e)	**10788**	**10329**	**8675**	**6836**	**7520**	**5195**	**4078**	**3788**	**4003**	**4016**	**4981**	-2.2	-1.4	-5.9	1.0
Solids	5462	6085	5929	5216	5337	3980	2238	1252	1150	992	1899	0.8	-1.0	-8.3	-0.8
Oil (including refinery gas)	1736	799	327	176	129	76	72	69	74	74	70	-15.4	-8.8	-5.7	-0.2
Gas (including derived gases)	3579	3437	2399	1331	1884	947	1509	2063	2180	2165	2196	-3.9	-2.4	-2.2	1.9
Biomass & Waste	12	9	21	113	169	192	258	404	599	786	817	6.1	23.3	4.3	5.9
Geothermal heat	0	0	1	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**16275**	**19666**	**15568**	**13664**	**13429**	**16134**	**15874**	**15794**	**16090**	**16019**	**15959**	-0.4	-1.5	1.7	0.0
Refineries	11250	15219	11480	9680	9169	9042	8834	8732	8714	8609	8537	0.2	-2.2	-0.4	-0.2
Biofuels and hydrogen production	0	0	115	273	559	546	542	541	564	586	599	0.0	17.1	-0.3	0.5
District heating	1738	825	749	702	682	638	638	691	1001	1029	1037	-8.1	-0.9	-0.7	2.5
Derived gases, cokeries etc.	3287	3621	3223	3009	3018	5909	5860	5830	5811	5795	5786	-0.2	-0.7	6.9	-0.1

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Romania: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**85**	**93**	**110**	**118**	**130**	**145**	**159**	**173**	**189**	**201**	**212**	2.6	1.7	2.1	1.4
Public road transport	12	12	12	12	13	14	14	15	15	16	16	0.0	0.9	0.8	0.7
Private cars and motorcycles	54	63	78	85	92	103	113	123	134	140	147	3.9	1.7	2.0	1.3
Rail	18	15	13	13	15	16	17	18	20	21	22	-3.3	1.5	1.5	1.4
Aviation [3]	2	3	7	8	10	12	15	18	20	24	27	15.1	3.4	4.7	2.9
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	-2.5	1.9	2.2	1.3
Freight transport activity (Gtkm)	**27**	**56**	**43**	**51**	**61**	**69**	**76**	**82**	**88**	**94**	**100**	4.7	3.5	2.3	1.4
Heavy goods and light commercial vehicles	8	31	16	20	25	29	32	35	37	39	41	7.2	4.4	2.5	1.3
Rail	16	17	12	15	18	21	23	25	28	30	33	-2.7	3.9	2.4	1.7
Inland navigation	3	8	14	15	18	19	21	22	23	25	26	18.4	2.1	1.7	1.2
Energy demand in transport (ktoe) [4]	**3336**	**4186**	**5073**	**5448**	**5734**	**6076**	**6294**	**6572**	**6908**	**7105**	**7307**	4.3	1.2	0.9	0.7
Public road transport	293	260	359	373	380	383	385	391	398	405	412	2.0	0.6	0.1	0.3
Private cars and motorcycles	2082	2416	3214	3381	3375	3477	3542	3678	3861	3920	3976	4.4	0.5	0.5	0.6
Heavy goods and light commercial vehicles	363	1182	946	1142	1359	1500	1567	1626	1699	1755	1818	10.1	3.7	1.4	0.7
Rail	357	159	222	245	274	301	317	333	345	354	358	-4.6	2.1	1.5	0.6
Aviation	128	128	272	265	298	364	427	486	544	607	675	7.8	0.9	3.7	2.3
Inland navigation	113	42	59	42	47	52	55	58	61	64	67	-6.2	-2.2	1.5	0.9
By transport activity															
Passenger transport	2648	2855	3921	4091	4136	4314	4448	4654	4906	5039	5174	4.0	0.5	0.7	0.8
Freight transport	689	1331	1152	1356	1598	1762	1846	1918	2001	2065	2133	5.3	3.3	1.5	0.7
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.8	1.1	1.3				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	2.3	5.1	10.0	9.2	8.9	8.5	8.4	8.4	8.3				
ENERGY EFFICIENCY															
Primary energy consumption	**34767**	**36740**	**34326**	**31337**	**33045**	**33599**	**32358**	**31853**	**32612**	**32951**	**33937**	-0.1	-0.4	-0.2	0.2
Final Energy Demand	**22772**	**24714**	**22591**	**23117**	**24600**	**24902**	**24723**	**24658**	**25133**	**25544**	**25875**	-0.1	0.9	0.0	0.2
by sector															
Industry	9296	10007	6876	7316	8152	8307	7887	7369	7268	7322	7331	-3.0	1.7	-0.3	-0.4
Energy intensive industries	6510	7208	4759	4794	5398	5367	4896	4420	4350	4346	4317	-3.1	1.3	-1.0	-0.6
Other industrial sectors	2787	2799	2117	2522	2754	2939	2991	2950	2917	2976	3014	-2.7	2.7	0.8	0.0
Residential	8409	7990	8102	7825	8128	7903	7934	8100	8283	8350	8392	-0.4	0.0	-0.2	0.3
Tertiary	1606	2441	2489	2468	2523	2549	2538	2544	2597	2686	2762	4.5	0.1	0.1	0.4
Transport[5]	3460	4276	5124	5507	5797	6143	6364	6646	6985	7185	7390	4.0	1.2	0.9	0.7
by fuel															
Solids	1046	1611	939	815	950	886	771	560	442	356	258	-1.1	0.1	-2.1	-5.3
Oil	5526	6628	6184	6765	6610	6866	6883	6996	7160	7255	7358	1.1	0.7	0.4	0.3
Gas	6910	7754	6189	6337	6865	6785	6349	6043	6051	6011	6020	-1.1	1.0	-0.8	-0.3
Electricity	2918	3341	3553	3683	4058	4233	4392	4584	4840	5107	5355	2.0	1.3	0.8	1.0
Heat (from CHP and District Heating)	3570	2136	1650	1493	1628	1712	1801	1873	1954	2046	2122	-7.4	-0.1	1.0	0.8
Renewable energy forms	2802	3244	4077	4023	4488	4419	4524	4598	4675	4749	4734	3.8	1.0	0.1	0.2
Other	0	0	0	0	1	1	3	5	11	19	28	-100.0	0.0	11.5	12.3
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	423	343	275	229	215	198	178	164	157	148	142	-4.2	-2.5	-1.9	-1.1
Industry (Energy on Value added, index 2000=100)	100	78	44	41	40	37	32	28	26	25	24	-7.8	-1.0	-2.2	-1.4
Residential (Energy on Private Income, index 2000=100)	100	59	49	43	39	34	32	30	28	26	25	-6.9	-2.1	-2.1	-1.3
Tertiary (Energy on Value added, index 2000=100)	100	119	114	102	92	83	76	71	66	63	59	1.4	-2.1	-1.9	-1.2
Passenger transport (toe/Mpkm) [6]	31	31	35	34	32	29	28	26	26	25	24	1.3	-1.1	-1.4	-0.7
Freight transport (toe/Mtkm)	25	24	27	27	26	25	24	23	23	22	21	0.5	-0.2	-0.8	-0.7
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**145.9**	**151.3**	**125.5**	**118.7**	**119.0**	**110.1**	**99.7**	**94.0**	**93.9**	**92.9**	**87.9**	-1.5	-0.5	-1.8	-0.6
of which ETS sectors (2013 scope) GHG emissions		74.8	55.8	46.9	49.1	40.0	31.4	26.3	25.0	23.6	18.0		-1.3	-4.4	-2.7
of which ESD sectors (2013 scope) GHG emissions		76.5	69.6	71.8	69.8	70.1	68.3	67.7	68.9	69.4	69.9		0.0	-0.2	0.1
CO_2 Emissions (energy related)	**88.8**	**95.8**	**77.4**	**71.5**	**74.3**	**66.0**	**57.6**	**52.9**	**52.2**	**51.1**	**45.6**	-1.4	-0.4	-2.5	-1.2
Power generation/District heating	42.0	39.0	33.6	27.2	28.9	20.4	14.0	10.9	10.4	9.5	4.3	-2.2	-1.5	-7.0	-5.8
Energy Branch	6.8	7.7	5.1	4.0	3.8	3.7	3.6	3.6	3.6	3.5	3.5	-2.8	-2.9	-0.5	-0.1
Industry	21.6	25.2	14.4	14.7	15.7	14.9	12.7	10.3	9.1	8.5	8.2	-4.0	0.9	-2.1	-2.2
Residential	6.6	7.3	5.8	6.5	6.9	7.0	7.0	7.2	7.5	7.3	7.0	-1.2	1.7	0.0	0.1
Tertiary	1.9	4.2	3.6	3.5	3.5	3.5	3.3	3.2	3.1	3.1	3.1	6.7	-0.4	-0.6	-0.2
Transport	9.9	12.4	14.8	15.5	15.5	16.5	17.1	17.8	18.6	19.0	19.5	4.1	0.4	1.0	0.7
CO_2 Emissions (non energy and non land use related)	**13.4**	**8.7**	**7.1**	**7.4**	**7.8**	**7.7**	**7.1**	**6.7**	**6.6**	**6.1**	**5.5**	-6.1	0.8	-0.9	-1.3
Non-CO2 GHG emissions	**43.8**	**46.7**	**40.9**	**39.8**	**36.9**	**36.5**	**34.9**	**34.3**	**35.0**	**35.8**	**36.7**	-0.7	-1.0	-0.5	0.3
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**57.4**	**59.5**	**49.4**	**46.7**	**46.8**	**43.3**	**39.2**	**37.0**	**36.9**	**36.6**	**34.6**	-1.5	-0.5	-1.8	-0.6
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.41	0.42	0.39	0.30	0.30	0.20	0.14	0.11	0.10	0.09	0.04	-0.6	-2.5	-7.6	-6.5
Final energy demand (t of CO_2/toe)	1.76	1.99	1.71	1.74	1.69	1.68	1.62	1.56	1.52	1.49	1.46	-0.3	-0.1	-0.4	-0.5
Industry	2.33	2.52	2.09	2.01	1.93	1.79	1.61	1.39	1.25	1.17	1.12	-1.1	-0.8	-1.8	-1.8
Residential	0.79	0.92	0.72	0.83	0.85	0.88	0.88	0.89	0.90	0.87	0.84	-0.8	1.7	0.3	-0.2
Tertiary	1.17	1.70	1.44	1.42	1.37	1.36	1.28	1.24	1.20	1.16	1.13	2.2	-0.5	-0.7	-0.6
Transport	2.86	2.90	2.89	2.81	2.67	2.68	2.68	2.68	2.67	2.65	2.63	0.1	-0.8	0.1	-0.1
RES in Gross Final Energy Consumption [7] **(in%)**	**16.9**	**17.6**	**23.3**	**25.1**	**26.0**	**27.4**	**30.0**	**31.5**	**32.6**	**34.5**	**34.4**				
RES-H&C share	16.1	17.9	27.4	25.9	26.0	26.8	29.5	32.2	34.0	35.7	36.4				
RES-E share	30.2	28.8	30.4	42.3	40.8	46.8	52.8	54.1	55.0	59.3	56.2				
RES-T share (based on ILUC formula)	2.3	1.9	3.8	7.5	10.1	11.0	12.3	13.2	14.3	16.2	17.0				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€13/MWh)	43	72	70	76	75	76	76	68	68	67	67	5.0	0.7	0.1	-0.7
Average Price of Electricity in Final demand sectors (€13/MWh	52	105	90	101	109	122	129	140	144	143	139	5.7	2.0	1.7	0.4
Total energy-rel. and other mitigation costs [8] **(in 000 M€13)**	**9.9**	**19.1**	**23.0**	**26.7**	**32.4**	**37.0**	**41.1**	**44.5**	**47.6**	**50.2**	**53.6**	8.8	3.5	2.4	1.3
as % of GDP	**11.5**	**16.8**	**17.7**	**18.4**	**19.9**	**20.5**	**21.0**	**21.3**	**21.1**	**20.7**	**20.6**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Slovakia: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	**5**	0.0	0.0	-0.2	-0.4
GDP (in 000 M€13)	**43**	**55**	**69**	**76**	**89**	**102**	**117**	**127**	**134**	**139**	**143**	4.8	2.6	2.7	1.0
Gross Inland Consumption (ktoe)	**18302**	**19029**	**17864**	**16867**	**18383**	**18942**	**19390**	**19561**	**19734**	**18810**	**18852**	-0.2	0.3	0.5	-0.1
Solids	4278	4231	3897	3247	3294	2959	2359	2061	1722	1305	1695	-0.9	-1.7	-3.3	-1.6
Oil	3415	3711	3692	3346	3440	3542	3702	3705	3711	3676	3621	0.8	-0.7	0.7	-0.1
Natural gas	5777	5884	5007	4939	4873	5403	4754	4718	4604	5265	4963	-1.4	-0.3	-0.2	0.2
Nuclear	4255	4626	3819	3569	4953	5375	6887	7223	7535	5695	5695	-1.1	2.6	3.4	-0.9
Electricity	-232	-281	90	215	-203	-230	-223	-202	-239	-219	-205	0.0	0.0	0.9	-0.4
Renewable energy forms	810	859	1360	1551	2027	1892	1911	2057	2402	3087	3082	5.3	4.1	-0.6	2.4
Energy Branch Consumption	**623**	**1297**	**963**	**942**	**980**	**890**	**873**	**860**	**832**	**794**	**836**	4.5	0.2	-1.1	-0.2
Non-Energy Uses	**1365**	**1279**	**1053**	**1597**	**1738**	**1886**	**2046**	**2146**	**2177**	**2189**	**2169**	-2.6	5.1	1.6	0.3
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**6389**	**6684**	**6345**	**6192**	**7946**	**7875**	**9216**	**9646**	**10361**	**9158**	**9391**	-0.1	2.3	1.5	0.1
Solids	1018	637	613	593	512	450	264	213	282	203	457	-4.9	-1.8	-6.4	2.8
Oil	165	383	387	297	264	0	0	0	0	0	0	8.9	-3.7	-100.0	0.0
Natural gas	133	126	88	120	106	78	80	80	77	89	89	-4.0	1.8	-2.8	0.5
Nuclear	4255	4626	3819	3569	4953	5375	6887	7223	7535	5695	5695	-1.1	2.6	3.4	-0.9
Renewable energy sources	818	912	1438	1613	2112	1971	1986	2130	2468	3171	3150	5.8	3.9	-0.6	2.3
Hydro	397	399	452	407	471	434	434	433	433	483	495	1.3	0.4	-0.8	0.7
Biomass & Waste	421	505	972	1148	1562	1456	1420	1490	1534	1919	1876	8.7	4.9	-1.0	1.4
Wind	0	1	1	1	2	2	2	2	3	23	32	0.0	16.2	0.0	14.2
Solar and others	0	0	6	51	63	62	78	95	111	157	162	0.0	26.9	2.2	3.7
Geothermal	0	8	8	6	14	16	53	109	387	589	586	0.0	5.4	14.2	12.8
Net Imports (ktoe)	**11997**	**12428**	**11230**	**10675**	**10437**	**11068**	**10173**	**9916**	**9374**	**9652**	**9461**	-0.7	-0.7	-0.3	-0.4
Solids	3432	3739	2951	2654	2782	2509	2095	1848	1441	1102	1238	-1.5	-0.6	-2.8	-2.6
Oil	3090	3274	3266	3048	3176	3542	3702	3705	3711	3676	3621	0.6	-0.3	1.5	-0.1
Crude oil and Feedstocks	5720	5429	5282	5716	5604	5732	5647	5452	5252	5022	4782	-0.8	0.6	0.1	-0.8
Oil products	-2630	-2155	-2015	-2667	-2429	-2189	-1945	-1747	-1541	-1345	-1161	-2.6	1.9	-2.2	-2.5
Natural gas	5707	5735	5003	4819	4767	5324	4674	4638	4527	5176	4874	-1.3	-0.5	-0.2	0.2
Electricity	-232	-281	90	215	-203	-230	-223	-202	-239	-219	-205	0.0	0.0	0.9	-0.4
Import Dependency (%)	65.5	65.3	62.9	63.3	56.8	58.4	52.5	50.7	47.5	51.3	50.2				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**30798**	**31352**	**27464**	**27068**	**33934**	**36485**	**38296**	**39659**	**40877**	**40446**	**41814**	-1.1	2.1	1.2	0.4
Nuclear energy	16494	17727	14574	14662	20320	22049	29384	30757	31945	24479	24479	-1.2	3.4	3.8	-0.9
Solids	5584	5535	3570	4119	4615	3539	1877	1639	1592	648	3170	-4.4	2.6	-8.6	2.7
Oil (including refinery gas)	202	741	600	163	8	91	92	0	0	3	0	11.5	-34.7	26.9	-100.0
Gas (including derived gases)	3871	2629	2716	1730	984	3617	346	395	335	4852	3676	-3.5	-9.7	-9.9	12.5
Biomass-waste	32	76	726	1131	1972	1581	908	1094	1123	3324	3097	36.6	10.5	-7.5	6.3
Hydro (pumping excluded)	4615	4638	5255	4738	5475	5049	5045	5040	5036	5615	5751	1.3	0.4	-0.8	0.7
Wind	0	6	6	6	26	26	26	27	33	273	373	0.0	15.8	0.0	14.2
Solar	0	0	17	520	532	532	619	707	812	1252	1268	0.0	40.8	1.5	3.6
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**6919**	**7103**	**6715**	**7497**	**7711**	**7632**	**8440**	**8206**	**8171**	**7916**	**8063**	-0.3	1.4	0.9	-0.2
Nuclear energy	2707	2707	1845	1940	2820	2820	4020	4020	4020	3020	3020	-3.8	4.3	3.6	-1.4
Renewable energy	1685	1601	1624	2220	2364	2364	2424	2484	2549	3083	3170	-0.4	3.8	0.3	1.4
Hydro (pumping excluded)	1685	1596	1600	1607	1725	1725	1725	1725	1725	1859	1888	-0.5	0.8	0.0	0.5
Wind	0	5	5	5	19	19	19	19	24	124	164	0.0	14.3	0.0	11.4
Solar	0	0	19	608	620	620	680	740	800	1100	1119	0.0	41.7	0.9	2.5
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	2526	2795	3246	3337	2527	2448	1996	1702	1603	1814	1873	2.5	-2.5	-2.3	-0.3
of which cogeneration units	618	5411	2821	1020	876	864	778	682	659	974	961	16.4	-11.0	-1.2	1.1
of which CCS units	0	0	0	0	0	0	0	0	0	0	330	0.0	0.0	0.0	0.0
Solids fired	1618	1617	1313	1274	792	711	483	477	456	212	449	-2.1	-4.9	-4.8	-0.4
Gas fired	821	1067	1674	1738	1323	1322	1097	863	782	1061	958	7.4	-2.3	-1.9	-0.7
Oil fired	81	81	81	84	84	84	84	30	30	30	3	0.0	0.4	0.0	-15.0
Biomass-waste fired	7	30	177	241	327	331	332	332	335	511	462	38.2	6.3	0.2	1.7
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	45.2	46.9	42.6	38.8	47.3	51.6	49.3	52.5	54.4	55.8	55.8				
Efficiency of gross thermal power generation (%)	31.4	29.0	25.6	36.3	36.3	36.9	26.9	26.9	27.1	46.5	44.7				
% of gross electricity from CHP	18.4	15.3	15.9	25.6	21.6	18.1	8.4	7.9	7.5	21.6	22.5				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.6				
% of carbon free (RES, nuclear) gross electricity generation	68.6	71.6	74.9	77.8	83.5	80.1	94.0	94.9	95.3	86.4	83.6				
Fuel Inputs to Thermal Power Generation (GWh_e)	**2656**	**2664**	**2555**	**1692**	**1795**	**2058**	**1028**	**999**	**968**	**1634**	**1911**	-0.4	-3.5	-5.4	3.1
Solids	1619	1677	1205	1089	1132	992	560	491	477	212	700	-2.9	-0.6	-6.8	1.1
Oil (including refinery gas)	31	100	293	34	3	30	30	0	0	1	0	25.4	-37.2	26.9	-100.0
Gas (including derived gases)	1002	847	793	314	214	675	172	187	157	772	615	-2.3	-12.3	-2.2	6.6
Biomass & Waste	4	40	264	255	445	361	266	321	334	649	596	51.0	5.4	-5.0	4.1
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**12901**	**13989**	**12558**	**12416**	**13880**	**13878**	**15226**	**15280**	**15380**	**13405**	**13031**	-0.3	1.0	0.9	-0.8
Refineries	5959	6398	6011	6450	6336	6232	6184	6005	5811	5581	5341	0.1	0.5	-0.2	-0.7
Biofuels and hydrogen production	0	11	98	118	176	178	187	197	204	209	214	0.0	6.1	0.6	0.7
District heating	674	718	497	367	377	389	390	429	671	885	822	-3.0	-2.7	0.3	3.8
Derived gases, cokeries etc.	6268	6862	5952	5481	6992	7080	8466	8649	8694	6730	6654	-0.5	1.6	1.9	-1.2

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Slovakia: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**37**	**39**	**36**	**38**	**45**	**51**	**58**	**62**	**65**	**67**	**68**	-0.2	2.2	2.5	0.8
Public road transport	9	9	5	6	6	7	8	9	9	9	9	-5.5	2.0	2.3	0.7
Private cars and motorcycles	24	26	27	28	34	39	43	46	48	49	50	1.2	2.1	2.4	0.8
Rail	3	3	3	3	3	4	5	5	5	5	6	-2.1	2.8	2.9	1.1
Aviation [3]	0	2	1	1	1	2	2	2	3	3	3	15.3	3.0	4.7	1.7
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Freight transport activity (Gtkm)	**20**	**21**	**22**	**23**	**26**	**29**	**32**	**34**	**36**	**37**	**37**	1.1	1.8	2.1	0.8
Heavy goods and light commercial vehicles	7	11	13	14	15	16	18	19	20	20	20	6.0	1.9	1.7	0.6
Rail	11	9	8	8	10	11	13	14	15	15	15	-3.2	1.8	2.8	1.0
Inland navigation	1	1	1	1	1	1	2	2	2	2	2	-1.5	1.1	1.4	0.5
Energy demand in transport (ktoe) [4]	**1455**	**1794**	**2241**	**2205**	**2350**	**2413**	**2533**	**2630**	**2667**	**2666**	**2667**	4.4	0.5	0.8	0.3
Public road transport	193	185	132	141	155	167	179	185	191	191	192	-3.7	1.6	1.5	0.3
Private cars and motorcycles	830	992	1194	1155	1210	1225	1296	1353	1371	1372	1371	3.7	0.1	0.7	0.3
Heavy goods and light commercial vehicles	308	527	821	814	874	893	913	936	942	937	936	10.3	0.6	0.4	0.1
Rail	83	42	40	41	48	54	60	64	66	67	67	-7.1	1.8	2.4	0.5
Aviation	27	39	41	44	53	62	71	78	83	86	88	4.5	2.5	3.0	1.1
Inland navigation	14	7	12	10	11	12	13	13	14	14	14	-2.0	-0.4	1.2	0.3
By transport activity															
Passenger transport	1064	1223	1374	1346	1425	1462	1556	1626	1655	1659	1661	2.6	0.4	0.9	0.3
Freight transport	390	570	867	859	925	950	977	1004	1012	1008	1006	8.3	0.7	0.6	0.1
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.2	0.4	0.6	0.9	1.2	1.4				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.6	4.4	5.5	7.7	7.7	7.7	7.8	7.9	8.0	8.1				
ENERGY EFFICIENCY															
Primary energy consumption	**16937**	**17751**	**16811**	**15270**	**16645**	**17057**	**17343**	**17415**	**17557**	**16621**	**16683**	-0.1	-0.1	0.4	-0.2
Final Energy Demand	**10980**	**11561**	**11546**	**11225**	**11683**	**11755**	**11714**	**11555**	**11291**	**11187**	**11075**	0.5	0.1	0.0	-0.3
by sector															
Industry	4532	4713	4361	4420	4595	4594	4503	4273	4003	3901	3827	-0.4	0.5	-0.2	-0.8
Energy intensive industries	3678	3887	3637	3655	3761	3725	3592	3332	3055	2953	2888	-0.1	0.3	-0.5	-1.1
Other industrial sectors	854	826	723	765	834	870	911	941	948	948	939	-1.7	1.4	0.9	0.2
Residential	2586	2540	2312	2176	2207	2223	2194	2170	2145	2128	2128	-1.1	-0.5	-0.1	-0.2
Tertiary	2407	1916	2240	2038	2151	2129	2111	2116	2119	2118	2098	-0.7	-0.4	-0.2	0.0
Transport[5]	1455	2392	2633	2591	2730	2809	2906	2997	3024	3040	3022	6.1	0.4	0.6	0.2
by fuel															
Solids	1747	1572	1637	1294	1239	1230	1103	921	680	565	494	-0.6	-2.8	-1.2	-3.9
Oil	1703	2184	2301	2230	2290	2326	2414	2466	2462	2429	2403	3.1	-0.1	0.5	0.0
Gas	4698	4540	4119	4011	4084	3911	3722	3577	3464	3420	3345	-1.3	-0.1	-0.9	-0.5
Electricity	1893	1965	2075	2219	2333	2532	2675	2771	2839	2897	2942	0.9	1.2	1.4	0.5
Heat (from CHP and District Heating)	619	951	851	726	816	827	807	791	778	758	747	3.2	-0.4	-0.1	-0.4
Renewable energy forms	320	349	562	745	921	926	990	1025	1063	1108	1133	5.8	5.1	0.7	0.7
Other	0	0	0	0	2	2	3	4	6	8	11	0.0	0.0	6.5	6.8
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	424	347	259	221	206	186	166	153	147	136	132	-4.8	-2.3	-2.1	-1.1
Industry (Energy on Value added, index 2000=100)	100	61	39	37	34	30	26	23	21	20	19	-8.9	-1.4	-2.5	-1.6
Residential (Energy on Private Income, index 2000=100)	100	78	59	51	44	38	33	29	27	25	24	-5.1	-2.9	-3.0	-1.4
Tertiary (Energy on Value added, index 2000=100)	100	72	68	54	49	42	36	33	31	30	29	-3.8	-3.2	-3.0	-1.1
Passenger transport (toe/Mpkm) [6]	29	31	37	35	31	28	26	25	25	24	24	2.7	-1.8	-1.6	-0.5
Freight transport (toe/Mtkm)	20	27	40	37	36	33	30	29	28	28	27	7.2	-1.1	-1.5	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**54.1**	**54.7**	**50.8**	**45.0**	**43.8**	**42.4**	**37.8**	**35.7**	**33.2**	**32.6**	**30.5**	-0.6	-1.5	-1.5	-1.1
of which ETS sectors (2013 scope) GHG emissions		29.2	24.7	20.4	20.4	19.5	15.5	13.7	11.7	11.4	9.7		-1.9	-2.7	-2.3
of which ESD sectors (2013 scope) GHG emissions		25.5	26.1	24.6	23.5	22.9	22.4	22.0	21.5	21.2	20.8		-1.1	-0.5	-0.4
CO_2 Emissions (energy related)	**38.7**	**41.6**	**38.7**	**33.6**	**33.9**	**32.6**	**28.4**	**26.6**	**24.4**	**23.9**	**21.9**	0.0	-1.3	-1.7	-1.3
Power generation/District heating	11.1	11.2	9.2	6.3	6.4	7.4	4.2	3.7	3.3	3.7	2.5	-1.8	-3.6	-4.0	-2.6
Energy Branch	1.6	3.4	2.5	2.2	2.2	1.9	1.8	1.6	1.5	1.4	1.4	4.4	-1.0	-2.2	-1.3
Industry	13.3	14.1	12.8	12.0	12.1	10.4	9.5	8.3	6.8	6.1	5.6	-0.4	-0.6	-2.4	-2.6
Residential	4.1	3.6	3.4	2.8	2.7	2.7	2.6	2.6	2.5	2.5	2.5	-2.0	-2.3	-0.1	-0.4
Tertiary	4.5	2.7	3.5	3.1	3.1	2.7	2.5	2.3	2.2	2.1	2.0	-2.5	-1.0	-2.3	-1.1
Transport	4.1	6.6	7.3	7.1	7.3	7.5	7.8	8.0	8.0	8.0	7.9	5.9	0.1	0.6	0.1
CO_2 Emissions (non energy and non land use related)	**6.7**	**3.9**	**3.2**	**3.5**	**3.5**	**3.5**	**3.4**	**3.2**	**2.9**	**2.8**	**2.7**	-7.0	0.8	-0.3	-1.1
Non-CO2 GHG emissions	**8.7**	**9.1**	**8.9**	**7.8**	**6.4**	**6.3**	**6.0**	**5.9**	**5.9**	**5.9**	**5.9**	0.2	-3.2	-0.7	-0.1
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**71.5**	**72.3**	**67.2**	**59.5**	**58.0**	**56.1**	**50.1**	**47.2**	**43.9**	**43.1**	**40.4**	-0.6	-1.5	-1.5	-1.1
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.27	0.25	0.23	0.17	0.14	0.15	0.09	0.07	0.06	0.07	0.05	-1.4	-5.0	-4.8	-2.8
Final energy demand (t of CO_2/toe)	2.37	2.34	2.33	2.24	2.16	1.99	1.91	1.84	1.73	1.67	1.63	-0.2	-0.8	-1.2	-0.8
Industry	2.94	2.99	2.94	2.72	2.63	2.27	2.11	1.95	1.71	1.56	1.47	0.0	-1.1	-2.2	-1.8
Residential	1.60	1.40	1.47	1.30	1.21	1.21	1.20	1.19	1.18	1.17	1.15	-0.9	-1.9	-0.1	-0.2
Tertiary	1.85	1.43	1.55	1.54	1.45	1.29	1.18	1.10	1.04	0.99	0.96	-1.8	-0.6	-2.1	-1.0
Transport	2.82	2.77	2.77	2.74	2.69	2.68	2.68	2.67	2.66	2.64	2.63	-0.2	-0.3	0.0	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**3.3**	**5.8**	**9.0**	**11.6**	**14.3**	**13.5**	**14.5**	**15.6**	**17.0**	**20.5**	**20.8**				
RES-H&C share	1.2	4.9	7.8	10.3	12.7	12.8	15.8	18.0	20.8	23.1	24.1				
RES-E share	11.9	13.5	17.8	21.7	25.4	21.3	18.5	18.5	18.4	27.7	26.7				
RES-T share (based on ILUC formula)	1.7	1.5	5.3	6.6	10.1	10.2	10.3	10.7	10.9	12.8	13.3				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	62	60	70	80	82	74	82	79	71	80	80	1.2	1.5	0.1	-0.2
Average Price of Electricity in Final demand sectors (€'13/MWh	94	102	143	128	132	138	141	141	141	141	142	4.3	-0.8	0.6	0.1
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**7.1**	**8.5**	**11.5**	**11.2**	**13.6**	**15.4**	**16.9**	**17.9**	**18.7**	**19.0**	**19.3**	4.9	1.7	2.2	0.7
as % of GDP	**16.4**	**15.6**	**16.6**	**14.7**	**15.3**	**15.1**	**14.4**	**14.0**	**13.9**	**13.7**	**13.5**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Slovenia: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	0.3	0.2	0.0	0.0
GDP (in 000 M€13)	**28**	**34**	**37**	**38**	**41**	**45**	**48**	**51**	**55**	**58**	**62**	2.7	1.0	1.6	1.3
Gross Inland Consumption (ktoe)	**6451**	**7325**	**7226**	**6776**	**7004**	**7059**	**6918**	**6841**	**6536**	**6608**	**6676**	1.1	-0.3	-0.1	-0.2
Solids	1305	1539	1451	1268	1354	1306	1241	1062	416	43	14	1.1	-0.7	-0.9	-20.1
Oil	2419	2580	2579	2360	2279	2158	2028	1987	1970	1971	1991	0.6	-1.2	-1.2	-0.1
Natural gas	826	929	863	681	698	774	873	1008	1203	1008	987	0.4	-2.1	2.3	0.6
Nuclear	1228	1518	1459	1322	1373	1429	1429	1429	1429	2010	2010	1.7	-0.6	0.4	1.7
Electricity	-114	-28	-180	-36	-83	-49	-156	-222	-297	-243	-217	4.7	-7.4	6.5	1.7
Renewable energy forms	788	787	1054	1182	1384	1441	1504	1577	1814	1819	1892	3.0	2.8	0.8	1.2
Energy Branch Consumption	**107**	**100**	**112**	**99**	**105**	**96**	**102**	**100**	**93**	**90**	**88**	0.5	-0.6	-0.3	-0.7
Non-Energy Uses	**238**	**310**	**209**	**114**	**120**	**122**	**126**	**131**	**138**	**142**	**152**	-1.3	-5.4	0.5	0.9
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**3085**	**3492**	**3687**	**3441**	**3753**	**3797**	**3879**	**3861**	**3449**	**3672**	**3706**	1.8	0.2	0.3	-0.2
Solids	1062	1184	1196	1023	1127	1059	1082	1002	387	33	7	1.2	-0.6	-0.4	-22.0
Oil	1	0	0	0	0	0	0	0	0	0	0	-95.0	-100.0	0.0	0.0
Natural gas	6	3	6	3	4	11	18	20	23	21	20	0.0	-3.7	15.7	0.6
Nuclear	1228	1518	1459	1322	1373	1429	1429	1429	1429	2010	2010	1.7	-0.6	0.4	1.7
Renewable energy sources	788	787	1025	1094	1249	1298	1350	1410	1609	1608	1669	2.7	2.0	0.8	1.1
Hydro	330	298	388	380	391	407	430	441	459	459	495	1.6	0.1	1.0	0.7
Biomass & Waste	458	489	601	632	712	740	739	772	940	929	929	2.7	1.7	0.4	1.2
Wind	0	0	0	0	24	26	30	32	34	34	38	0.0	0.0	2.0	1.2
Solar and others	0	0	9	36	55	72	99	111	122	130	148	0.0	19.3	6.1	2.0
Geothermal	0	0	27	45	67	53	53	53	54	56	60	0.0	9.5	-2.3	0.6
Net Imports (ktoe)	**3415**	**3855**	**3581**	**3356**	**3273**	**3283**	**3061**	**3001**	**3108**	**2957**	**2992**	0.5	-0.9	-0.7	-0.1
Solids	244	323	279	245	227	247	160	60	28	10	7	1.4	-2.1	-3.4	-14.8
Oil	2466	2634	2596	2380	2300	2179	2049	2008	1991	1992	2012	0.5	-1.2	-1.2	-0.1
Crude oil and Feedstocks	152	0	0	0	0	0	0	0	0	0	0	-100.0	0.0	0.0	0.0
Oil products	2314	2634	2596	2380	2300	2179	2049	2008	1991	1992	2012	1.2	-1.2	-1.2	-0.1
Natural gas	820	925	857	678	694	763	855	988	1181	987	968	0.4	-2.1	2.1	0.6
Electricity	-114	-28	-180	-36	-83	-49	-156	-222	-297	-243	-217	4.7	-7.4	6.5	1.7
Import Dependency (%)	52.9	52.5	49.4	49.4	46.6	46.4	44.1	43.7	47.4	44.6	44.7				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**13624**	**15117**	**16248**	**15126**	**16444**	**17141**	**18787**	**19812**	**21223**	**21198**	**21627**	1.8	0.1	1.3	0.7
Nuclear energy	4761	5884	5657	5421	5628	5801	5801	5801	5801	9377	9377	1.7	-0.1	0.3	2.4
Solids	4611	5271	5288	4858	5182	4754	4465	3726	2210	174	37	1.4	-0.2	-1.5	-21.3
Oil (including refinery gas)	55	42	8	0	0	0	0	0	0	0	0	-17.5	-100.0	0.0	0.0
Gas (including derived gases)	293	339	548	14	117	418	1704	3002	4482	3043	2822	6.5	-14.3	30.7	2.6
Biomass-waste	70	120	222	111	300	511	622	926	2137	2006	2238	12.2	3.0	7.6	6.6
Hydro (pumping excluded)	3834	3461	4512	4423	4542	4734	5001	5131	5335	5337	5751	1.6	0.1	1.0	0.7
Wind	0	0	0	5	284	301	346	376	399	400	440	0.0	0.0	2.0	1.2
Solar	0	0	13	295	391	622	849	849	859	862	962	0.0	40.8	8.1	0.6
Geothermal and other renewables	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	-100.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**2955**	**3111**	**3186**	**3490**	**3888**	**3907**	**4177**	**4397**	**4467**	**4855**	**4963**	0.8	2.0	0.7	0.9
Nuclear energy	700	700	700	700	700	700	700	700	700	1117	1117	0.0	0.0	0.0	2.4
Renewable energy	843	979	1086	1385	1773	2001	2305	2357	2422	2422	2612	2.6	5.0	2.7	0.6
Hydro (pumping excluded)	843	979	1074	1119	1220	1220	1284	1316	1366	1366	1465	2.5	1.3	0.5	0.7
Wind	0	0	0	4	200	212	242	262	277	277	280	0.0	0.0	1.9	0.7
Solar	0	0	12	262	352	569	779	779	779	779	867	0.0	40.2	8.3	0.5
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	1412	1432	1400	1405	1415	1206	1171	1340	1344	1316	1234	-0.1	0.1	-1.9	0.3
of which cogeneration units	648	336	333	228	215	238	233	223	427	421	432	-6.4	-4.3	0.8	3.1
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	923	923	792	792	792	678	632	564	250	250	250	-1.5	0.0	-2.2	-4.5
Gas fired	278	284	372	470	470	388	404	637	861	833	819	3.0	2.4	-1.5	3.6
Oil fired	176	190	185	92	29	16	16	16	14	14	0	0.5	-16.9	-5.7	-100.0
Biomass-waste fired	35	35	51	51	124	124	118	123	220	218	165	3.9	9.3	-0.5	1.7
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	49.4	51.9	54.5	46.4	45.3	47.7	49.1	49.4	52.4	48.1	48.0				
Efficiency of gross thermal power generation (%)	33.2	32.9	33.4	34.4	34.5	33.2	36.6	40.2	53.7	54.2	54.3				
% of gross electricity from CHP	6.4	7.3	6.9	8.9	8.6	6.3	5.6	5.7	14.1	14.0	13.5				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	63.6	62.6	64.0	67.8	67.8	69.8	67.2	66.0	68.5	84.8	86.8				
Fuel Inputs to Thermal Power Generation (GWh_e)	**1302**	**1508**	**1562**	**1247**	**1395**	**1474**	**1596**	**1638**	**1415**	**829**	**808**	1.8	-1.1	1.4	-3.3
Solids	1215	1412	1381	1217	1301	1258	1209	1040	402	33	7	1.3	-0.6	-0.7	-22.7
Oil (including refinery gas)	13	9	3	0	0	0	0	0	0	0	0	-13.3	-100.0	0.0	0.0
Gas (including derived gases)	59	58	113	3	21	93	256	430	641	441	409	6.7	-15.6	28.6	2.4
Biomass & Waste	15	30	65	27	73	123	131	168	372	355	392	15.5	1.2	6.0	5.6
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**1479**	**1607**	**1562**	**1481**	**1581**	**1632**	**1632**	**1638**	**1647**	**2233**	**2236**	0.6	0.1	0.3	1.6
Refineries	171	0	0	0	0	0	0	0	0	0	0	-100.0	0.0	0.0	0.0
Biofuels and hydrogen production	0	0	46	98	145	144	148	156	165	171	179	0.0	12.3	0.2	1.0
District heating	80	89	57	61	63	58	54	52	52	50	46	-3.2	0.9	-1.5	-0.8
Derived gases, cokeries etc.	1228	1518	1459	1322	1373	1430	1430	1430	1431	2011	2011	1.7	-0.6	0.4	1.7

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)											Slovenia: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**25**	**27**	**30**	**31**	**34**	**35**	**37**	**38**	**40**	**41**	**43**	2.0	1.0	1.0	0.7
Public road transport	4	3	3	3	3	3	3	3	3	4	4	-1.0	0.2	0.4	0.2
Private cars and motorcycles	20	23	26	27	29	30	31	32	33	34	36	2.4	1.0	0.9	0.6
Rail	1	1	1	1	1	1	2	2	2	2	2	1.4	4.0	3.4	1.9
Aviation [3]	0	0	0	0	0	1	1	1	1	1	1	2.0	3.3	3.0	1.9
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Freight transport activity (Gtkm)	**6**	**11**	**11**	**12**	**15**	**18**	**20**	**22**	**24**	**25**	**27**	5.6	3.3	2.8	1.4
Heavy goods and light commercial vehicles	4	8	8	8	10	12	13	14	15	16	16	7.9	3.1	2.2	1.2
Rail	3	3	3	4	5	6	7	8	9	10	10	1.8	3.6	3.9	1.8
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Energy demand in transport (ktoe) [4]	**1249**	**1492**	**1806**	**1838**	**1908**	**1883**	**1844**	**1850**	**1869**	**1895**	**1933**	3.8	0.6	-0.3	0.2
Public road transport	78	71	92	94	96	96	94	93	92	91	91	1.8	0.4	-0.2	-0.2
Private cars and motorcycles	1025	1047	1304	1319	1301	1218	1145	1119	1108	1109	1121	2.4	0.0	-1.3	-0.1
Heavy goods and light commercial vehicles	98	323	355	370	444	494	522	550	577	599	621	13.8	2.3	1.6	0.9
Rail	24	28	26	27	33	38	42	45	46	48	49	1.0	2.2	2.5	0.8
Aviation	25	23	28	28	34	38	41	44	46	48	51	1.3	2.1	1.8	1.1
Inland navigation	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
By transport activity															
Passenger transport	1132	1146	1430	1447	1438	1360	1289	1265	1256	1259	1273	2.4	0.1	-1.1	-0.1
Freight transport	117	346	376	391	470	523	555	585	614	636	660	12.4	2.3	1.7	0.9
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.3	0.9	1.7	2.1	2.4	2.8	3.1				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.0	2.5	5.4	7.7	7.8	8.3	8.6	8.9	9.1	9.2				
ENERGY EFFICIENCY															
Primary energy consumption	**6214**	**7016**	**7017**	**6662**	**6885**	**6937**	**6793**	**6710**	**6398**	**6465**	**6525**	1.2	-0.2	-0.1	-0.2
Final Energy Demand	**4457**	**4897**	**4927**	**4954**	**5050**	**5004**	**4830**	**4783**	**4809**	**4880**	**4951**	1.0	0.2	-0.4	0.1
by sector															
Industry	1424	1644	1273	1332	1421	1442	1346	1291	1280	1301	1321	-1.1	1.1	-0.5	-0.1
Energy intensive industries	836	1028	788	890	951	954	853	803	773	770	763	-0.6	1.9	-1.1	-0.6
Other industrial sectors	588	616	485	442	470	488	493	487	508	530	558	-1.9	-0.3	0.5	0.6
Residential	1077	1140	1191	1145	1094	1067	1048	1054	1070	1091	1103	1.0	-0.8	-0.4	0.3
Tertiary	697	620	657	638	625	611	591	588	588	592	593	-0.6	-0.5	-0.6	0.0
Transport[5]	1259	1493	1806	1839	1909	1884	1845	1852	1871	1897	1934	3.7	0.6	-0.3	0.2
by fuel															
Solids	90	80	47	51	53	48	32	21	14	9	7	-6.3	1.3	-4.9	-7.4
Oil	2264	2409	2447	2239	2159	2037	1904	1858	1833	1830	1840	0.8	-1.2	-1.3	-0.2
Gas	569	665	620	635	651	642	580	544	528	538	553	0.9	0.5	-1.2	-0.2
Electricity	905	1096	1029	1098	1158	1264	1296	1322	1373	1424	1482	1.3	1.2	1.1	0.7
Heat (from CHP and District Heating)	195	196	192	197	206	211	211	211	219	217	214	-0.2	0.7	0.2	0.1
Renewable energy forms	435	452	592	735	822	801	805	823	834	853	844	3.1	3.3	-0.2	0.2
Other	0	0	0	0	0	1	2	4	7	8	11	0.0	0.0	21.1	8.2
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	227	215	195	181	171	158	144	133	119	113	107	-1.5	-1.3	-1.7	-1.5
Industry (Energy on Value added, index 2000=100)	100	93	70	74	72	66	57	51	47	45	42	-3.6	0.3	-2.3	-1.5
Residential (Energy on Private Income, index 2000=100)	100	93	85	87	76	67	61	56	53	50	47	-1.6	-1.1	-2.3	-1.3
Tertiary (Energy on Value added, index 2000=100)	100	74	70	66	59	52	47	44	41	39	37	-3.5	-1.7	-2.2	-1.3
Passenger transport (toe/Mpkm) [6]	45	42	46	46	42	37	34	32	31	30	29	0.3	-1.0	-2.1	-0.8
Freight transport (toe/Mtkm)	18	32	34	33	31	29	28	27	26	25	25	6.4	-1.0	-1.1	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**19.0**	**20.2**	**19.2**	**17.5**	**17.4**	**16.9**	**16.3**	**15.6**	**13.2**	**11.1**	**11.0**	0.1	-1.0	-0.7	-2.0
of which ETS sectors (2013 scope) GHG emissions		8.9	8.2	7.2	7.6	7.5	7.3	6.8	4.5	2.4	2.2		-0.8	-0.3	-5.8
of which ESD sectors (2013 scope) GHG emissions		11.3	11.0	10.2	9.8	9.4	8.9	8.8	8.7	8.7	8.8		-1.1	-0.9	-0.1
CO_2 Emissions (energy related)	**14.1**	**15.5**	**15.3**	**13.8**	**13.9**	**13.5**	**13.1**	**12.5**	**10.2**	**8.1**	**8.0**	0.9	-0.9	-0.6	-2.4
Power generation/District heating	5.5	6.3	6.2	5.3	5.6	5.6	5.8	5.4	3.2	1.2	1.0	1.3	-1.0	0.3	-8.4
Energy Branch	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-14.9	-4.8	15.6	0.7
Industry	2.4	2.3	1.7	1.7	1.7	1.5	1.2	1.0	0.9	0.9	0.9	-3.0	-0.3	-3.2	-1.5
Residential	1.3	1.5	1.2	0.9	0.8	0.7	0.7	0.7	0.7	0.7	0.7	-1.0	-4.0	-1.6	-0.2
Tertiary	1.2	1.0	0.9	0.7	0.6	0.5	0.4	0.4	0.4	0.4	0.3	-3.0	-4.1	-2.5	-1.2
Transport	3.7	4.4	5.3	5.2	5.3	5.1	4.9	4.9	4.9	5.0	5.0	3.8	0.0	-0.6	0.1
CO_2 Emissions (non energy and non land use related)	**1.0**	**1.2**	**0.8**	**0.7**	**0.7**	**0.8**	**0.7**	**0.6**	**0.6**	**0.6**	**0.6**	-1.7	-1.1	-0.2	-1.2
Non-CO2 GHG emissions	**3.9**	**3.5**	**3.0**	**3.0**	**2.7**	**2.6**	**2.5**	**2.5**	**2.4**	**2.4**	**2.4**	-2.6	-1.0	-1.0	-0.1
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**102.0**	**108.4**	**103.1**	**93.8**	**93.5**	**90.7**	**87.5**	**83.8**	**71.0**	**59.9**	**59.0**	0.1	-1.0	-0.7	-2.0
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.34	0.35	0.33	0.30	0.29	0.28	0.27	0.24	0.13	0.05	0.04	-0.3	-1.2	-0.9	-8.9
Final energy demand (t of CO_2/toe)	1.91	1.88	1.85	1.72	1.65	1.58	1.51	1.47	1.43	1.41	1.40	-0.4	-1.1	-0.9	-0.4
Industry	1.66	1.41	1.37	1.29	1.19	1.07	0.91	0.80	0.71	0.69	0.69	-1.9	-1.4	-2.7	-1.4
Residential	1.24	1.28	1.01	0.79	0.73	0.67	0.65	0.64	0.62	0.61	0.60	-2.0	-3.2	-1.1	-0.4
Tertiary	1.68	1.63	1.32	1.03	0.91	0.85	0.75	0.71	0.67	0.63	0.58	-2.4	-3.6	-2.0	-1.2
Transport	2.90	2.97	2.93	2.85	2.76	2.73	2.68	2.66	2.63	2.61	2.60	0.1	-0.6	-0.3	-0.2
RES in Gross Final Energy Consumption [7] (in%)	**16.6**	**15.9**	**19.1**	**21.9**	**25.0**	**25.9**	**28.3**	**29.9**	**33.5**	**33.4**	**34.3**				
RES-H&C share	18.9	19.0	25.5	29.8	33.9	34.5	38.3	40.9	45.1	46.3	46.6				
RES-E share	30.9	28.7	32.2	33.0	35.8	37.4	40.3	42.4	49.3	47.0	49.4				
RES-T share (based on ILUC formula)	1.0	0.8	3.2	6.1	10.1	11.7	14.7	16.6	18.9	20.1	21.6				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€13/MWh)	49	47	45	67	70	58	64	67	70	80	80	-0.7	4.5	-0.9	1.1
Average Price of Electricity in Final demand sectors (€13/MWh	109	86	111	106	108	110	114	117	117	116	116	0.2	-0.3	0.5	0.1
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**3.8**	**4.7**	**6.1**	**6.4**	**7.5**	**8.1**	**8.4**	**8.7**	**9.1**	**9.5**	**9.8**	5.0	2.0	1.2	0.8
as % of GDP	**13.3**	**13.8**	**16.5**	**17.1**	**18.4**	**18.1**	**17.6**	**16.9**	**16.6**	**16.2**	**15.8**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												Spain: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**40**	**43**	**46**	**46**	**46**	**45**	**44**	**44**	**45**	**45**	**46**	1.5	-0.2	-0.3	0.1
GDP (in 000 M€13)	**893**	**1048**	**1093**	**1094**	**1207**	**1327**	**1447**	**1569**	**1675**	**1746**	**1854**	2.0	1.0	1.8	1.2
Gross Inland Consumption (ktoe)	**123642**	**144223**	**129868**	**124583**	**124858**	**119269**	**114780**	**112335**	**107761**	**103885**	**104283**	0.5	-0.4	-0.8	-0.5
Solids	20938	20566	7906	15768	15413	10287	5279	1746	1342	627	646	-9.3	6.9	-10.2	-10.0
Oil	63967	70457	60436	53990	50171	49719	49067	49020	49447	49084	49201	-0.6	-1.8	-0.2	0.0
Natural gas	15305	29886	31162	25155	25460	23862	21874	23035	23257	23375	20272	7.4	-2.0	-1.5	-0.4
Nuclear	16046	14842	15991	14173	14173	14173	14173	14173	6140	0	0	0.0	-1.2	0.0	-100.0
Electricity	382	-116	-717	-114	380	546	402	-352	-383	-376	-376	0.0	0.0	0.6	0.0
Renewable energy forms	7005	8587	15090	15611	19262	20682	23987	24714	27958	31175	34540	8.0	2.5	2.2	1.8
Energy Branch Consumption	**6259**	**6666**	**7878**	**7994**	**7433**	**6763**	**6377**	**6220**	**6029**	**5835**	**5800**	2.3	-0.6	-1.5	-0.5
Non-Energy Uses	**9407**	**8362**	**7046**	**5744**	**6094**	**6269**	**6430**	**6651**	**6929**	**7018**	**7171**	-2.8	-1.4	0.5	0.5
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**31478**	**30047**	**34166**	**33101**	**36539**	**36151**	**38864**	**39420**	**34732**	**31840**	**35165**	0.8	0.7	0.6	-0.5
Solids	7966	6265	3296	2973	2828	1068	459	175	167	66	66	-8.4	-1.5	-16.6	-9.2
Oil	228	167	124	377	365	347	365	383	396	386	379	-5.9	11.5	0.0	0.2
Natural gas	234	185	78	42	47	54	59	56	51	50	48	-10.4	-4.9	2.3	-1.0
Nuclear	16046	14842	15991	14173	14173	14173	14173	14173	6140	0	0	0.0	-1.2	0.0	-100.0
Renewable energy sources	7005	8587	14677	15536	19126	20510	23809	24633	27977	31339	34671	7.7	2.7	2.2	1.9
Hydro	2430	1582	3638	2853	2862	2876	2881	2884	2882	2973	2995	4.1	-2.4	0.1	0.2
Biomass & Waste	4131	5113	6183	6934	9492	9369	9745	9005	9717	10317	10471	4.1	4.4	0.3	0.4
Wind	406	1821	3807	4443	4844	5045	6196	6334	7405	9503	10978	25.1	2.4	2.5	2.9
Solar and others	33	65	1035	1288	1904	3169	4922	6342	7886	8441	10107	41.3	6.3	10.0	3.7
Geothermal	5	7	16	18	25	50	66	69	88	104	120	11.5	4.5	10.2	3.1
Net Imports (ktoe)	**99342**	**123832**	**106084**	**100729**	**97965**	**93065**	**86149**	**83270**	**83474**	**82599**	**79863**	0.7	-0.8	-1.3	-0.4
Solids	12840	14418	6726	12795	12584	9219	4820	1571	1175	561	579	-6.3	6.5	-9.2	-10.1
Oil	70653	79281	68704	62860	59367	59153	58707	58618	59004	58773	59033	-0.3	-1.5	-0.1	0.0
Crude oil and Feedstocks	59023	60650	56496	66666	63310	62451	61492	60876	60717	60020	59643	-0.4	1.1	-0.3	-0.2
Oil products	11631	18630	12208	-3806	-3943	-3299	-2785	-2258	-1713	-1248	-610	0.5	0.0	-3.4	-7.3
Natural gas	15467	30248	30950	25113	25498	23975	22042	23353	23697	23805	20758	7.2	-1.9	-1.4	-0.3
Electricity	382	-116	-717	-114	380	546	402	-352	-383	-376	-376	0.0	0.0	0.6	0.0
Import Dependency (%)	76.6	81.4	76.8	75.3	72.8	72.0	68.9	67.9	70.6	72.2	69.4				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**220921**	**289445**	**298320**	**275295**	**282996**	**280362**	**287052**	**301423**	**307314**	**315379**	**328449**	3.0	-0.5	0.1	0.7
Nuclear energy	62206	57539	61990	58066	58066	57757	57521	57521	24921	0	0	0.0	-0.7	-0.1	-100.0
Solids	79094	84047	25493	57621	56432	34503	15179	4266	3207	246	540	-10.7	8.3	-12.3	-15.4
Oil (including refinery gas)	22578	24420	16562	4988	561	1707	1611	1519	3184	3271	1484	-3.1	-28.7	11.1	-0.4
Gas (including derived gases)	21942	80725	95840	53218	56357	56730	49876	55019	61980	64189	44263	15.9	-5.2	-1.2	-0.6
Biomass-waste	2100	3104	4674	4514	5972	7917	8960	10126	11538	14012	12517	8.3	2.5	4.1	1.7
Hydro (pumping excluded)	28256	18393	42304	33177	33275	33444	33500	33531	33515	34567	34829	4.1	-2.4	0.1	0.2
Wind	4727	21176	44271	51665	56322	58668	72043	73653	86104	110504	127648	25.1	2.4	2.5	2.9
Solar	17	41	6423	12046	16011	29636	48361	65788	82865	88589	107167	80.6	9.6	11.7	4.1
Geothermal and other renewables	1	0	763	0	0	0	0	0	0	0	0	105.9	-100.0	0.0	7.2
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**52405**	**73568**	**99270**	**104515**	**104567**	**108361**	**115578**	**108757**	**109066**	**117562**	**131172**	6.6	0.5	1.0	0.6
Nuclear energy	7869	7869	7845	7399	7399	7399	7399	7399	3181	0	0	0.0	-0.6	0.0	-100.0
Renewable energy	17760	25774	41432	46783	51047	58528	71246	78708	89465	99798	113658	8.8	2.1	3.4	2.4
Hydro (pumping excluded)	15542	15796	16086	16632	16795	16795	16795	16795	16795	17158	17158	0.3	0.4	0.0	0.1
Wind	2206	9918	20693	23025	24977	25706	29888	29923	33408	41405	47142	25.1	1.9	1.8	2.3
Solar	12	60	4653	7126	9275	16027	24564	31991	39262	41235	49359	81.5	7.1	10.2	3.6
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	26776	39924	49994	50333	46121	42434	36933	22650	16420	17764	17514	6.4	-0.8	-2.2	-3.7
of which cogeneration units	4570	6597	3382	6195	3015	3816	2791	4577	5472	5684	3279	-3.0	-1.1	-0.8	0.8
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	11556	11359	10389	10316	9333	7378	3968	3033	789	55	97	-1.1	-1.1	-8.2	-17.0
Gas fired	4713	17647	29569	31333	30273	29760	28091	15564	12386	14546	14482	20.2	0.2	-0.7	-3.3
Oil fired	10028	10043	8964	7496	4752	3423	2952	2147	1374	929	782	-1.1	-6.1	-4.7	-6.4
Biomass-waste fired	478	876	1072	1188	1762	1873	1923	1906	1870	2234	2153	8.4	5.1	0.9	0.6
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	45.9	43.1	33.1	28.9	29.7	28.7	27.7	31.0	31.7	30.3	28.4				
Efficiency of gross thermal power generation (%)	40.8	46.7	48.9	42.5	42.7	43.2	44.2	48.0	51.4	54.8	53.3				
% of gross electricity from CHP	9.2	4.0	7.4	9.8	5.1	5.2	5.9	9.5	10.3	10.2	7.6				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	44.0	34.6	53.8	57.9	59.9	66.9	76.8	79.8	77.8	78.5	85.9				
Fuel Inputs to Thermal Power Generation (GWh_e)	**26472**	**35403**	**25226**	**24328**	**24036**	**20090**	**14709**	**12704**	**13367**	**12814**	**9497**	-0.5	-0.5	-4.8	-2.2
Solids	18245	17623	5561	13703	13343	8225	3641	878	655	55	115	-11.2	9.1	-12.2	-15.9
Oil (including refinery gas)	4455	5249	3391	948	132	404	382	360	664	630	359	-2.7	-27.7	11.2	-0.3
Gas (including derived gases)	3075	11140	14839	8684	9260	9540	8391	9227	9443	9394	6463	17.0	-4.6	-1.0	-1.3
Biomass & Waste	697	1391	1435	994	1300	1922	2295	2238	2606	2735	2560	7.5	-1.0	5.8	0.5
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**79871**	**79435**	**78129**	**80766**	**79251**	**78489**	**77153**	**76454**	**68136**	**61306**	**61185**	-0.2	0.1	-0.3	-1.2
Refineries	60685	61323	58480	63161	61170	60666	59736	59354	59227	58539	58338	-0.4	0.5	-0.2	-0.1
Biofuels and hydrogen production	70	256	1412	1419	2065	2024	2009	2095	2108	2225	2358	35.0	3.9	-0.3	0.8
District heating	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Derived gases, cokeries etc.	19115	17857	18237	16187	16016	15799	15408	15005	6801	542	488	-0.5	-1.3	-0.4	-15.9

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)												Spain: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**476**	**535**	**542**	**561**	**608**	**661**	**712**	**766**	**812**	**843**	**888**	1.3	1.2	1.6	1.1
Public road transport	50	53	51	52	53	55	56	59	62	64	66	0.1	0.5	0.5	0.8
Private cars and motorcycles	310	346	352	354	372	398	426	453	474	489	514	1.3	0.5	1.4	0.9
Rail	25	28	29	29	36	42	48	54	60	65	70	1.2	2.4	2.8	2.0
Aviation [3]	89	106	109	124	145	164	180	198	213	223	236	2.1	2.9	2.2	1.4
Inland navigation	2	2	2	2	2	2	2	2	2	2	2	0.8	1.2	0.9	0.5
Freight transport activity (Gtkm)	**180**	**265**	**227**	**228**	**247**	**265**	**282**	**298**	**313**	**322**	**335**	2.3	0.9	1.3	0.9
Heavy goods and light commercial vehicles	138	217	190	191	206	220	234	247	261	269	279	3.2	0.8	1.3	0.9
Rail	12	12	9	10	12	13	15	15	16	17	17	-2.3	2.3	2.3	0.8
Inland navigation	31	36	28	28	30	32	33	35	36	37	38	-1.1	0.6	1.2	0.7
Energy demand in transport (ktoe) [4]	**33084**	**39797**	**37180**	**35033**	**34516**	**34656**	**35161**	**36154**	**37007**	**37341**	**38305**	1.2	-0.7	0.2	0.4
Public road transport	1354	1408	1319	1329	1329	1318	1312	1343	1377	1404	1433	-0.3	0.1	-0.1	0.4
Private cars and motorcycles	18655	20608	19876	18098	16553	16037	16221	16693	17094	17276	17801	0.6	-1.8	-0.2	0.5
Heavy goods and light commercial vehicles	6486	9874	8641	8122	8386	8472	8769	9070	9326	9478	9753	2.9	-0.3	0.4	0.5
Rail	708	1029	899	772	872	959	1024	1066	1094	1103	1121	2.4	-0.3	1.6	0.5
Aviation	4486	5323	5389	6005	6620	7070	6995	7112	7222	7174	7273	1.9	2.1	0.6	0.2
Inland navigation	1395	1555	1057	707	756	800	838	871	894	905	923	-2.7	-3.3	1.0	0.5
By transport activity															
Passenger transport	25151	27727	26960	25730	24853	24818	24952	25608	26191	26374	27057	0.7	-0.8	0.0	0.4
Freight transport	7933	12069	10220	9303	9663	9838	10208	10546	10817	10967	11248	2.6	-0.6	0.6	0.5
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.1	0.3	0.5	0.8	1.0	1.2	1.5				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.2	0.6	3.8	4.1	6.1	6.0	5.9	5.9	5.7	5.8	5.9				
ENERGY EFFICIENCY															
Primary energy consumption	**114235**	**135861**	**122822**	**118838**	**118764**	**113000**	**108350**	**105684**	**100832**	**96867**	**97112**	0.7	-0.3	-0.9	-0.5
Final Energy Demand	**79885**	**97754**	**89072**	**85314**	**86213**	**83790**	**83134**	**82498**	**83435**	**84300**	**85940**	1.1	-0.3	-0.4	0.2
by sector															
Industry	25368	30967	21435	21275	22290	21498	20866	19418	19350	19443	19645	-1.7	0.4	-0.7	-0.3
Energy intensive industries	17349	20338	13379	13268	14041	13307	12667	11397	11162	11038	10949	-2.6	0.5	-1.0	-0.7
Other industrial sectors	8020	10628	8056	8007	8249	8191	8199	8021	8188	8405	8697	0.0	0.2	-0.1	0.3
Residential	12000	15132	16920	15550	15483	14750	14313	14149	14291	14573	14668	3.5	-0.9	-0.8	0.1
Tertiary	9287	11712	13526	13441	13908	12870	12776	12758	12767	12923	13301	3.8	0.3	-0.8	0.2
Transport[5]	33230	39944	37192	35048	34532	34673	35179	36173	37027	37361	38325	1.1	-0.7	0.2	0.4
by fuel															
Solids	1775	1712	1261	1123	1307	1378	1073	435	310	236	215	-3.4	0.4	-2.0	-7.7
Oil	46297	53449	46775	43129	40362	39848	39282	39200	39181	38843	39145	0.1	-1.5	-0.3	0.0
Gas	12141	17978	14645	14743	14371	12565	11685	11903	11852	12011	11888	1.9	-0.2	-2.0	0.1
Electricity	16205	20827	21049	20057	21205	21435	22072	22635	23240	24014	25017	2.7	0.1	0.4	0.6
Heat (from CHP and District Heating)	0	0	0	8	118	301	586	733	877	758	728	0.0	0.0	17.3	1.1
Renewable energy forms	3469	3788	5343	6252	8840	8245	8406	7544	7875	8284	8723	4.4	5.2	-0.5	0.2
Other	0	0	0	3	10	18	30	49	101	155	225	0.0	#####	11.4	10.6
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	139	138	119	114	103	90	79	72	64	59	56	-1.5	-1.4	-2.6	-1.7
Industry (Energy on Value added, index 2000=100)	100	114	87	87	83	75	67	58	55	53	50	-1.4	-0.4	-2.1	-1.5
Residential (Energy on Private Income, index 2000=100)	100	106	115	103	93	81	72	65	62	60	57	1.4	-2.1	-2.6	-1.2
Tertiary (Energy on Value added, index 2000=100)	100	108	110	107	100	84	76	69	65	63	61	1.0	-1.0	-2.7	-1.1
Passenger transport (toe/Mpkm) [6]	47	46	42	38	34	31	29	27	26	25	25	-1.1	-2.2	-1.7	-0.7
Freight transport (toe/Mtkm)	44	46	45	41	39	37	36	35	35	34	34	0.3	-1.4	-0.8	-0.4
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**398.8**	**447.7**	**364.3**	**356.5**	**340.7**	**310.5**	**276.0**	**262.4**	**261.3**	**257.2**	**249.4**	-0.9	-0.7	-2.1	-0.5
of which ETS sectors (2013 scope) GHG emissions		216.2	146.4	157.9	156.3	133.8	104.4	90.5	88.3	83.9	75.2		0.7	-4.0	-1.6
of which ESD sectors (2013 scope) GHG emissions		231.5	218.0	198.6	184.3	176.7	171.7	171.9	173.0	173.3	174.3		-1.7	-0.7	0.1
CO_2 Emissions (energy related)	**291.6**	**347.3**	**272.6**	**271.0**	**257.9**	**231.1**	**202.8**	**189.5**	**188.0**	**183.7**	**176.5**	-0.7	-0.6	-2.4	-0.7
Power generation/District heating	98.8	117.7	70.3	81.2	78.3	59.0	37.0	27.0	27.0	24.2	16.9	-3.4	1.1	-7.2	-3.8
Energy Branch	13.4	13.5	16.2	16.1	14.3	13.0	12.3	11.9	11.6	11.4	11.1	1.9	-1.2	-1.5	-0.5
Industry	50.4	59.2	42.3	39.8	40.0	36.3	31.4	26.7	24.2	23.3	22.5	-1.7	-0.6	-2.4	-1.6
Residential	17.1	20.9	20.5	16.5	13.6	12.8	12.1	12.1	11.9	11.8	11.3	1.9	-4.1	-1.1	-0.4
Tertiary	13.2	16.5	15.0	15.5	13.9	12.0	10.8	10.3	9.7	9.2	8.9	1.3	-0.7	-2.5	-1.0
Transport	98.7	119.5	108.3	101.9	97.8	98.0	99.2	101.5	103.6	103.8	105.8	0.9	-1.0	0.1	0.3
CO_2 Emissions (non energy and non land use related)	**26.2**	**29.5**	**21.8**	**17.7**	**18.8**	**18.9**	**16.1**	**16.0**	**15.9**	**15.6**	**14.5**	-1.8	-1.5	-1.5	-0.5
Non-CO2 GHG emissions	**81.1**	**71.0**	**69.9**	**67.7**	**64.0**	**60.5**	**57.1**	**57.0**	**57.4**	**57.8**	**58.4**	-1.5	-0.9	-1.1	0.1
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**134.6**	**151.1**	**123.0**	**120.3**	**115.0**	**104.8**	**93.2**	**88.6**	**88.2**	**86.8**	**84.2**	-0.9	-0.7	-2.1	-0.5
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.45	0.41	0.24	0.29	0.28	0.21	0.13	0.09	0.08	0.07	0.05	-6.2	1.6	-7.6	-4.5
Final energy demand (t of CO_2/toe)	2.25	2.21	2.09	2.04	1.92	1.90	1.85	1.82	1.79	1.76	1.73	-0.7	-0.9	-0.4	-0.3
Industry	1.99	1.91	1.97	1.87	1.79	1.69	1.50	1.37	1.25	1.20	1.15	-0.1	-1.0	-1.7	-1.3
Residential	1.42	1.38	1.21	1.06	0.88	0.87	0.85	0.85	0.83	0.81	0.77	-1.6	-3.2	-0.3	-0.5
Tertiary	1.43	1.41	1.11	1.15	1.00	0.93	0.85	0.80	0.76	0.72	0.67	-2.5	-1.0	-1.6	-1.2
Transport	2.97	2.99	2.91	2.91	2.83	2.83	2.82	2.81	2.80	2.78	2.76	-0.2	-0.3	0.0	-0.1
RES in Gross Final Energy Consumption [7] (in%)	**8.1**	**8.4**	**13.8**	**15.4**	**20.9**	**23.0**	**27.0**	**28.4**	**31.8**	**35.4**	**38.6**				
RES-H&C share	11.0	9.4	12.6	16.1	22.2	22.7	25.4	24.3	26.4	28.0	29.8				
RES-E share	16.6	19.1	29.8	36.9	38.7	45.2	55.8	61.6	70.7	79.8	87.7				
RES-T share (based on ILUC formula)	0.6	1.3	5.1	0.8	10.1	11.1	12.2	13.8	15.4	17.7	20.1				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	58	62	75	90	98	94	86	82	78	76	72	2.5	2.7	-1.4	-0.8
Average Price of Electricity in Final demand sectors (€'13/MWh	105	101	149	173	173	169	168	168	167	165	163	3.5	1.5	-0.3	-0.2
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**74.3**	**101.3**	**120.1**	**122.7**	**144.6**	**153.1**	**163.5**	**172.1**	**180.3**	**185.6**	**192.6**	4.9	1.9	1.2	0.8
as % of GDP	**8.3**	**9.7**	**11.0**	**11.2**	**12.0**	**11.5**	**11.3**	**11.0**	**10.8**	**10.6**	**10.4**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)											Sweden: Reference scenario				
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**9**	**9**	**9**	**10**	**10**	**11**	**11**	**11**	**12**	**12**	**12**	0.5	0.9	0.8	0.6
GDP (in 000 M€13)	**296**	**337**	**366**	**404**	**448**	**497**	**552**	**614**	**684**	**761**	**841**	2.2	2.1	2.1	2.1
Gross Inland Consumption (ktoe)	**48898**	**50993**	**50783**	**47002**	**45519**	**45686**	**45689**	**45980**	**48113**	**47374**	**48201**	0.4	-1.1	0.0	0.3
Solids	2452	2629	2492	2263	2012	1738	1352	928	692	569	484	0.2	-2.1	-3.9	-5.0
Oil	15377	14136	14199	11663	10825	10333	9918	9901	9909	9922	10021	-0.8	-2.7	-0.9	0.1
Natural gas	816	886	1484	679	1955	2431	2390	3171	2107	2552	2518	6.2	2.8	2.0	0.3
Nuclear	14785	18670	14917	14362	12192	12192	12192	12192	16058	13952	13952	0.1	-2.0	0.0	0.7
Electricity	402	-636	179	-1111	-542	-777	-1036	-1321	-1702	-1789	-1768	-7.8	0.0	6.7	2.7
Renewable energy forms	15066	15308	17512	19146	19077	19769	20872	21109	21049	22169	22993	1.5	0.9	0.9	0.5
Energy Branch Consumption	**1141**	**1326**	**1469**	**1414**	**1326**	**1298**	**1315**	**1338**	**1423**	**1456**	**1462**	2.6	-1.0	-0.1	0.5
Non-Energy Uses	**3143**	**2460**	**2113**	**2183**	**2281**	**2375**	**2444**	**2552**	**2632**	**2588**	**2655**	-3.9	0.8	0.7	0.4
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**30052**	**34233**	**32685**	**33372**	**30973**	**31592**	**32571**	**32794**	**36569**	**35571**	**36375**	0.8	-0.5	0.5	0.6
Solids	162	211	238	210	95	95	0	0	0	0	0	4.0	-8.8	-100.0	0.0
Oil	0	0	0	0	0	0	0	0	0	0	0	7.8	-100.0	0.0	0.0
Natural gas	40	44	18	0	0	0	0	0	0	0	0	-7.6	-100.0	0.0	0.0
Nuclear	14785	18670	14917	14362	12192	12192	12192	12192	16058	13952	13952	0.1	-2.0	0.0	0.7
Renewable energy sources	15066	15308	17512	18801	18686	19305	20379	20602	20512	21619	22423	1.5	0.7	0.9	0.5
Hydro	6757	6260	5709	6203	6053	6006	6003	6131	6130	6319	6509	-1.7	0.6	-0.1	0.4
Biomass & Waste	8264	8961	11490	11434	11353	11566	12341	12404	12226	12860	13101	3.4	-0.1	0.8	0.3
Wind	39	81	301	1147	1249	1678	1924	1929	1962	2231	2579	22.6	15.3	4.4	1.5
Solar and others	5	6	11	17	30	53	105	129	180	193	217	7.4	10.6	13.3	3.7
Geothermal	0	0	0	0	0	1	5	9	13	16	17	0.0	0.0	30.3	5.8
Net Imports (ktoe)	**20436**	**19460**	**19294**	**15820**	**16865**	**16524**	**15667**	**15874**	**14403**	**14841**	**15041**	-0.6	-1.3	-0.7	-0.2
Solids	2409	2556	2548	2054	1917	1643	1352	928	692	569	484	0.6	-2.8	-3.4	-5.0
Oil	16849	16698	15102	13853	13095	12669	12340	12372	12461	12562	12780	-1.1	-1.4	-0.6	0.2
Crude oil and Feedstocks	21606	19369	19139	15905	15010	14370	13907	13680	13481	13328	13239	-1.2	-2.4	-0.8	-0.2
Oil products	-4757	-2671	-4038	-2052	-1915	-1701	-1567	-1308	-1020	-767	-460	-1.6	-7.2	-2.0	-5.9
Natural gas	776	843	1466	679	2003	2524	2517	3388	2414	2949	2974	6.6	3.2	2.3	0.8
Electricity	402	-636	179	-1111	-542	-777	-1036	-1321	-1702	-1789	-1768	-7.8	0.0	6.7	2.7
Import Dependency (%)	40.7	36.8	36.6	32.2	35.3	34.3	32.5	32.6	28.3	29.4	29.3				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**145231**	**158365**	**148460**	**160491**	**160211**	**166882**	**174735**	**182836**	**193548**	**202764**	**209728**	0.2	0.8	0.9	0.9
Nuclear energy	57316	72377	57828	57851	49379	49379	49738	49738	67776	65100	65100	0.1	-1.6	0.1	1.4
Solids	1706	1169	1770	1540	1107	731	715	133	95	103	9	0.4	-4.6	-4.3	-19.7
Oil (including refinery gas)	1533	1379	1774	249	273	191	0	118	3	0	0	1.5	-17.1	-100.0	0.0
Gas (including derived gases)	1292	1342	3782	471	7164	10964	11143	15751	8835	11628	11744	11.3	6.6	4.5	0.3
Biomass-waste	4342	8357	13397	14846	17307	16195	20890	23299	22662	26440	27121	11.9	2.6	1.9	1.3
Hydro (pumping excluded)	78584	72803	66398	72128	70379	69835	69800	71291	71282	73473	75687	-1.7	0.6	-0.1	0.4
Wind	457	936	3502	13335	14526	19511	22375	22431	22817	25942	29983	22.6	15.3	4.4	1.5
Solar	1	2	8	69	75	75	75	75	77	79	85	21.5	24.9	0.0	0.6
Geothermal and other renewables	0	0	1	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**34594**	**33587**	**36947**	**39676**	**35461**	**38425**	**39871**	**40761**	**43072**	**43566**	**46402**	0.7	-0.4	1.2	0.8
Nuclear energy	10122	9532	9532	9532	6949	6949	6949	6949	9449	9023	9023	-0.6	-3.1	0.0	1.3
Renewable energy	16718	16799	18654	22501	23236	24945	25842	26176	26142	26994	29224	1.1	2.2	1.1	0.6
Hydro (pumping excluded)	16506	16302	16624	16395	16642	16740	16742	17075	17075	17509	17909	0.1	0.0	0.1	0.3
Wind	209	493	2019	6025	6507	8118	9013	9013	8979	9397	11220	25.5	12.4	3.3	1.1
Solar	3	4	11	81	88	88	88	88	88	89	96	13.9	23.1	0.0	0.4
Other renewables (tidal etc.)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Thermal power	7754	7256	8761	7643	5275	6531	7079	7636	7480	7549	8155	1.2	-4.9	3.0	0.7
of which cogeneration units	4940	3488	5100	4504	5092	6126	5927	7008	7311	7365	7976	0.3	0.0	1.5	1.5
of which CCS units	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Solids fired	337	348	356	356	136	136	128	19	19	19	8	0.5	-9.2	-0.6	-13.0
Gas fired	547	469	1168	1168	1992	3281	3280	4430	4381	4253	4734	7.9	5.5	5.1	1.9
Oil fired	4472	3974	3963	2958	559	510	510	293	15	0	0	-1.2	-17.8	-0.9	-100.0
Biomass-waste fired	2398	2465	3274	3161	2589	2604	3161	2894	3066	3277	3412	3.2	-2.3	2.0	0.4
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	-100.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	46.7	52.5	44.9	45.1	50.3	48.4	48.7	49.9	49.8	51.5	50.0				
Efficiency of gross thermal power generation (%)	21.3	23.0	27.3	25.6	35.2	35.4	37.9	40.7	38.1	40.7	40.7				
% of gross electricity from CHP	5.9	6.7	12.5	10.7	16.1	16.3	17.2	19.4	16.0	18.1	17.9				
% of electricity from CCS	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
% of carbon free (RES, nuclear) gross electricity generation	96.9	97.5	95.1	98.6	94.7	92.9	93.2	91.2	95.4	94.2	94.4				
Fuel Inputs to Thermal Power Generation (GWh_e)	**3582**	**4575**	**6518**	**5747**	**6321**	**6815**	**7426**	**8305**	**7132**	**8069**	**8217**	6.2	-0.3	1.6	0.5
Solids	462	508	597	566	290	202	172	38	36	38	4	2.6	-7.0	-5.1	-17.1
Oil (including refinery gas)	530	317	431	70	79	61	0	34	1	0	0	-2.0	-15.6	-100.0	0.0
Gas (including derived gases)	508	591	998	225	1396	1849	1816	2520	1406	1821	1821	7.0	3.4	2.7	0.0
Biomass & Waste	2084	3158	4491	4886	4556	4703	5437	5713	5689	6209	6392	8.0	0.1	1.8	0.8
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**40980**	**42243**	**39786**	**34628**	**31777**	**31258**	**30606**	**30381**	**34081**	**32005**	**32185**	-0.3	-2.2	-0.4	0.3
Refineries	22901	20082	21039	16927	16144	15610	15207	15067	14927	14892	14925	-0.8	-2.6	-0.6	-0.1
Biofuels and hydrogen production	0	134	376	733	816	856	927	967	1010	1048	1117	0.0	8.1	1.3	0.9
District heating	1564	1525	1735	1424	1438	1503	1419	1494	1581	1708	1826	1.0	-1.9	-0.1	1.3
Derived gases, cokeries etc.	16516	20501	16636	15543	13380	13289	13053	12853	16563	14357	14316	0.1	-2.2	-0.2	0.5

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	Sweden: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**142**	**148**	**151**	**160**	**166**	**175**	**186**	**194**	**203**	**211**	**219**	0.7	0.9	1.1	0.8
Public road transport	9	9	9	9	9	10	10	11	12	12	13	-1.0	0.9	1.1	1.0
Private cars and motorcycles	102	108	109	114	116	121	126	130	134	137	140	0.7	0.7	0.8	0.5
Rail	10	11	13	15	16	18	19	20	21	22	23	2.8	2.0	1.5	0.9
Aviation [3]	14	13	15	17	18	20	23	26	29	32	35	0.3	2.2	2.4	2.2
Inland navigation	6	6	6	5	6	6	7	7	8	8	8	-0.3	0.2	1.2	0.8
Freight transport activity (Gtkm)	**70**	**78**	**81**	**81**	**90**	**98**	**104**	**111**	**117**	**123**	**128**	1.5	1.1	1.5	1.0
Heavy goods and light commercial vehicles	43	47	45	46	49	53	55	58	61	63	64	0.4	1.1	1.2	0.7
Rail	19	22	23	24	28	31	34	36	38	41	43	1.9	1.7	1.9	1.3
Inland navigation	7	9	13	11	13	14	16	17	18	19	20	5.6	0.4	1.7	1.4
Energy demand in transport (ktoe) [4]	**8192**	**8609**	**8620**	**8260**	**7908**	**7643**	**7534**	**7582**	**7730**	**7900**	**8089**	0.5	-0.9	-0.5	0.4
Public road transport	189	179	184	187	193	201	209	219	228	235	243	-0.3	0.5	0.8	0.7
Private cars and motorcycles	4879	5236	5250	4890	4399	4032	3871	3796	3793	3823	3881	0.7	-1.8	-1.3	0.0
Heavy goods and light commercial vehicles	1740	1959	1951	1921	1951	1940	1958	2009	2052	2070	2097	1.2	0.0	0.0	0.3
Rail	299	246	208	232	266	285	303	315	325	329	332	-3.6	2.5	1.3	0.4
Aviation	928	846	840	945	1002	1080	1082	1125	1209	1316	1404	-1.0	1.8	0.8	1.3
Inland navigation	156	142	188	85	98	104	111	117	123	128	132	1.8	-6.3	1.2	0.9
By transport activity															
Passenger transport	6165	6361	6387	6089	5670	5394	5246	5228	5319	5464	5619	0.4	-1.2	-0.8	0.3
Freight transport	2027	2248	2234	2171	2238	2248	2288	2355	2411	2437	2470	1.0	0.0	0.2	0.4
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.3	0.4	0.7	1.3	1.9	2.5	2.8				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	1.6	4.7	9.2	10.7	11.6	12.8	13.3	13.5	13.6	14.0				
ENERGY EFFICIENCY															
Primary energy consumption	**45755**	**48533**	**48670**	**44819**	**43238**	**43311**	**43244**	**43428**	**45481**	**44786**	**45546**	0.6	-1.2	0.0	0.3
Final Energy Demand	**33561**	**33492**	**34077**	**31885**	**31972**	**31841**	**31536**	**31465**	**31673**	**32530**	**33259**	0.2	-0.6	-0.1	0.3
by sector															
Industry	12854	12464	12205	11531	12124	12075	11766	11385	11089	11241	11298	-0.5	-0.1	-0.3	-0.2
Energy intensive industries	9198	9252	9141	8370	8760	8566	8165	7738	7267	7153	6943	-0.1	-0.4	-0.7	-0.8
Other industrial sectors	3656	3212	3064	3161	3364	3510	3601	3647	3822	4088	4355	-1.8	0.9	0.7	1.0
Residential	7300	7305	7557	7197	7042	7201	7141	7384	7647	8028	8404	0.3	-0.7	0.1	0.8
Tertiary	5214	5114	5720	4897	4898	4923	5095	5113	5207	5361	5468	0.9	-1.5	0.4	0.4
Transport[5]	8192	8609	8595	8260	7908	7643	7534	7582	7730	7900	8089	0.5	-0.8	-0.5	0.4
by fuel															
Solids	1114	1346	1202	1122	1134	984	703	483	322	233	197	0.8	-0.6	-4.7	-6.2
Oil	11861	11256	10038	8856	8015	7463	7071	6918	6886	6939	6971	-1.7	-2.2	-1.2	-0.1
Gas	673	765	728	677	783	781	713	689	683	712	735	0.8	0.7	-0.9	0.2
Electricity	11068	11238	11283	11102	11650	11995	12402	12736	13123	13723	14256	0.2	0.3	0.6	0.7
Heat (from CHP and District Heating)	3550	4174	5141	4420	4421	4567	4453	4627	4789	5043	5271	3.8	-1.5	0.1	0.8
Renewable energy forms	5294	4714	5685	5705	5966	6047	6186	5997	5838	5836	5767	0.7	0.5	0.4	-0.3
Other	0	0	0	3	3	4	10	16	32	44	63	0.0	0.0	11.5	9.9
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	165	151	139	116	102	92	83	75	70	62	57	-1.7	-3.1	-2.0	-1.8
Industry (Energy on Value added, index 2000=100)	100	76	70	62	59	54	48	43	38	35	33	-3.5	-1.7	-2.0	-2.0
Residential (Energy on Private Income, index 2000=100)	100	90	84	71	62	56	49	45	41	38	36	-1.7	-3.0	-2.2	-1.6
Tertiary (Energy on Value added, index 2000=100)	100	89	91	70	63	56	52	47	42	39	36	-0.9	-3.7	-1.8	-1.9
Passenger transport (toe/Mpkm) [6]	41	41	39	35	31	28	25	24	23	23	22	-0.5	-2.2	-2.0	-0.7
Freight transport (toe/Mtkm)	29	29	28	27	25	23	22	21	21	20	19	-0.5	-1.1	-1.2	-0.6
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**71.6**	**69.0**	**65.1**	**55.7**	**54.2**	**51.2**	**47.0**	**46.2**	**42.4**	**43.3**	**43.2**	-0.9	-1.8	-1.4	-0.4
of which ETS sectors (2013 scope) GHG emissions		25.9	25.6	19.9	21.2	20.4	17.8	17.7	14.1	14.7	14.3		-1.9	-1.7	-1.1
of which ESD sectors (2013 scope) GHG emissions		43.0	39.5	35.8	33.0	30.8	29.2	28.6	28.3	28.6	28.9		-1.8	-1.2	-0.1
CO_2 Emissions (energy related)	**52.2**	**52.1**	**49.0**	**40.6**	**39.7**	**37.4**	**33.9**	**33.5**	**29.7**	**30.4**	**30.1**	-0.6	-2.1	-1.6	-0.6
Power generation/District heating	7.7	7.7	9.1	4.4	6.0	6.7	6.1	7.2	4.3	5.1	4.8	1.7	-4.0	0.1	-1.2
Energy Branch	2.0	1.9	2.0	2.1	1.8	1.8	1.7	1.6	1.6	1.6	1.6	0.4	-1.0	-1.0	-0.3
Industry	11.9	13.3	10.5	10.1	9.7	7.8	5.8	4.4	3.5	3.0	2.8	-1.2	-0.8	-5.1	-3.6
Residential	3.0	1.5	0.4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	-17.9	-6.9	-0.9	-0.7
Tertiary	4.5	3.2	2.9	1.7	1.4	1.3	1.2	1.2	1.2	1.2	1.2	-4.2	-7.0	-1.4	-0.3
Transport	23.2	24.6	24.1	22.0	20.6	19.6	19.0	18.8	19.0	19.3	19.6	0.4	-1.6	-0.8	0.2
CO_2 Emissions (non energy and non land use related)	**3.2**	**3.2**	**3.7**	**3.4**	**3.4**	**3.3**	**3.0**	**2.8**	**2.7**	**2.6**	**2.5**	1.5	-1.0	-1.1	-0.9
Non-CO2 GHG emissions	**16.2**	**13.6**	**12.3**	**11.7**	**11.1**	**10.5**	**10.1**	**9.9**	**10.0**	**10.3**	**10.6**	-2.7	-1.1	-0.9	0.3
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**97.8**	**94.2**	**89.0**	**76.1**	**74.0**	**69.9**	**64.2**	**63.2**	**58.0**	**59.2**	**59.0**	-0.9	-1.8	-1.4	-0.4
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.04	0.04	0.04	0.02	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.6	-4.2	-0.5	-2.1
Final energy demand (t of CO_2/toe)	1.27	1.27	1.11	1.07	1.00	0.91	0.83	0.78	0.75	0.73	0.71	-1.3	-1.1	-1.8	-0.8
Industry	0.93	1.07	0.86	0.87	0.80	0.64	0.49	0.39	0.31	0.27	0.25	-0.7	-0.8	-4.8	-3.4
Residential	0.41	0.20	0.05	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	-18.2	-6.2	-1.0	-1.5
Tertiary	0.86	0.62	0.51	0.35	0.29	0.26	0.24	0.24	0.23	0.21	0.21	-5.1	-5.5	-1.8	-0.7
Transport	2.83	2.86	2.80	2.66	2.60	2.56	2.52	2.49	2.46	2.45	2.43	-0.1	-0.7	-0.3	-0.2
RES in Gross Final Energy Consumption [7] (in%)	**38.6**	**40.3**	**46.8**	**56.8**	**56.2**	**58.4**	**61.0**	**60.7**	**61.1**	**61.9**	**62.7**				
RES-H&C share	48.7	52.4	60.9	72.7	70.5	74.0	77.7	76.4	80.8	80.4	81.3				
RES-E share	51.7	51.6	56.6	67.3	65.8	66.3	68.9	69.4	66.7	68.7	69.7				
RES-T share (based on ILUC formula)	4.8	5.7	8.9	18.7	21.9	24.5	28.5	31.3	33.1	35.6	37.5				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€13/MWh)	57	51	57	63	61	54	58	58	61	68	70	-0.1	0.7	-0.5	1.0
Average Price of Electricity in Final demand sectors (€13/MWh	83	107	144	142	135	137	140	144	142	142	139	5.7	-0.6	0.3	0.0
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**31.7**	**39.3**	**46.2**	**43.5**	**48.3**	**52.4**	**56.8**	**60.7**	**63.4**	**66.6**	**69.2**	3.9	0.4	1.6	1.0
as % of GDP	**10.7**	**11.6**	**12.6**	**10.8**	**10.8**	**10.5**	**10.3**	**9.9**	**9.3**	**8.7**	**8.2**				

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (A)												United Kingdom: Reference scenario			
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
Population (in million)	**59**	**60**	**63**	**65**	**67**	**69**	**71**	**72**	**74**	**76**	**77**	0.6	0.7	0.5	0.5
GDP (in 000 M€13)	**1538**	**1780**	**1810**	**1976**	**2120**	**2247**	**2423**	**2668**	**2957**	**3267**	**3582**	1.6	1.6	1.3	2.0
Gross Inland Consumption (ktoe)	**230560**	**233992**	**212234**	**199641**	**185473**	**178267**	**177024**	**173256**	**175095**	**175723**	**179058**	-0.8	-1.3	-0.5	0.1
Solids	36516	37737	30761	30896	12366	8027	4198	3037	2379	1990	1833	-1.7	-8.7	-10.2	-4.1
Oil	81031	84449	72986	71030	65747	63041	60194	58360	57711	57555	57768	-1.0	-1.0	-0.9	-0.2
Natural gas	87399	85473	85050	67578	64587	63927	57890	58653	60432	60788	56373	-0.3	-2.7	-1.1	-0.1
Nuclear	21942	21054	16029	15793	15374	13860	23774	21478	22467	25436	31374	-3.1	-0.4	4.5	1.4
Electricity	1219	716	229	1580	1341	1166	1063	791	532	484	471	-15.4	19.3	-2.3	-4.0
Renewable energy forms	2453	4564	7179	12764	26058	28245	29905	30937	31572	29469	31239	11.3	13.8	1.4	0.2
Energy Branch Consumption	**14909**	**16092**	**13761**	**10879**	**9604**	**8789**	**8124**	**7503**	**6994**	**6501**	**6147**	-0.8	-3.5	-1.7	-1.4
Non-Energy Uses	**11330**	**11213**	**7524**	**8461**	**8861**	**8831**	**8897**	**9009**	**9214**	**9327**	**9359**	-4.0	1.6	0.0	0.3
SECURITY OF SUPPLY															
Production (incl.recovery of products) (ktoe)	**268546**	**204420**	**147634**	**115064**	**108346**	**96097**	**92745**	**80656**	**72256**	**65239**	**63582**	-5.8	-3.0	-1.5	-1.9
Solids	18658	11899	10751	6067	3421	3047	1736	1167	838	706	522	-5.4	-10.8	-6.6	-5.8
Oil	127939	87930	63788	48199	40965	33042	26447	20174	14326	8135	2952	-6.7	-4.3	-4.3	-10.4
Natural gas	97554	79397	51468	34247	26819	22738	16090	12373	8567	6074	2173	-6.2	-6.3	-5.0	-9.5
Nuclear	21942	21054	16029	15793	15374	13860	23774	21478	22467	25436	31374	-3.1	-0.4	4.5	1.4
Renewable energy sources	2453	4141	5598	10758	21766	23411	24698	25464	26057	24889	26560	8.6	14.5	1.3	0.4
Hydro	437	423	307	477	466	470	470	471	470	471	478	-3.5	4.3	0.1	0.1
Biomass & Waste	1922	3437	4314	6434	11742	13169	14599	15287	15362	12937	13123	8.4	10.5	2.2	-0.5
Wind	81	250	875	2969	8204	8204	8204	8226	8565	9795	11233	26.8	25.1	0.0	1.6
Solar and others	11	30	101	878	1352	1558	1405	1457	1624	1636	1664	24.5	29.6	0.4	0.9
Geothermal	1	1	1	1	3	10	20	23	36	50	62	0.0	14.4	20.4	5.9
Net Imports (ktoe)	**-39220**	**31596**	**61239**	**87711**	**80332**	**85332**	**87435**	**95804**	**106129**	**113888**	**119003**	0.0	2.8	0.9	1.6
Solids	14454	27222	16045	24829	8945	4981	2462	1870	1541	1284	1311	1.0	-5.7	-12.1	-3.1
Oil	-45582	-2738	11181	25966	27951	33096	36817	41253	46491	52593	58083	0.0	9.6	2.8	2.3
Crude oil and Feedstocks	-39093	4558	13213	20985	23725	28616	32223	36086	40279	45148	49178	0.0	6.0	3.1	2.1
Oil products	-6489	-7296	-2032	4981	4226	4480	4595	5168	6212	7445	8904	-11.0	0.0	0.8	3.4
Natural gas	-9311	5973	32205	33331	37804	41256	41886	46416	52051	54945	54459	0.0	1.6	1.0	1.3
Electricity	1219	716	229	1580	1341	1166	1063	791	532	484	471	-15.4	19.3	-2.3	-4.0
Import Dependency (%)	-16.9	13.4	28.5	43.3	42.6	47.0	48.5	54.3	59.5	63.6	65.2				
ELECTRICITY															
Gross Electricity generation by source [1] (GWh_e)	**374375**	**395425**	**378558**	**357131**	**369460**	**378063**	**398021**	**418372**	**447539**	**477475**	**497924**	0.1	-0.2	0.7	1.1
Nuclear energy	85063	81618	62140	64689	62974	59946	107051	97644	103374	117226	144929	-3.1	0.1	5.4	1.5
Solids	119950	134637	107694	96299	26643	12099	3676	3615	3556	3546	3537	-1.1	-13.0	-18.0	-0.2
Oil (including refinery gas)	8446	5339	4804	4252	3293	2893	2893	1027	634	605	534	-5.5	-3.7	-1.3	-8.1
Gas (including derived gases)	150427	154339	176759	117631	115535	133245	108350	137885	160861	174885	147690	1.6	-4.2	-0.6	1.6
Biomass-waste	4455	11658	13373	26283	51007	59785	65945	67827	64512	52217	55324	11.6	14.3	2.6	-0.9
Hydro (pumping excluded)	5086	4922	3568	5550	5416	5464	5469	5471	5468	5474	5557	-3.5	4.3	0.1	0.1
Wind	947	2904	10180	34520	95394	95394	95394	95652	99594	113901	130616	26.8	25.1	0.0	1.6
Solar	1	8	41	7899	8985	8985	8985	8988	9260	9343	9457	42.7	71.6	0.0	0.3
Geothermal and other renewables	0	0	-1	8	212	252	258	263	280	280	280	15.7	0.0	2.0	0.4
Other fuels (hydrogen, methanol)	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Net Generation Capacity (MW_e)	**78130**	**82074**	**88395**	**92944**	**120195**	**110488**	**114323**	**117277**	**124051**	**130896**	**136895**	1.2	3.1	-0.5	0.9
Nuclear energy	12086	11376	10027	9374	8884	7811	13107	11922	12352	14002	17302	-1.9	-1.2	4.0	1.4
Renewable energy	1900	3077	7128	25020	46356	46374	46377	46379	47347	51373	54673	14.1	20.6	0.0	0.8
Hydro (pumping excluded)	1485	1501	1637	1693	1791	1791	1791	1791	1791	1792	1818	1.0	0.9	0.0	0.1
Wind	412	1565	5396	13603	33421	33421	33421	33421	34383	38338	41468	29.3	20.0	0.0	1.1
Solar	2	11	94	9721	11043	11043	11043	11043	11043	11112	11255	47.0	61.1	0.0	0.1
Other renewables (tidal etc.)	1	0	1	4	102	119	122	124	130	130	130	0.0	58.7	1.9	0.3
Thermal power	64144	67621	71240	58550	64955	56303	54839	58976	64352	65521	64920	1.1	-0.9	-1.7	0.8
of which cogeneration units	5794	5440	6102	5052	5517	5793	14861	13329	13654	10547	8408	0.5	-1.0	10.4	-2.8
of which CCS units	0	0	0	0	833	833	833	833	833	833	833	0.0	0.0	0.0	0.0
Solids fired	27533	26230	25549	18735	11149	2323	501	478	449	449	448	-0.7	-8.0	-26.7	-0.6
Gas fired	24512	29106	33292	33953	35332	35530	35928	40677	46345	47021	46102	3.1	0.6	0.2	1.3
Oil fired	9696	9323	9064	2227	1235	1206	1167	674	485	392	339	-0.7	-18.1	-0.6	-6.0
Biomass-waste fired	2403	2961	3335	3634	17238	17244	17244	17148	17072	17658	18032	3.3	17.9	0.0	0.2
Hydrogen plants	0	0	0	0	0	0	0	0	0	0	0	0.0	-100.0	0.0	0.0
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Avg. Load factor of net power capacity [2] (%)	52.3	52.5	46.8	41.7	33.7	37.6	38.2	39.2	39.7	40.3	40.1				
Efficiency of gross thermal power generation (%)	41.1	42.1	43.6	41.3	45.2	47.7	46.7	51.8	53.9	59.9	60.7				
% of gross electricity from CHP	6.1	6.8	6.2	5.4	5.0	4.7	5.4	5.4	4.3	3.8	4.0				
% of electricity from CCS	0.0	0.0	0.0	0.0	1.4	1.5	1.6	1.5	1.4	1.3	1.3				
% of carbon free (RES, nuclear) gross electricity generation	25.5	25.6	23.6	38.9	60.6	60.8	71.1	65.9	63.1	62.5	69.5				
Fuel Inputs to Thermal Power Generation (GWh_e)	**59321**	**62482**	**59738**	**50947**	**37386**	**37509**	**33317**	**34932**	**36651**	**33226**	**29324**	0.1	-4.6	-1.1	-0.6
Solids	28425	29812	23816	23961	6447	2974	779	779	779	779	779	-1.8	-12.2	-19.1	0.0
Oil (including refinery gas)	1453	1060	789	920	736	648	648	229	141	135	120	-5.9	-0.7	-1.3	-8.1
Gas (including derived gases)	28139	28415	31452	20339	19251	21014	17595	19144	21369	21754	17623	1.1	-4.8	-0.9	0.0
Biomass & Waste	1305	3194	3681	5727	10952	12873	14295	14780	14362	10558	10802	10.9	11.5	2.7	-1.4
Geothermal heat	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Hydrogen - Methanol	0	0	0	0	0	0	0	0	0	0	0	0.0	0.0	0.0	0.0
Fuel Input to other conversion processes	**118459**	**115207**	**97492**	**88112**	**83506**	**78557**	**84528**	**78891**	**77986**	**79608**	**84485**	-1.9	-1.5	0.1	0.0
Refineries	88821	88399	75162	65526	61352	58573	55760	53304	51675	50354	49284	-1.7	-2.0	-1.0	-0.6
Biofuels and hydrogen production	0	80	1130	1361	2139	2105	2067	2137	2290	2523	2648	0.0	6.6	-0.3	1.2
District heating	15	14	13	13	11	11	9	9	8	8	7	-0.9	-2.2	-1.2	-1.6
Derived gases, cokeries etc.	29623	26714	21187	21212	20004	17867	26691	23441	24012	26723	32546	-3.3	-0.6	2.9	1.0

Source: PRIMES

SUMMARY ENERGY BALANCE AND INDICATORS (B)	United Kingdom: Reference scenario														
	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050	'00-'10	'10-'20	'20-'30	'30-'50
												Annual % Change			
TRANSPORT															
Passenger transport activity (Gpkm)	**822**	**872**	**849**	**878**	**934**	**974**	**1023**	**1057**	**1098**	**1135**	**1168**	0.3	1.0	0.9	0.7
Public road transport	49	44	46	46	47	48	48	48	48	49	49	-0.5	0.2	0.3	0.1
Private cars and motorcycles	644	673	649	659	702	729	764	786	811	834	853	0.1	0.8	0.8	0.6
Rail	47	53	66	76	79	84	89	92	96	98	101	3.5	1.8	1.1	0.6
Aviation [3]	77	97	83	90	100	107	116	123	136	147	158	0.7	1.8	1.5	1.6
Inland navigation	6	6	5	5	6	6	6	6	6	7	7	-0.3	0.7	0.6	0.4
Freight transport activity (Gtkm)	**237**	**248**	**216**	**242**	**253**	**264**	**276**	**288**	**299**	**310**	**319**	-0.9	1.6	0.9	0.7
Heavy goods and light commercial vehicles	183	183	164	187	195	204	213	223	232	241	250	-1.1	1.7	0.9	0.8
Rail	18	21	19	22	23	24	25	27	28	29	29	0.3	2.1	1.1	0.7
Inland navigation	36	43	33	34	35	36	37	38	40	40	40	-0.9	0.5	0.7	0.4
Energy demand in transport (ktoe) [4]	**52386**	**55501**	**51470**	**52014**	**49660**	**47943**	**46525**	**46621**	**47324**	**48232**	**49207**	-0.2	-0.4	-0.6	0.3
Public road transport	559	499	515	511	504	493	480	469	462	456	452	-0.8	-0.2	-0.5	-0.3
Private cars and motorcycles	29150	30049	29058	27657	25147	23575	22862	22637	22590	22510	22435	0.0	-1.4	-0.9	-0.1
Heavy goods and light commercial vehicles	9809	9612	8396	9457	9067	9125	8935	9137	9323	9543	9813	-1.5	0.8	-0.1	0.5
Rail	821	988	966	1108	1153	1201	1242	1256	1242	1186	1126	1.6	1.8	0.7	-0.5
Aviation	11115	13069	11650	12400	12878	12619	12049	12149	12719	13548	14402	0.5	1.0	-0.7	0.9
Inland navigation	933	1282	884	881	911	930	957	973	988	989	980	-0.5	0.3	0.5	0.1
By transport activity															
Passenger transport	41504	44033	41640	40984	38966	37128	35840	35704	36218	36959	37733	0.0	-0.7	-0.8	0.3
Freight transport	10882	11467	9830	11030	10694	10815	10685	10918	11106	11273	11475	-1.0	0.8	0.0	0.4
Other indicators															
Electricity in road transport (%)	0.0	0.0	0.0	0.0	0.4	0.6	1.3	1.7	2.1	2.7	3.3				
Biofuels in total fuels (excl.hydrogen and electricity) (%)	0.0	0.1	2.2	2.7	4.6	4.7	4.8	4.9	5.1	5.4	5.5				
ENERGY EFFICIENCY															
Primary energy consumption	**219230**	**222779**	**204710**	**191181**	**176613**	**169435**	**168127**	**164247**	**165880**	**166396**	**169699**	-0.7	-1.5	-0.5	0.0
Final Energy Demand	**153236**	**152728**	**142723**	**138484**	**135118**	**131091**	**126704**	**126029**	**127273**	**129857**	**131825**	-0.7	-0.5	-0.6	0.2
by sector															
Industry	36930	33388	26923	25432	25541	23327	21124	19958	19527	19701	19840	-3.1	-0.5	-1.9	-0.3
Energy intensive industries	19392	16472	12350	11464	11312	9778	8306	7280	6837	6741	6797	-4.4	-0.9	-3.0	-1.0
Other industrial sectors	17537	16916	14573	13968	14229	13549	12818	12678	12691	12960	13043	-1.8	-0.2	-1.0	0.1
Residential	43034	44151	44715	40936	39775	39963	39267	39618	40415	41531	42411	0.4	-1.2	-0.1	0.4
Tertiary	20377	19686	19633	20101	20143	19858	19788	19832	20007	20394	20367	-0.4	0.3	-0.2	0.1
Transport[5]	52895	55503	51452	52014	49660	47943	46525	46621	47324	48232	49207	-0.3	-0.4	-0.6	0.3
by fuel															
Solids	5954	4530	4133	4583	3870	3300	2127	1343	850	561	447	-3.6	-0.7	-5.8	-7.5
Oil	63674	65851	59524	58175	53165	50805	48143	47075	46526	46412	46730	-0.7	-1.1	-1.0	-0.1
Gas	52180	50380	47246	43853	42314	40340	38123	37298	37116	37398	37521	-1.0	-1.1	-1.0	-0.1
Electricity	28360	29998	28286	27707	28796	29338	30625	31996	33983	36238	37662	0.0	0.2	0.6	1.0
Heat (from CHP and District Heating)	2439	1268	1266	1255	1338	1403	1532	1612	1317	1227	1308	-6.3	0.5	1.4	-0.8
Renewable energy forms	630	702	2268	2885	5538	5784	5998	6492	7134	7576	7639	13.7	9.3	0.8	1.2
Other	0	0	0	26	97	121	156	213	347	445	518	-100.0	0.0	4.9	6.2
Energy intensity indicators															
Gross Inl. Cons./GDP (toe/M€13)	150	131	117	101	88	79	73	65	59	54	50	-2.4	-2.9	-1.8	-1.9
Industry (Energy on Value added, index 2000=100)	100	93	79	71	68	60	52	46	43	40	39	-2.3	-1.5	-2.6	-1.5
Residential (Energy on Private Income, index 2000=100)	100	87	87	75	68	64	58	53	49	45	42	-1.4	-2.4	-1.6	-1.7
Tertiary (Energy on Value added, index 2000=100)	100	81	77	71	66	61	56	51	46	42	38	-2.6	-1.5	-1.6	-1.9
Passenger transport (toe/Mpkm) [6]	38	36	35	33	29	26	24	22	21	20	20	-0.8	-1.9	-2.0	-0.9
Freight transport (toe/Mtkm)	46	46	46	46	42	41	39	38	37	36	36	-0.1	-0.7	-0.9	-0.4
DECARBONISATION															
TOTAL GHG emissions (Mt of CO2 eq.)	**720.6**	**727.6**	**636.4**	**585.9**	**473.4**	**437.7**	**387.6**	**374.0**	**371.3**	**367.9**	**356.7**	-1.2	-2.9	-2.0	-0.4
of which ETS sectors (2013 scope) GHG emissions		314.0	273.9	244.9	162.2	143.4	114.0	108.7	110.8	111.3	102.0		-5.1	-3.5	-0.6
of which ESD sectors (2013 scope) GHG emissions		413.6	362.5	341.0	311.2	294.3	273.6	265.3	260.4	256.6	254.7		-1.5	-1.3	-0.4
CO_2 Emissions (energy related)	**568.2**	**573.4**	**518.3**	**477.6**	**373.8**	**345.5**	**305.2**	**295.2**	**293.7**	**291.9**	**281.5**	-0.9	-3.2	-2.0	-0.4
Power generation/District heating	194.2	199.6	178.4	155.5	75.8	64.5	45.3	46.4	50.7	51.3	41.4	-0.8	-8.2	-5.0	-0.5
Energy Branch	31.3	35.2	29.4	20.9	18.5	16.4	14.2	12.3	10.9	9.6	8.4	-0.6	-4.5	-2.6	-2.6
Industry	77.4	67.5	52.1	49.6	46.6	39.1	29.6	23.2	20.0	18.9	17.8	-3.9	-1.1	-4.4	-2.5
Residential	82.6	80.4	83.1	74.7	68.6	68.9	67.0	66.2	65.0	64.4	65.0	0.1	-1.9	-0.2	-0.1
Tertiary	27.0	25.3	24.8	25.3	22.4	20.1	17.6	16.1	15.3	14.9	14.3	-0.9	-1.0	-2.4	-1.0
Transport	155.6	165.4	150.6	151.7	141.8	136.5	131.5	130.9	131.7	132.8	134.5	-0.3	-0.6	-0.8	0.1
CO_2 Emissions (non energy and non land use related)	**20.8**	**21.0**	**15.6**	**17.7**	**18.7**	**17.9**	**16.8**	**15.5**	**14.0**	**13.1**	**12.4**	-2.8	1.8	-1.1	-1.5
Non-CO2 GHG emissions	**131.6**	**133.2**	**102.5**	**90.5**	**80.9**	**74.3**	**65.6**	**63.3**	**63.6**	**62.8**	**62.8**	-2.5	-2.3	-2.1	-0.2
TOTAL GHG emissions (excl. LULUCF) Index (1990=100)	**88.0**	**88.8**	**77.7**	**71.5**	**57.8**	**53.4**	**47.3**	**45.7**	**45.3**	**44.9**	**43.5**	-1.2	-2.9	-2.0	-0.4
Carbon Intensity indicators															
Electricity and Steam production (t of CO_2/MWh)	0.48	0.49	0.45	0.42	0.20	0.16	0.11	0.10	0.11	0.10	0.08	-0.6	-8.0	-5.8	-1.5
Final energy demand (t of CO_2/toe)	2.24	2.22	2.18	2.18	2.07	2.02	1.94	1.88	1.82	1.78	1.76	-0.3	-0.5	-0.6	-0.5
Industry	2.10	2.02	1.93	1.95	1.83	1.67	1.40	1.16	1.03	0.96	0.90	-0.8	-0.6	-2.6	-2.2
Residential	1.92	1.82	1.86	1.82	1.73	1.72	1.71	1.67	1.61	1.55	1.53	-0.3	-0.7	-0.1	-0.5
Tertiary	1.32	1.29	1.26	1.26	1.11	1.01	0.89	0.81	0.76	0.73	0.70	-0.5	-1.2	-2.2	-1.2
Transport	2.94	2.98	2.93	2.92	2.86	2.85	2.83	2.81	2.78	2.75	2.73	-0.1	-0.2	-0.1	-0.2
RES in Gross Final Energy Consumption [7] (in%)	**0.9**	**1.4**	**3.3**	**6.9**	**14.8**	**15.7**	**16.6**	**17.2**	**17.8**	**18.3**	**19.5**				
RES-H&C share	0.8	0.8	1.8	3.4	6.9	7.0	7.8	9.0	10.8	12.2	12.5				
RES-E share	2.6	4.1	7.4	19.3	41.4	43.0	42.5	41.3	39.1	37.2	39.7				
RES-T share (based on ILUC formula)	0.1	0.2	3.0	6.0	11.4	13.2	14.9	16.1	17.3	18.9	21.1				
MARKETS AND COMPETITIVENESS															
Average Cost of Gross Electricity Generation (€'13/MWh)	42	49	59	95	115	115	116	107	96	87	80	3.4	7.0	0.1	-1.8
Average Price of Electricity in Final demand sectors (€'13/MWh	124	91	129	166	170	178	180	180	174	168	168	0.3	2.8	0.6	-0.3
Total energy-rel. and other mitigation costs [8] (in 000 M€13)	**154.6**	**159.7**	**179.7**	**203.0**	**230.7**	**251.4**	**266.6**	**280.9**	**295.9**	**309.0**	**322.9**	1.5	2.5	1.5	1.0
as % of GDP	**10.1**	**9.0**	**9.9**	**10.3**	**10.9**	**11.2**	**11.0**	**10.5**	**10.0**	**9.5**	**9.0**				

Source: PRIMES

(1) For years 2000 to 2010, total gross electricity by source as reported in this table and total gross electricity generation reported as part of the energy balance slightly differ because of differences in the respective statistical sources
(2) Electricity generated over maximum potential generation based on net power capacity
(3) Excluding international extra-EU aviation.
(4) Excluding pipeline transport and other non-specified transport.
(5) Including pipeline transport and other non-specified transport.
(6) Caclulated by taking into account domestic, international intra-EU flights, and extra-EU flights for aviation.
(7) Including the part of electricity and heat generated from renewables
(8) Excluding payments for auctioned emission allowances (if applicable)

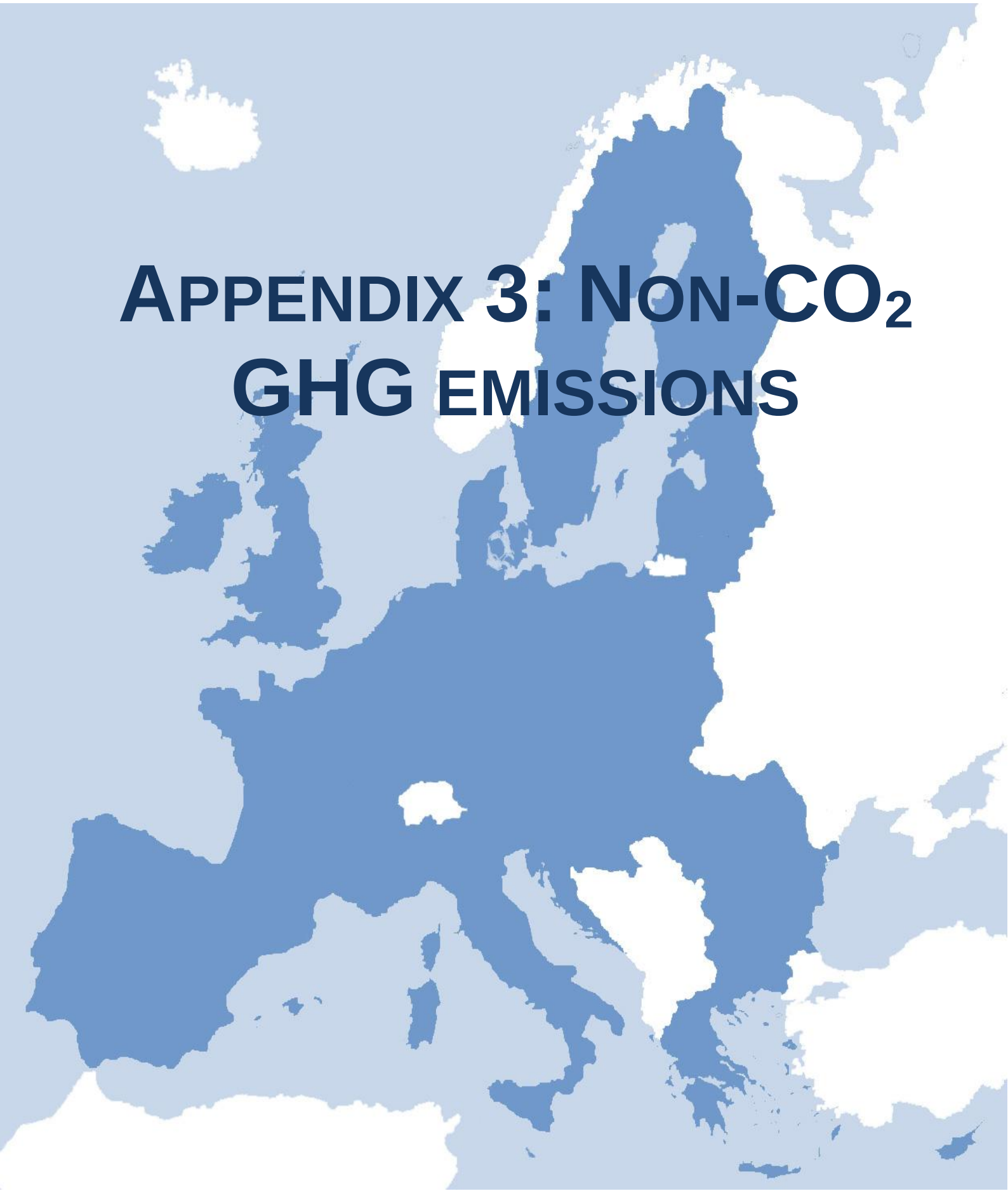
Disclaimer: Energy and transport statistics reported in this publication and used for the modelling are mainly based on EUROSTAT and on the publications "EU Energy in Figures" of the Directorate General for Energy and "EU Transport in Figures" of the Directorate General for Mobility and Transport.
Energy and transport statistical concepts have developed differently in the past according to their individual purposes. Energy demand in transport reflects usually sales of fuels at the point of refuelling, which can differ from the region of consumption. These differences should be borne in mind when comparing energy and transport figures. This applies in particular to transport activity ratios, such as energy efficiency in freight or passenger transport, which are measured in tonnes of oil equivalent per million tonne-km and in tonnes of oil equivalent per million passenger-km, respectively.
For modelling purposes, some assumptions had to be made for calculating air and maritime transport performance and allocating it by MS. The transport volumes (number of passengers and tonnes) and distance matrices have been used for this purpose. By assumption, 50% of the calculated transport performance is allocated to the origin country and 50% to the destination country. The same "50%-50%" principle allocation applies to the EFTA countries and the candidate countries. For the international extra-EU activity, where the corresponding partner is outside EU-28 and is not an EFTA or candidate country, 100% of transport performance is allocated to the declaring EU MS country. These assumptions are used only for modelling purposes and shall be considered as model estimates and not as official data.

Abbreviations

GIC: Gross Inland Consumption
CHP: combined heat and power

Units

toe: tonne of oil equivalent, or 10^7 kilocalories, or 41.86 GJ (Gigajoule)
ktoe: 1000 toe
MW: Megawatt or 10^6 watt
MWh: megawatt-hour or 10^6 watt-hours
GWh: gigawatt-hour or 10^9 watt-hours
t: metric tonnes, or 1000 kilogrammes
Mt: Million metric tonnes
km: kilometre
pkm: passenger-kilometre (one passenger transported a distance of one kilometre)
tkm: tonne-kilometre (one tonne transported a distance of one kilometre)
Gpkm: Giga passenger-kilometre, or 10^9 passenger-kilometre
Gtkm: Giga tonne-kilometre, or 10^9 tonne-kilometre



APPENDIX 3: NON-CO_2 GHG EMISSIONS

EU-28

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		547.44	490.62	454.02	401.88	384.86	369.06	360.29	359.39	358.35	360.35
Total N_2O		304.12	264.06	262.73	255.54	254.27	252.03	247.57	246.37	245.37	244.49
Total F-gases		88.04	100.72	103.78	88.71	67.79	42.49	44.53	46.51	48.95	51.44
Agriculture	3A, 3B, 3C, 3D, 3F	443.28	432.58	439.69	434.01	432.49	432.62	431.72	431.71	431.07	431.09
Energy	1A, 1B	118.30	101.88	91.99	88.93	82.70	75.84	68.28	63.21	58.99	57.25
Industry	2B, 2C, 2E, 2G	68.75	27.03	19.63	12.27	12.72	13.17	13.71	14.27	14.80	15.35
Waste	5A, 5B, 5C	185.53	151.68	122.93	79.16	67.87	55.79	50.16	52.23	54.27	56.38
Wastewater	5D	39.42	37.37	37.44	37.94	38.33	38.74	39.23	39.75	40.21	40.61
Air conditioning & refrigeration	2F.1	52.84	73.61	77.67	64.86	46.39	25.75	27.34	28.86	30.84	32.84
Other sectors	2F, 2G	27.44	27.21	27.15	24.92	22.40	17.63	17.91	18.19	18.45	18.71
Calibration to UNFCCC 2005		4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04
whereof ETS sectors		54.97	19.06	12.15	4.50	4.71	4.91	5.14	5.36	5.55	5.74
whereof non-ETS sectors		884.63	836.35	808.38	741.63	702.23	658.67	647.25	646.91	647.12	650.54
Total non-CO_2 GHGs		939.60	855.41	820.54	746.12	706.93	663.58	652.39	652.27	652.67	656.28

Austria

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		7.57	6.42	6.00	5.63	5.42	5.11	4.93	4.84	4.81	4.81
Total N_2O		3.50	3.44	3.45	3.50	3.50	3.48	3.46	3.45	3.47	3.48
Total F-gases		2.08	2.22	2.29	1.97	1.57	0.86	0.92	0.98	1.05	1.12
Agriculture	3A, 3B, 3C, 3D, 3F	7.19	7.23	7.26	7.34	7.34	7.34	7.33	7.22	7.17	7.16
Energy	1A, 1B	1.64	1.79	1.62	1.54	1.42	1.34	1.23	1.20	1.19	1.17
Industry	2B, 2C, 2E, 2G	0.61	0.24	0.27	0.29	0.31	0.32	0.33	0.35	0.37	0.39
Waste	5A, 5B, 5C	2.97	1.77	1.47	1.12	1.01	0.75	0.65	0.68	0.71	0.74
Wastewater	5D	0.44	0.43	0.44	0.45	0.46	0.47	0.47	0.48	0.48	0.49
Air conditioning & refrigeration	2F.1	1.17	1.71	1.78	1.46	1.06	0.61	0.65	0.69	0.75	0.80
Other sectors	2F, 2G	0.68	0.46	0.46	0.45	0.44	0.19	0.19	0.20	0.20	0.20
Calibration to UNFCCC 2005		-1.55	-1.55	-1.55	-1.55	-1.55	-1.55	-1.55	-1.55	-1.55	-1.55
whereof ETS sectors		0.26	0.06	0.09	0.10	0.11	0.11	0.11	0.12	0.12	0.13
whereof non-ETS sectors		12.89	12.02	11.65	11.00	10.38	9.35	9.19	9.15	9.20	9.27
Total non-CO_2 GHGs		13.15	12.08	11.74	11.10	10.48	9.46	9.31	9.27	9.33	9.40

Belgium

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		9.81	9.23	9.15	8.36	7.92	7.83	7.58	7.54	7.52	7.48
Total N_2O		8.15	7.16	6.10	5.73	5.71	5.78	5.79	5.87	5.93	5.97
Total F-gases		2.89	3.85	4.03	3.43	2.61	1.57	1.73	1.89	2.09	2.30
Agriculture	3A, 3B, 3C, 3D, 3F	11.28	11.17	11.37	11.05	10.70	10.68	10.48	10.29	10.13	9.95
Energy	1A, 1B	1.17	1.35	1.35	1.48	1.44	1.47	1.47	1.53	1.56	1.57
Industry	2B, 2C, 2E, 2G	3.48	2.29	1.06	0.66	0.69	0.72	0.76	0.81	0.86	0.91
Waste	5A, 5B, 5C	2.73	2.21	2.07	1.47	1.33	1.23	1.12	1.19	1.27	1.36
Wastewater	5D	0.64	0.63	0.65	0.68	0.71	0.73	0.77	0.80	0.83	0.86
Air conditioning & refrigeration	2F.1	2.37	3.42	3.60	3.02	2.23	1.33	1.47	1.62	1.81	2.00
Other sectors	2F, 2G	0.47	0.46	0.48	0.46	0.44	0.31	0.33	0.35	0.37	0.39
Calibration to UNFCCC 2005		-1.30	-1.30	-1.30	-1.30	-1.30	-1.30	-1.30	-1.30	-1.30	-1.30
whereof ETS sectors		2.95	1.79	0.62	0.20	0.21	0.23	0.24	0.26	0.28	0.30
whereof non-ETS sectors		17.90	18.45	18.67	17.31	16.03	14.95	14.85	15.03	15.26	15.45
Total non-CO_2 GHGs		20.85	20.24	19.29	17.52	16.25	15.18	15.10	15.30	15.54	15.75

Bulgaria

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		9.23	8.29	8.10	5.34	4.98	4.91	4.68	4.66	4.48	4.58
Total N_2O		4.06	3.62	3.93	4.07	4.16	4.23	4.19	4.25	4.23	4.20
Total F-gases		0.66	0.44	0.49	0.43	0.31	0.17	0.18	0.19	0.19	0.20
Agriculture	3A, 3B, 3C, 3D, 3F	5.22	5.06	5.41	5.45	5.49	5.53	5.52	5.56	5.53	5.51
Energy	1A, 1B	1.29	1.35	1.23	1.30	1.15	1.14	1.01	1.00	0.82	0.91
Industry	2B, 2C, 2E, 2G	0.89	0.24	0.26	0.09	0.10	0.10	0.11	0.11	0.11	0.11
Waste	5A, 5B, 5C	4.23	3.69	3.59	1.04	0.87	0.86	0.75	0.77	0.78	0.79
Wastewater	5D	0.76	0.69	0.66	0.66	0.65	0.64	0.63	0.62	0.61	0.61
Air conditioning & refrigeration	2F.1	4.43	0.38	0.43	0.37	0.26	0.13	0.14	0.15	0.15	0.16
Other sectors	2F, 2G	0.13	0.16	0.16	0.15	0.13	0.12	0.12	0.12	0.11	0.11
Calibration to UNFCCC 2005		0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
whereof ETS sectors		0.88	0.22	0.25	0.08	0.09	0.09	0.09	0.09	0.09	0.09
whereof non-ETS sectors		13.08	12.12	12.28	9.76	9.36	9.22	8.96	9.01	8.81	8.89
Total non-CO_2 GHGs		13.95	12.35	12.52	9.84	9.44	9.31	9.05	9.10	8.91	8.98

Croatia

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		4.15	4.01	3.71	3.22	3.09	3.08	2.83	2.89	2.97	3.03
Total N_2O		2.42	2.37	1.75	1.76	1.76	1.75	1.70	1.66	1.64	1.62
Total F-gases		0.82	1.02	0.48	0.42	0.31	0.17	0.19	0.21	0.22	0.23
Agriculture	3A, 3B, 3C, 3D, 3F	2.96	2.63	2.68	2.72	2.74	2.77	2.73	2.68	2.72	2.76
Energy	1A, 1B	0.64	0.61	0.53	0.54	0.51	0.47	0.46	0.52	0.52	0.53
Industry	2B, 2C, 2E, 2G	0.65	0.77	0.10	0.04	0.04	0.04	0.05	0.05	0.05	0.06
Waste	5A, 5B, 5C	1.34	1.38	1.18	0.72	0.59	0.59	0.35	0.36	0.37	0.38
Wastewater	5D	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26
Air conditioning & refrigeration	2F.1	0.79	0.99	0.45	0.39	0.29	0.15	0.17	0.18	0.20	0.21
Other sectors	2F, 2G	0.08	0.08	0.08	0.08	0.07	0.07	0.07	0.07	0.07	0.07
Calibration to UNFCCC 2005		0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62	0.62
whereof ETS sectors		0.64	0.76	0.09	0.03	0.03	0.03	0.04	0.04	0.04	0.05
whereof non-ETS sectors		6.76	6.63	5.84	5.37	5.12	4.96	4.69	4.72	4.78	4.84
Total non-CO_2 GHGs		7.39	7.39	5.93	5.40	5.16	5.00	4.72	4.76	4.83	4.89

Cyprus

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		0.80	0.83	0.87	0.66	0.78	0.86	0.95	1.01	1.05	1.07
Total N_2O		0.56	0.57	0.53	0.54	0.54	0.55	0.55	0.56	0.57	0.58
Total F-gases		0.18	0.19	0.18	0.16	0.12	0.07	0.07	0.08	0.09	0.09
Agriculture	3A, 3B, 3C, 3D, 3F	0.68	0.70	0.63	0.69	0.69	0.71	0.73	0.75	0.77	0.79
Energy	1A, 1B	0.05	0.05	0.03	0.02	0.15	0.20	0.29	0.33	0.35	0.34
Industry	2B, 2C, 2E, 2G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste	5A, 5B, 5C	0.32	0.33	0.40	0.15	0.15	0.16	0.14	0.15	0.16	0.17
Wastewater	5D	0.09	0.10	0.10	0.11	0.11	0.11	0.11	0.12	0.12	0.12
Air conditioning & refrigeration	2F.1	0.16	0.17	0.17	0.15	0.11	0.06	0.07	0.07	0.08	0.08
Other sectors	2F, 2G	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02	0.02	0.02
Calibration to UNFCCC 2005		0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21	0.21
whereof ETS sectors		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
whereof non-ETS sectors		1.54	1.59	1.58	1.36	1.45	1.48	1.58	1.66	1.71	1.74
Total non-CO_2 GHGs		1.54	1.59	1.58	1.36	1.45	1.48	1.58	1.66	1.71	1.74

Czech Republic

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		12.86	12.23	10.65	8.12	7.95	7.40	6.62	5.56	5.38	5.32
Total N_2O		6.75	5.91	6.14	5.83	6.09	6.05	5.73	5.62	5.58	5.55
Total F-gases		1.47	3.37	3.67	3.15	2.41	1.50	1.64	1.78	1.94	2.11
Agriculture	3A, 3B, 3C, 3D, 3F	7.25	6.78	7.25	6.88	6.93	6.87	6.80	6.72	6.68	6.67
Energy	1A, 1B	6.98	6.37	5.05	5.13	5.41	5.09	4.14	2.99	2.75	2.62
Industry	2B, 2C, 2E, 2G	1.05	0.51	0.46	0.31	0.32	0.34	0.36	0.38	0.41	0.43
Waste	5A, 5B, 5C	3.87	4.04	3.58	1.16	0.90	0.65	0.55	0.58	0.60	0.62
Wastewater	5D	0.77	0.76	0.77	0.79	0.80	0.82	0.83	0.85	0.87	0.88
Air conditioning & refrigeration	2F.1	1.30	3.19	3.51	2.99	2.26	1.35	1.49	1.62	1.78	1.93
Other sectors	2F, 2G	0.23	0.23	0.21	0.20	0.19	0.18	0.18	0.18	0.18	0.19
Calibration to UNFCCC 2005		-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36	-0.36
whereof ETS sectors		0.89	0.33	0.25	0.08	0.09	0.09	0.10	0.11	0.11	0.12
whereof non-ETS sectors		20.19	21.18	20.21	17.01	16.36	14.85	13.90	12.85	12.79	12.86
Total non-CO_2 GHGs		21.08	21.50	20.46	17.10	16.45	14.94	14.00	12.96	12.90	12.98

Denmark

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		7.62	7.29	7.09	6.89	6.76	6.55	6.29	6.30	6.30	6.32
Total N_2O		5.45	5.39	5.23	5.35	5.34	5.35	5.27	5.24	5.21	5.12
Total F-gases		0.94	0.97	0.96	0.87	0.65	0.40	0.43	0.46	0.50	0.54
Agriculture	3A, 3B, 3C, 3D, 3F	10.04	10.17	10.21	10.23	10.26	10.36	10.36	10.31	10.24	10.13
Energy	1A, 1B	1.72	1.40	0.97	1.01	0.89	0.78	0.59	0.56	0.56	0.55
Industry	2B, 2C, 2E, 2G	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.03	0.03
Waste	5A, 5B, 5C	1.28	1.08	1.10	0.96	0.89	0.71	0.55	0.58	0.62	0.65
Wastewater	5D	0.28	0.28	0.28	0.29	0.30	0.31	0.31	0.32	0.33	0.34
Air conditioning & refrigeration	2F.1	0.75	0.79	0.78	0.70	0.51	0.31	0.33	0.36	0.39	0.43
Other sectors	2F, 2G	0.24	0.24	0.24	0.23	0.20	0.16	0.17	0.17	0.18	0.18
Calibration to UNFCCC 2005		-0.33	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33	-0.33
whereof ETS sectors		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
whereof non-ETS sectors		14.01	13.65	13.27	13.11	12.75	12.31	12.00	12.00	12.01	11.98
Total non-CO_2 GHGs		14.01	13.65	13.27	13.11	12.75	12.31	12.00	12.00	12.01	11.98

Estonia

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		1.19	1.15	1.03	0.88	0.88	0.75	0.74	0.73	0.74	0.73
Total N_2O		0.63	0.70	0.76	0.78	0.79	0.77	0.71	0.70	0.69	0.69
Total F-gases		0.12	0.12	0.14	0.12	0.08	0.05	0.05	0.05	0.05	0.06
Agriculture	3A, 3B, 3C, 3D, 3F	1.15	1.17	1.31	1.29	1.26	1.30	1.29	1.28	1.27	1.27
Energy	1A, 1B	0.31	0.35	0.33	0.32	0.31	0.28	0.22	0.21	0.21	0.20
Industry	2B, 2C, 2E, 2G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste	5A, 5B, 5C	0.65	0.60	0.43	0.33	0.37	0.22	0.22	0.23	0.23	0.24
Wastewater	5D	0.07	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08	0.08
Air conditioning & refrigeration	2F.1	0.07	0.11	0.12	0.11	0.07	0.04	0.04	0.04	0.04	0.05
Other sectors	2F, 2G	0.07	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Calibration to UNFCCC 2005		-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38	-0.38
whereof ETS sectors		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
whereof non-ETS sectors		1.94	1.97	1.93	1.78	1.75	1.56	1.49	1.49	1.49	1.48
Total non-CO_2 GHGs		1.94	1.97	1.93	1.78	1.75	1.56	1.49	1.49	1.49	1.48

Finland

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		5.66	5.28	4.97	3.89	3.74	3.65	3.59	3.64	3.72	3.81
Total N_2O		5.93	4.78	4.56	4.45	4.48	4.50	4.17	4.04	4.00	3.93
Total F-gases		0.58	0.70	0.73	0.62	0.42	0.23	0.24	0.26	0.28	0.29
Agriculture	3A, 3B, 3C, 3D, 3F	6.13	5.95	5.97	5.95	5.85	5.84	5.77	5.80	5.85	5.90
Energy	1A, 1B	1.54	1.87	1.56	1.56	1.63	1.66	1.38	1.23	1.17	1.10
Industry	2B, 2C, 2E, 2G	1.59	0.17	0.17	0.09	0.09	0.10	0.10	0.11	0.11	0.12
Waste	5A, 5B, 5C	2.77	2.53	2.30	1.19	1.10	0.98	0.94	0.97	1.00	1.03
Wastewater	5D	0.74	0.70	0.69	0.70	0.70	0.71	0.72	0.73	0.74	0.74
Air conditioning & refrigeration	2F.1	0.45	0.60	0.63	0.53	0.35	0.18	0.19	0.20	0.22	0.24
Other sectors	2F, 2G	0.18	0.18	0.17	0.16	0.14	0.13	0.13	0.13	0.13	0.13
Calibration to UNFCCC 2005		-1.23	-1.23	-1.23	-1.23	-1.23	-1.23	-1.23	-1.23	-1.23	-1.23
whereof ETS sectors		1.56	0.16	0.16	0.08	0.08	0.08	0.09	0.09	0.10	0.10
whereof non-ETS sectors		10.60	10.60	10.10	8.88	8.56	8.29	7.92	7.84	7.89	7.93
Total non-CO_2 GHGs		12.17	10.76	10.26	8.96	8.64	8.38	8.01	7.94	7.99	8.04

France

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		64.07	63.86	60.99	50.45	49.27	48.84	48.38	48.40	48.39	48.48
Total N_2O		51.90	47.84	48.08	46.50	45.84	45.31	44.76	44.49	44.24	44.01
Total F-gases		13.27	14.62	15.00	13.14	9.99	6.85	7.07	7.33	7.64	7.97
Agriculture	3A, 3B, 3C, 3D, 3F	75.27	76.15	75.72	73.79	73.05	72.78	72.30	71.87	71.39	70.94
Energy	1A, 1B	5.72	5.36	4.88	5.52	4.90	4.47	4.03	3.86	3.72	3.63
Industry	2B, 2C, 2E, 2G	9.06	3.06	2.78	1.76	1.80	1.83	1.88	1.94	2.01	2.08
Waste	5A, 5B, 5C	18.30	17.92	16.30	6.41	5.84	5.48	5.28	5.51	5.76	6.03
Wastewater	5D	4.36	4.08	4.13	4.21	4.27	4.33	4.40	4.48	4.56	4.64
Air conditioning & refrigeration	2F.1	6.22	8.93	9.37	8.06	5.50	2.92	3.07	3.25	3.47	3.71
Other sectors	2F, 2G	4.79	5.30	5.37	4.82	4.21	3.65	3.71	3.78	3.84	3.90
Calibration to UNFCCC 2005		5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53	5.53
whereof ETS sectors		6.73	1.85	1.67	0.63	0.64	0.66	0.68	0.70	0.72	0.75
whereof non-ETS sectors		122.51	124.48	122.39	109.47	104.45	100.34	99.53	99.52	99.55	99.71
Total non-CO_2 GHGs		129.24	126.33	124.07	110.09	105.09	100.99	100.21	100.22	100.27	100.46

Germany

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		69.83	60.03	54.44	50.75	48.24	45.57	44.31	44.19	43.68	43.34
Total N_2O		43.16	36.54	37.17	34.90	34.04	33.26	31.37	30.61	29.95	29.28
Total F-gases		15.93	17.13	17.47	14.79	11.77	6.90	7.00	7.05	7.27	7.50
Agriculture	3A, 3B, 3C, 3D, 3F	63.40	63.00	63.31	62.41	61.53	60.94	60.09	59.11	58.17	57.35
Energy	1A, 1B	21.87	17.24	15.57	14.74	13.40	12.30	10.73	10.72	10.44	10.20
Industry	2B, 2C, 2E, 2G	10.65	3.09	3.72	1.75	1.81	1.87	1.92	1.98	2.04	2.11
Waste	5A, 5B, 5C	19.05	13.66	9.45	7.09	5.86	4.06	3.29	3.37	3.44	3.49
Wastewater	5D	4.26	4.20	4.14	4.19	4.22	4.24	4.24	4.24	4.22	4.19
Air conditioning & refrigeration	2F.1	7.75	10.48	10.85	8.48	5.77	3.34	3.43	3.44	3.62	3.80
Other sectors	2F, 2G	6.76	6.85	6.86	6.61	6.28	3.81	3.81	3.81	3.81	3.80
Calibration to UNFCCC 2005		-4.82	-4.82	-4.82	-4.82	-4.82	-4.82	-4.82	-4.82	-4.82	-4.82
whereof ETS sectors		8.40	2.22	2.94	0.99	1.04	1.09	1.12	1.16	1.20	1.23
whereof non-ETS sectors		120.52	111.48	106.14	99.46	93.01	84.65	81.56	80.69	79.71	78.88
Total non-CO_2 GHGs		128.92	113.70	109.08	100.44	94.05	85.73	82.68	81.85	80.90	80.11

Greece

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		12.16	12.47	10.29	8.76	8.28	7.94	7.95	7.95	7.65	7.75
Total N_2O		5.88	5.58	4.90	4.77	4.67	4.56	4.45	4.43	4.40	4.41
Total F-gases		5.59	4.60	4.14	3.41	2.47	1.55	1.69	1.80	1.88	1.95
Agriculture	3A, 3B, 3C, 3D, 3F	8.72	9.08	8.26	8.17	8.14	8.17	8.26	8.35	8.46	8.59
Energy	1A, 1B	3.21	2.69	2.34	2.02	1.71	1.35	1.30	1.13	0.65	0.57
Industry	2B, 2C, 2E, 2G	2.28	0.55	0.28	0.18	0.17	0.17	0.18	0.18	0.18	0.18
Waste	5A, 5B, 5C	3.95	4.40	3.07	1.94	1.70	1.58	1.40	1.41	1.44	1.47
Wastewater	5D	1.86	1.69	1.59	1.60	1.58	1.59	1.64	1.68	1.70	1.73
Air conditioning & refrigeration	2F.1	3.68	4.21	3.78	3.07	2.16	1.26	1.37	1.47	1.54	1.60
Other sectors	2F, 2G	0.32	0.43	0.39	0.37	0.34	0.33	0.34	0.35	0.36	0.36
Calibration to UNFCCC 2005		-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39	-0.39
whereof ETS sectors		0.58	0.45	0.18	0.08	0.08	0.07	0.09	0.09	0.09	0.09
whereof non-ETS sectors		23.05	22.20	19.15	16.86	15.35	13.98	14.01	14.10	13.84	14.01
Total non-CO_2 GHGs		23.62	22.65	19.33	16.95	15.42	14.05	14.10	14.19	13.93	14.10

Hungary

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		8.76	8.52	8.14	5.12	4.58	4.25	4.12	4.08	4.04	4.04
Total N_2O		5.79	5.41	4.19	4.25	4.25	4.11	4.03	3.96	3.86	3.79
Total F-gases		1.05	1.06	1.16	1.03	0.81	0.53	0.57	0.59	0.62	0.66
Agriculture	3A, 3B, 3C, 3D, 3F	7.28	6.63	7.14	6.91	6.77	6.59	6.46	6.33	6.18	6.09
Energy	1A, 1B	1.78	1.61	1.40	1.26	1.02	0.98	0.88	0.87	0.86	0.85
Industry	2B, 2C, 2E, 2G	1.99	1.74	0.21	0.12	0.13	0.15	0.16	0.17	0.17	0.18
Waste	5A, 5B, 5C	3.58	3.90	3.51	1.03	0.87	0.61	0.64	0.66	0.69	0.71
Wastewater	5D	0.73	0.63	0.61	0.60	0.60	0.60	0.60	0.60	0.60	0.59
Air conditioning & refrigeration	2F.1	0.48	0.78	0.91	0.80	0.61	0.35	0.38	0.40	0.42	0.44
Other sectors	2F, 2G	0.40	0.34	0.34	0.31	0.27	0.23	0.24	0.24	0.24	0.25
Calibration to UNFCCC 2005		-0.63	-0.63	-0.63	-0.63	-0.63	-0.63	-0.63	-0.63	-0.63	-0.63
whereof ETS sectors		1.94	1.65	0.15	0.05	0.06	0.06	0.07	0.07	0.07	0.07
whereof non-ETS sectors		13.66	13.34	13.34	10.35	9.59	8.83	8.65	8.57	8.45	8.41
Total non-CO_2 GHGs		15.60	14.99	13.50	10.41	9.65	8.89	8.72	8.63	8.52	8.49

Ireland

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		13.98	12.75	14.24	14.00	14.59	14.74	15.08	15.33	15.51	15.73
Total N_2O		8.13	7.94	8.31	8.40	8.56	8.69	8.79	8.88	8.93	9.02
Total F-gases		0.97	0.84	0.93	0.82	0.62	0.40	0.43	0.45	0.48	0.52
Agriculture	3A, 3B, 3C, 3D, 3F	19.01	18.13	19.75	20.37	20.96	21.48	21.86	22.13	22.30	22.53
Energy	1A, 1B	0.57	0.50	0.50	0.39	0.39	0.40	0.41	0.43	0.44	0.46
Industry	2B, 2C, 2E, 2G	0.30	0.08	0.09	0.10	0.10	0.11	0.12	0.13	0.14	0.14
Waste	5A, 5B, 5C	1.87	1.41	1.64	0.97	1.14	0.89	0.93	0.97	1.00	1.05
Wastewater	5D	0.36	0.34	0.35	0.36	0.36	0.36	0.37	0.37	0.38	0.40
Air conditioning & refrigeration	2F.1	0.41	0.53	0.60	0.53	0.37	0.19	0.21	0.22	0.24	0.26
Other sectors	2F, 2G	0.32	0.30	0.31	0.26	0.21	0.16	0.17	0.17	0.18	0.19
Calibration to UNFCCC 2005		0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24	0.24
whereof ETS sectors		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
whereof non-ETS sectors		23.09	21.53	23.48	23.23	23.77	23.84	24.30	24.66	24.92	25.26
Total non-CO_2 GHGs		23.09	21.53	23.48	23.23	23.77	23.84	24.30	24.66	24.92	25.26

Italy

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		50.34	46.43	44.22	41.43	38.67	37.21	36.77	37.03	36.96	37.26
Total N_2O		28.40	19.28	20.79	20.51	20.07	19.76	19.40	19.10	18.96	18.76
Total F-gases		12.54	15.88	16.17	13.56	10.50	7.16	7.46	7.78	8.15	8.55
Agriculture	3A, 3B, 3C, 3D, 3F	32.38	29.92	31.65	30.61	30.26	29.97	29.59	29.25	29.06	28.88
Energy	1A, 1B	11.37	10.32	10.39	10.56	10.01	9.75	9.51	9.29	8.79	8.55
Industry	2B, 2C, 2E, 2G	9.87	2.52	2.38	1.99	2.01	2.04	2.10	2.16	2.21	2.26
Waste	5A, 5B, 5C	20.95	18.19	15.77	13.86	11.46	10.15	9.88	10.28	10.69	11.14
Wastewater	5D	4.11	4.14	4.15	4.24	4.31	4.38	4.46	4.54	4.60	4.64
Air conditioning & refrigeration	2F.1	8.43	11.90	12.26	9.87	7.04	3.89	4.11	4.35	4.66	5.00
Other sectors	2F, 2G	2.56	2.97	2.96	2.76	2.54	2.34	2.38	2.42	2.45	2.48
Calibration to UNFCCC 2005		1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61	1.61
whereof ETS sectors		7.66	0.73	0.61	0.18	0.19	0.20	0.22	0.23	0.25	0.26
whereof non-ETS sectors		83.60	80.86	80.56	75.32	69.04	63.92	63.42	63.67	63.83	64.31
Total non-CO_2 GHGs		91.27	81.58	81.17	75.50	69.23	64.13	63.64	63.90	64.07	64.57

Latvia

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		2.00	1.95	1.88	1.45	1.41	1.38	1.34	1.33	1.35	1.36
Total N_2O		1.28	1.34	1.37	1.37	1.39	1.40	1.39	1.39	1.41	1.43
Total F-gases		0.05	0.14	0.19	0.18	0.12	0.07	0.07	0.07	0.08	0.08
Agriculture	3A, 3B, 3C, 3D, 3F	2.04	2.10	2.18	2.12	2.12	2.14	2.13	2.13	2.16	2.19
Energy	1A, 1B	0.28	0.24	0.24	0.22	0.20	0.20	0.19	0.18	0.18	0.18
Industry	2B, 2C, 2E, 2G	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Waste	5A, 5B, 5C	0.63	0.69	0.56	0.22	0.21	0.18	0.16	0.16	0.16	0.16
Wastewater	5D	0.26	0.20	0.21	0.22	0.21	0.21	0.21	0.21	0.21	0.21
Air conditioning & refrigeration	2F.1	0.05	0.13	0.19	0.17	0.11	0.06	0.06	0.06	0.07	0.07
Other sectors	2F, 2G	0.04	0.03	0.03	0.03	0.03	0.03	0.02	0.02	0.02	0.02
Calibration to UNFCCC 2005		0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
whereof ETS sectors		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
whereof non-ETS sectors		3.33	3.42	3.44	3.00	2.93	2.85	2.80	2.79	2.83	2.87
Total non-CO_2 GHGs		3.33	3.42	3.44	3.00	2.93	2.85	2.80	2.79	2.83	2.87

Lithuania

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		3.97	4.05	3.64	2.99	2.81	2.71	2.54	2.54	2.57	2.59
Total N_2O		5.15	3.56	3.55	3.10	3.13	3.15	3.14	3.16	3.20	3.23
Total F-gases		0.16	0.32	0.37	0.33	0.23	0.12	0.11	0.12	0.12	0.13
Agriculture	3A, 3B, 3C, 3D, 3F	5.44	5.45	5.50	5.38	5.44	5.51	5.46	5.51	5.56	5.60
Energy	1A, 1B	0.49	0.49	0.44	0.40	0.37	0.32	0.30	0.30	0.30	0.30
Industry	2B, 2C, 2E, 2G	2.32	0.71	0.65	0.21	0.21	0.21	0.20	0.21	0.21	0.22
Waste	5A, 5B, 5C	1.27	1.39	1.03	0.53	0.38	0.30	0.19	0.19	0.19	0.19
Wastewater	5D	0.32	0.31	0.31	0.29	0.28	0.26	0.25	0.25	0.25	0.26
Air conditioning & refrigeration	2F.1	0.15	0.30	0.34	0.30	0.21	0.10	0.10	0.10	0.11	0.11
Other sectors	2F, 2G	0.06	0.07	0.06	0.06	0.05	0.04	0.04	0.04	0.04	0.04
Calibration to UNFCCC 2005		-0.77	-0.77	-0.77	-0.77	-0.77	-0.77	-0.77	-0.77	-0.77	-0.77
whereof ETS sectors		2.32	0.70	0.64	0.21	0.21	0.20	0.20	0.20	0.21	0.21
whereof non-ETS sectors		6.96	7.24	6.92	6.20	5.96	5.77	5.59	5.62	5.69	5.74
Total non-CO_2 GHGs		9.28	7.94	7.56	6.41	6.17	5.97	5.79	5.82	5.89	5.95

Luxembourg

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		0.58	0.59	0.58	0.58	0.58	0.58	0.59	0.60	0.61	0.60
Total N_2O		0.30	0.32	0.32	0.32	0.34	0.35	0.36	0.37	0.38	0.38
Total F-gases		0.05	0.06	0.09	0.09	0.06	0.03	0.03	0.04	0.04	0.04
Agriculture	3A, 3B, 3C, 3D, 3F	0.64	0.71	0.69	0.66	0.67	0.67	0.67	0.66	0.65	0.64
Energy	1A, 1B	0.16	0.13	0.15	0.17	0.18	0.19	0.20	0.22	0.23	0.23
Industry	2B, 2C, 2E, 2G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste	5A, 5B, 5C	0.06	0.05	0.04	0.04	0.04	0.04	0.04	0.04	0.05	0.05
Wastewater	5D	0.02	0.02	0.03	0.03	0.03	0.04	0.04	0.04	0.05	0.05
Air conditioning & refrigeration	2F.1	0.04	0.05	0.08	0.08	0.05	0.03	0.03	0.03	0.03	0.04
Other sectors	2F, 2G	0.02	0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.02
Calibration to UNFCCC 2005		-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
whereof ETS sectors		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
whereof non-ETS sectors		0.92	0.98	0.99	0.99	0.98	0.96	0.98	1.00	1.02	1.02
Total non-CO_2 GHGs		0.92	0.98	0.99	0.99	0.98	0.96	0.98	1.00	1.02	1.02

Malta

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		0.17	0.15	0.15	0.13	0.11	0.11	0.10	0.10	0.11	0.11
Total N_2O		0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.06	0.06
Total F-gases		0.06	0.12	0.15	0.14	0.10	0.06	0.07	0.07	0.08	0.08
Agriculture	3A, 3B, 3C, 3D, 3F	0.12	0.10	0.10	0.10	0.09	0.09	0.09	0.09	0.09	0.09
Energy	1A, 1B	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Industry	2B, 2C, 2E, 2G	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Waste	5A, 5B, 5C	0.08	0.08	0.08	0.06	0.05	0.05	0.04	0.04	0.05	0.05
Wastewater	5D	0.02	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Air conditioning & refrigeration	2F.1	0.06	0.12	0.14	0.13	0.10	0.06	0.06	0.07	0.07	0.08
Other sectors	2F, 2G	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Calibration to UNFCCC 2005		-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
whereof ETS sectors		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
whereof non-ETS sectors		0.29	0.33	0.35	0.31	0.27	0.22	0.22	0.23	0.24	0.25
Total non-CO_2 GHGs		0.29	0.33	0.35	0.31	0.27	0.22	0.22	0.23	0.24	0.25

Netherlands

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		20.48	21.05	17.30	16.96	16.88	17.12	17.33	17.52	17.64	17.82
Total N_2O		13.84	9.36	9.64	8.79	8.64	8.71	8.61	8.68	8.75	8.87
Total F-gases		2.70	2.89	2.93	2.57	1.96	1.39	1.49	1.55	1.65	1.76
Agriculture	3A, 3B, 3C, 3D, 3F	19.14	19.62	20.27	19.69	19.41	19.59	19.77	19.90	19.91	20.01
Energy	1A, 1B	1.84	1.76	1.62	1.71	1.62	1.62	1.38	1.34	1.29	1.27
Industry	2B, 2C, 2E, 2G	6.91	2.38	2.42	1.69	1.76	1.83	1.94	2.04	2.15	2.26
Waste	5A, 5B, 5C	6.92	6.96	2.84	2.87	2.95	3.02	3.11	3.21	3.33	3.47
Wastewater	5D	0.99	0.92	0.93	0.95	0.97	0.99	1.00	1.02	1.03	1.05
Air conditioning & refrigeration	2F.1	1.43	1.92	2.04	1.72	1.15	0.68	0.72	0.74	0.80	0.86
Other sectors	2F, 2G	0.72	0.68	0.68	0.62	0.55	0.43	0.44	0.45	0.45	0.46
Calibration to UNFCCC 2005		-0.93	-0.93	-0.93	-0.93	-0.93	-0.93	-0.93	-0.93	-0.93	-0.93
whereof ETS sectors		5.54	1.23	1.30	0.50	0.52	0.55	0.59	0.62	0.65	0.68
whereof non-ETS sectors		31.47	32.08	28.57	27.82	26.96	26.68	26.84	27.14	27.39	27.78
Total non-CO_2 GHGs		37.02	33.31	29.86	28.31	27.48	27.23	27.43	27.76	28.04	28.45

Poland

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		46.98	43.56	43.47	38.68	37.33	37.56	36.29	34.80	34.22	34.52
Total N_2O		22.17	19.68	20.27	20.22	20.58	20.92	20.54	20.63	20.71	20.69
Total F-gases		5.59	7.81	9.42	8.60	6.69	3.58	3.81	4.02	4.23	4.38
Agriculture	3A, 3B, 3C, 3D, 3F	30.90	31.21	31.78	32.75	33.52	34.55	34.88	35.18	35.71	35.96
Energy	1A, 1B	17.69	14.94	14.87	14.27	12.36	11.45	9.51	7.36	6.00	5.76
Industry	2B, 2C, 2E, 2G	4.64	1.19	1.54	0.88	0.98	1.06	1.14	1.20	1.24	1.27
Waste	5A, 5B, 5C	10.31	10.11	9.70	5.12	5.16	5.51	5.42	5.83	6.16	6.42
Wastewater	5D	1.75	1.76	1.81	1.84	1.86	1.87	1.87	1.87	1.85	1.83
Air conditioning & refrigeration	2F.1	4.67	7.45	9.06	8.27	6.41	3.35	3.56	3.76	3.96	4.10
Other sectors	2F, 2G	1.29	0.88	0.88	0.85	0.80	0.74	0.74	0.74	0.74	0.73
Calibration to UNFCCC 2005		3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51	3.51
whereof ETS sectors		4.37	0.91	1.15	0.42	0.47	0.52	0.55	0.59	0.61	0.62
whereof non-ETS sectors		70.38	70.13	72.00	67.07	64.12	61.54	60.08	58.86	58.57	58.98
Total non-CO_2 GHGs		74.74	71.04	73.15	67.49	64.60	62.05	60.64	59.44	59.17	59.59

Portugal

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		14.00	13.25	11.82	10.04	9.81	8.68	8.66	8.77	8.87	8.94
Total N_2O		4.21	3.79	3.71	3.58	3.60	3.61	3.60	3.62	3.62	3.64
Total F-gases		0.94	1.40	1.40	1.23	0.92	0.55	0.56	0.57	0.58	0.60
Agriculture	3A, 3B, 3C, 3D, 3F	7.56	7.24	7.54	7.67	7.86	8.02	8.14	8.29	8.36	8.46
Energy	1A, 1B	1.36	0.96	1.00	0.90	0.89	0.82	0.77	0.73	0.73	0.71
Industry	2B, 2C, 2E, 2G	0.57	0.38	0.16	0.08	0.09	0.09	0.09	0.09	0.09	0.10
Waste	5A, 5B, 5C	5.87	6.17	4.61	2.71	2.28	1.05	0.93	0.94	0.95	0.96
Wastewater	5D	3.17	2.64	2.56	2.60	2.65	2.67	2.69	2.71	2.72	2.72
Air conditioning & refrigeration	2F.1	0.84	1.29	1.30	1.13	0.82	0.46	0.46	0.47	0.48	0.49
Other sectors	2F, 2G	0.22	0.22	0.21	0.20	0.20	0.20	0.20	0.20	0.19	0.19
Calibration to UNFCCC 2005		-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45	-0.45
whereof ETS sectors		0.54	0.33	0.11	0.04	0.04	0.04	0.04	0.04	0.04	0.05
whereof non-ETS sectors		18.60	18.11	16.82	14.81	14.29	12.81	12.78	12.92	13.02	13.13
Total non-CO_2 GHGs		19.14	18.44	16.93	14.85	14.33	12.85	12.82	12.96	13.07	13.17

Romania

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		35.27	31.34	30.74	28.19	27.85	26.77	26.20	26.78	27.47	28.30
Total N_2O		10.41	8.82	8.13	7.79	7.90	7.72	7.65	7.75	7.85	7.91
Total F-gases		1.05	0.79	0.97	0.93	0.72	0.45	0.46	0.48	0.50	0.52
Agriculture	3A, 3B, 3C, 3D, 3F	20.11	17.90	18.27	16.14	16.25	15.66	15.73	16.34	17.07	17.81
Energy	1A, 1B	4.42	3.96	3.53	3.70	3.54	3.24	3.13	3.12	3.13	3.23
Industry	2B, 2C, 2E, 2G	3.09	1.93	0.56	0.29	0.31	0.32	0.33	0.34	0.35	0.36
Waste	5A, 5B, 5C	4.89	3.38	3.56	2.88	2.70	2.33	1.75	1.81	1.85	1.89
Wastewater	5D	2.49	2.34	2.32	2.34	2.34	2.33	2.32	2.32	2.33	2.33
Air conditioning & refrigeration	2F.1	0.91	0.60	0.78	0.74	0.54	0.27	0.29	0.30	0.32	0.34
Other sectors	2F, 2G	0.35	0.36	0.35	0.34	0.32	0.30	0.30	0.30	0.30	0.29
Calibration to UNFCCC 2005		10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47	10.47
whereof ETS sectors		3.08	1.87	0.49	0.22	0.24	0.25	0.25	0.26	0.27	0.27
whereof non-ETS sectors		43.65	39.07	39.35	36.69	36.24	34.69	34.07	34.74	35.56	36.46
Total non-CO_2 GHGs		46.72	40.94	39.85	36.91	36.47	34.94	34.32	35.00	35.82	36.73

Slovakia

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		5.14	4.85	4.62	3.39	3.35	3.23	3.13	3.14	3.16	3.13
Total N_2O		3.70	3.54	2.64	2.52	2.50	2.49	2.47	2.46	2.45	2.44
Total F-gases		0.30	0.50	0.57	0.52	0.41	0.27	0.28	0.28	0.29	0.29
Agriculture	3A, 3B, 3C, 3D, 3F	3.00	2.62	2.60	2.49	2.45	2.45	2.44	2.43	2.41	2.40
Energy	1A, 1B	1.62	1.48	1.43	1.41	1.39	1.29	1.23	1.22	1.24	1.20
Industry	2B, 2C, 2E, 2G	1.30	1.34	0.30	0.15	0.16	0.17	0.18	0.18	0.18	0.18
Waste	5A, 5B, 5C	1.50	1.58	1.54	0.46	0.45	0.39	0.33	0.35	0.37	0.38
Wastewater	5D	0.83	0.79	0.80	0.81	0.83	0.84	0.85	0.85	0.85	0.84
Air conditioning & refrigeration	2F.1	0.21	0.40	0.48	0.44	0.33	0.18	0.19	0.20	0.20	0.21
Other sectors	2F, 2G	0.11	0.11	0.10	0.10	0.09	0.09	0.09	0.08	0.08	0.08
Calibration to UNFCCC 2005		0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57
whereof ETS sectors		1.28	1.32	0.28	0.13	0.14	0.14	0.15	0.15	0.15	0.15
whereof non-ETS sectors		7.86	7.57	7.54	6.31	6.13	5.84	5.73	5.74	5.76	5.71
Total non-CO_2 GHGs		9.15	8.89	7.83	6.44	6.27	5.99	5.88	5.89	5.90	5.86

Slovenia

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		2.37	2.02	1.98	1.80	1.73	1.68	1.69	1.67	1.66	1.66
Total N_2O		0.83	0.80	0.72	0.72	0.69	0.69	0.66	0.66	0.65	0.65
Total F-gases		0.27	0.22	0.26	0.22	0.17	0.11	0.11	0.11	0.11	0.11
Agriculture	3A, 3B, 3C, 3D, 3F	1.80	1.75	1.68	1.64	1.60	1.64	1.65	1.66	1.66	1.66
Energy	1A, 1B	0.46	0.48	0.48	0.46	0.45	0.43	0.40	0.35	0.32	0.31
Industry	2B, 2C, 2E, 2G	0.16	0.03	0.04	0.04	0.04	0.04	0.04	0.05	0.05	0.05
Waste	5A, 5B, 5C	0.77	0.49	0.45	0.32	0.27	0.20	0.20	0.20	0.21	0.21
Wastewater	5D	0.34	0.25	0.25	0.26	0.26	0.26	0.26	0.27	0.27	0.27
Air conditioning & refrigeration	2F.1	0.10	0.18	0.21	0.17	0.12	0.06	0.06	0.06	0.06	0.06
Other sectors	2F, 2G	0.05	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03	0.03
Calibration to UNFCCC 2005		-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19	-0.19
whereof ETS sectors		0.14	0.01	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
whereof non-ETS sectors		3.33	3.02	2.94	2.71	2.57	2.45	2.43	2.41	2.39	2.40
Total non-CO_2 GHGs		3.47	3.03	2.96	2.74	2.59	2.47	2.46	2.43	2.42	2.42

Spain

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		39.61	39.12	36.66	33.60	31.79	30.49	30.26	30.56	30.80	31.10
Total N_2O		25.03	23.56	23.91	24.68	24.59	24.11	24.09	24.14	24.23	24.34
Total F-gases		6.31	7.21	7.16	5.68	4.12	2.50	2.63	2.72	2.80	2.91
Agriculture	3A, 3B, 3C, 3D, 3F	36.66	35.30	35.79	37.79	37.86	37.64	37.77	37.94	38.05	38.24
Energy	1A, 1B	4.37	3.63	3.52	3.58	2.99	2.78	2.71	2.66	2.67	2.64
Industry	2B, 2C, 2E, 2G	2.25	1.11	0.84	0.67	0.69	0.73	0.77	0.79	0.81	0.85
Waste	5A, 5B, 5C	12.94	13.93	11.66	7.48	6.11	4.72	4.36	4.52	4.68	4.83
Wastewater	5D	3.38	3.38	3.36	3.37	3.35	3.35	3.37	3.42	3.46	3.51
Air conditioning & refrigeration	2F.1	4.17	5.28	5.46	4.36	3.22	1.76	1.84	1.90	1.96	2.04
Other sectors	2F, 2G	2.17	2.26	2.09	1.70	1.28	1.11	1.14	1.17	1.20	1.24
Calibration to UNFCCC 2005		5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01	5.01
whereof ETS sectors		1.56	0.59	0.37	0.16	0.17	0.17	0.18	0.18	0.18	0.19
whereof non-ETS sectors		69.40	69.31	67.37	63.79	60.34	56.92	56.79	57.23	57.65	58.16
Total non-CO_2 GHGs		70.95	69.89	67.73	63.96	60.50	57.09	56.97	57.41	57.83	58.35

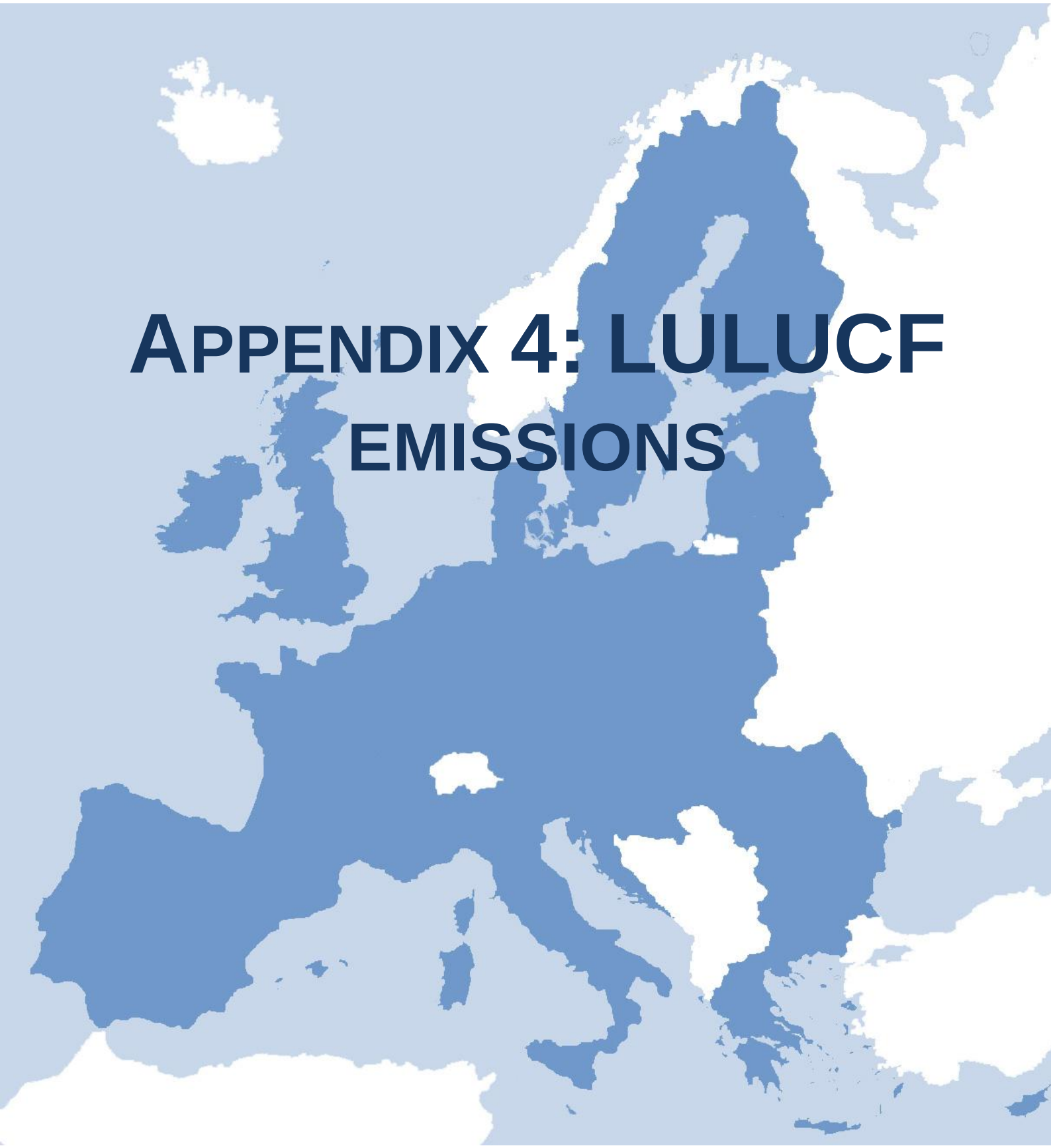
Sweden

Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		6.58	5.43	5.07	4.76	4.55	4.39	4.27	4.33	4.47	4.62
Total N_2O		5.05	4.97	4.79	4.73	4.75	4.77	4.72	4.63	4.71	4.76
Total F-gases		1.95	1.95	1.88	1.57	1.18	0.90	0.96	1.02	1.11	1.20
Agriculture	3A, 3B, 3C, 3D, 3F	7.04	6.88	6.86	6.77	6.76	6.85	6.94	7.01	7.11	7.26
Energy	1A, 1B	1.82	1.91	1.81	1.82	1.81	1.79	1.71	1.55	1.58	1.57
Industry	2B, 2C, 2E, 2G	0.84	0.55	0.18	0.11	0.12	0.12	0.13	0.13	0.14	0.15
Waste	5A, 5B, 5C	2.83	1.78	1.53	1.29	1.09	0.85	0.64	0.68	0.73	0.78
Wastewater	5D	0.83	0.83	0.85	0.87	0.89	0.91	0.93	0.95	0.96	0.98
Air conditioning & refrigeration	2F.1	1.10	1.34	1.48	1.19	0.81	0.55	0.60	0.66	0.74	0.82
Other sectors	2F, 2G	0.57	0.50	0.47	0.46	0.45	0.43	0.44	0.45	0.46	0.47
Calibration to UNFCCC 2005		-1.45	-1.45	-1.45	-1.45	-1.45	-1.45	-1.45	-1.45	-1.45	-1.45
whereof ETS sectors		0.72	0.48	0.14	0.08	0.08	0.08	0.09	0.09	0.09	0.10
whereof non-ETS sectors		12.87	11.86	11.60	10.99	10.40	9.97	9.86	9.90	10.19	10.48
Total non-CO_2 GHGs		13.59	12.35	11.74	11.06	10.48	10.06	9.94	9.98	10.28	10.58

United Kingdom Non-CO_2 GHG emissions Reference scenario

Non-CO_2 GHG in Mt CO_2eq	UNFCCC CRF code 2015	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total CH_4		92.26	64.48	52.22	45.81	41.51	35.67	33.07	33.09	32.25	31.84
Total N_2O		31.39	27.75	27.74	26.31	26.33	25.93	25.90	25.95	25.69	25.71
Total F-gases		9.52	10.30	10.56	8.75	6.45	4.05	4.29	4.57	4.90	5.23
Agriculture	3A, 3B, 3C, 3D, 3F	50.87	47.91	48.53	46.96	46.50	46.47	46.49	46.95	46.37	46.25
Energy	1A, 1B	23.94	19.03	15.14	12.88	12.55	10.02	9.09	8.28	7.31	6.58
Industry	2B, 2C, 2E, 2G	4.21	2.14	1.14	0.73	0.74	0.76	0.80	0.84	0.87	0.90
Waste	5A, 5B, 5C	49.60	27.98	19.45	15.71	12.10	8.24	6.32	6.55	6.80	7.09
Wastewater	5D	5.23	4.85	5.00	5.10	5.19	5.32	5.48	5.65	5.81	5.95
Air conditioning & refrigeration	2F.1	4.45	6.38	6.86	5.61	3.90	2.07	2.24	2.43	2.68	2.92
Other sectors	2F, 2G	4.59	3.98	4.13	3.61	3.04	2.49	2.56	2.65	2.74	2.82
Calibration to UNFCCC 2005		-9.73	-9.73	-9.73	-9.73	-9.73	-9.73	-9.73	-9.73	-9.73	-9.73
whereof ETS sectors		2.95	1.40	0.63	0.21	0.21	0.22	0.23	0.24	0.25	0.26
whereof non-ETS sectors		130.22	101.14	89.89	80.66	74.08	65.43	63.03	63.37	62.59	62.52
Total non-CO_2 GHGs		133.16	102.54	90.52	80.87	74.29	65.65	63.26	63.61	62.84	62.78



APPENDIX 4: LULUCF EMISSIONS

EU-28

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-376.8**	**-337.1**	**-368.1**	**-358.5**	**-327.8**	**-328.0**	**-321.0**	**-308.6**	**-295.5**	**-279.4**	**-266.5**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-396.4	-353.7	-373.4	-342.0	-289.5	-266.0	-242.1	-215.9	-193.8	-169.1	-151.4
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-31.1	-46.2	-56.8	-67.8	-78.7	-89.2	-99.0	-107.2	-113.8	-119.3	-123.1
Forest Land converted		Deforestation	Biomass, soil	50.6	62.8	62.0	51.3	40.5	27.3	20.0	14.6	12.0	9.1	8.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**64.5**	**61.0**	**57.6**	**55.1**	**52.7**	**51.2**	**49.8**	**44.7**	**39.5**	**41.2**	**42.9**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	60.1	56.3	52.5	49.8	47.2	45.9	44.5	42.3	40.1	38.5	36.9
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	4.4	4.8	5.2	5.3	5.4	5.4	5.3	2.3	-0.6	2.7	6.0
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-5.0**	**-9.3**	**-13.7**	**-16.7**	**-19.4**	**-18.9**	**-18.6**	**-18.9**	**-19.2**	**-18.8**	**-18.5**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	25.6	24.7	23.7	22.5	21.7	21.4	21.0	20.8	20.6	21.4	22.2
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-30.7	-34.0	-37.4	-39.2	-41.1	-40.3	-39.6	-39.7	-39.9	-40.2	-40.7
Total Wetlands	**4D**	**Wetlands**		**11.7**	**13.9**	**12.4**	**12.4**	**12.4**	**12.4**	**12.4**	**12.4**	**12.4**	**12.4**	**12.4**
Total Settlements	**4E**	**Settlements**		**27.8**	**28.0**	**29.3**	**27.5**	**26.3**	**23.3**	**20.2**	**18.0**	**16.4**	**15.2**	**14.3**
Total Other land	**4F**	**Other land**		**-1.8**	**-1.7**	**-1.7**	**-1.7**	**-1.7**	**-1.7**	**-1.7**	**-1.7**	**-1.7**	**-1.7**	**-1.7**
Harvested Wood Products		**Harvested Wood Products**		**-33.6**	**-53.8**	**-33.0**	**-26.9**	**-28.1**	**-28.9**	**-29.2**	**-28.5**	**-27.8**	**-27.0**	**-26.5**
LULUCF	**4**	**LULUCF**		**-313.3**	**-299.1**	**-317.2**	**-308.7**	**-285.6**	**-290.5**	**-288.0**	**-282.6**	**-275.9**	**-258.1**	**-243.6**

Source: G4M, GLOBIOM

Austria

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-9.6**	**-4.9**	**-3.2**	**-5.5**	**-8.0**	**-6.1**	**-4.6**	**-3.3**	**-1.3**	**-1.0**	**-0.6**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-10.7	-5.9	-3.4	-4.7	-6.3	-4.0	-2.0	-0.5	1.8	2.3	2.6
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.9	-1.2	-1.5	-1.8	-2.2	-2.5	-2.8	-3.0	-3.2	-3.4	-3.5
Forest Land converted		Deforestation	Biomass, soil	1.9	2.2	1.7	1.0	0.6	0.4	0.2	0.2	0.1	0.1	0.3
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**-0.1**	**-0.3**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.0	0.0	-0.1	-0.3
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.0
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.1**	**-0.1**	**-0.2**	**-0.2**	**-0.2**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**0.0**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.1	-0.1	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Total Settlements	**4E**	**Settlements**		**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-0.9**	**-1.4**	**-0.5**	**1.0**	**0.7**	**0.5**	**0.3**	**0.1**	**0.1**	**0.1**	**0.1**
LULUCF	**4**	**LULUCF**		**-10.5**	**-6.3**	**-3.6**	**-4.5**	**-7.2**	**-5.5**	**-4.1**	**-3.0**	**-1.1**	**-0.9**	**-0.8**

Source: G4M, GLOBIOM

Belgium

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-3.5**	**-3.1**	**-3.1**	**-3.5**	**-3.6**	**-3.7**	**-3.7**	**-3.8**	**-3.9**	**-4.0**	**-4.2**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-3.9	-3.5	-3.5	-3.6	-3.5	-3.5	-3.4	-3.4	-3.4	-3.4	-3.6
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.2	-0.2	-0.3	-0.3	-0.3	-0.4	-0.4	-0.5	-0.5	-0.6	-0.6
Forest Land converted		Deforestation	Biomass, soil	0.5	0.6	0.6	0.3	0.2	0.2	0.1	0.1	0.1	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.0**	**0.0**	**0.0**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.0	0.0	0.0	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.4**	**-0.4**	**-0.5**	**-0.5**	**-0.5**	**-0.4**	**-0.3**	**-0.3**	**-0.4**	**-0.4**	**-0.4**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	-0.2	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.2	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.3	-0.3
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.2**	**0.2**	**0.3**	**0.3**	**0.2**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.0**	**-0.2**	**0.1**	**0.2**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
LULUCF	**4**	**LULUCF**		**-3.6**	**-3.4**	**-3.2**	**-3.6**	**-3.9**	**-3.9**	**-4.0**	**-4.1**	**-4.2**	**-4.4**	**-4.6**

Source: G4M, GLOBIOM

Bulgaria

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-11.5**	**-10.0**	**-10.5**	**-10.2**	**-11.4**	**-11.5**	**-11.4**	**-10.8**	**-10.0**	**-9.0**	**-8.1**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-11.6	-9.8	-10.0	-9.3	-10.1	-9.6	-9.1	-8.0	-6.9	-5.4	-4.2
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	0.0	-0.4	-0.7	-1.0	-1.5	-1.9	-2.3	-2.8	-3.2	-3.5	-3.9
Forest Land converted		Deforestation	Biomass, soil	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**2.0**	**1.5**	**1.1**	**1.0**	**0.8**	**0.7**	**0.6**	**0.1**	**-0.3**	**-0.1**	**0.2**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	1.9	1.4	1.0	0.8	0.6	0.5	0.5	0.3	0.1	0.1	0.1
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.1	0.1	0.1	0.2	0.2	0.2	0.1	-0.2	-0.5	-0.2	0.1
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.1**	**-0.7**	**-1.2**	**-1.2**	**-1.3**	**-0.8**	**-0.3**	**-0.2**	**-0.2**	**-0.2**	**-0.2**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.1	-0.7	-1.2	-1.2	-1.3	-0.8	-0.3	-0.2	-0.2	-0.2	-0.2
Total Wetlands	**4D**	**Wetlands**		**0.1**	**0.2**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**
Total Settlements	**4E**	**Settlements**		**0.6**	**0.6**	**0.9**	**1.0**	**1.0**	**0.9**	**0.7**	**0.6**	**0.5**	**0.5**	**0.4**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**1.3**	**0.6**	**0.8**	**0.8**	**0.6**	**0.5**	**0.4**	**0.2**	**0.1**	**-0.1**	**-0.1**
LULUCF	**4**	**LULUCF**		**-7.7**	**-7.7**	**-8.7**	**-8.4**	**-10.0**	**-9.8**	**-9.7**	**-9.8**	**-9.7**	**-8.6**	**-7.5**

Source: G4M, GLOBIOM

Croatia

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-7.9**	**-7.1**	**-6.4**	**-4.3**	**-4.0**	**-4.2**	**-4.5**	**-3.9**	**-3.3**	**-3.2**	**-3.1**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-7.9	-7.3	-6.5	-4.2	-3.7	-3.8	-4.0	-3.3	-2.7	-2.4	-2.4
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.1	-0.1	-0.2	-0.2	-0.3	-0.4	-0.5	-0.6	-0.7	-0.7	-0.8
Forest Land converted		Deforestation	Biomass, soil	0.0	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.1**	**0.2**	**0.3**	**0.3**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.5**	**0.5**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.2**	**-0.3**	**-0.4**	**-0.5**	**-0.4**	**-0.3**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.1	-0.1	-0.1	-0.1	-0.1	-0.2	-0.3	-0.4	-0.5	-0.4	-0.3
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.2**	**0.4**	**0.4**	**0.5**	**0.6**	**0.5**	**0.4**	**0.3**	**0.3**	**0.3**	**0.2**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.0**	**-0.1**	**-0.1**	**0.0**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
LULUCF	**4**	**LULUCF**		**-7.6**	**-6.8**	**-5.9**	**-3.6**	**-3.2**	**-3.6**	**-4.1**	**-3.6**	**-3.2**	**-2.9**	**-2.8**

Source: G4M, GLOBIOM

Cyprus

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-0.7	-0.7	-0.7	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forest Land converted		Deforestation	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
LULUCF	**4**	**LULUCF**		**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.6**

Source: G4M, GLOBIOM

Czech Republic

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-9.0**	**-7.3**	**-5.3**	**-6.7**	**-6.0**	**-6.2**	**-6.1**	**-6.0**	**-5.8**	**-5.2**	**-5.3**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-9.1	-7.4	-5.3	-6.5	-5.7	-5.7	-5.4	-5.1	-4.8	-4.1	-4.1
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.2	-0.2	-0.3	-0.4	-0.5	-0.7	-0.8	-0.9	-1.0	-1.1	-1.2
Forest Land converted		Deforestation	Biomass, soil	0.3	0.3	0.3	0.3	0.2	0.1	0.1	0.1	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.1**	**0.0**	**-0.1**	**-0.2**	**-0.3**	**-0.3**	**-0.4**	**-0.5**	**-0.6**	**-0.6**	**-0.6**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.1	0.0	-0.1	-0.1	-0.2	-0.3	-0.3	-0.4	-0.4	-0.5	-0.5
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	-0.1	-0.1	-0.1	-0.1
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.4**	**-0.5**	**-0.6**	**-0.7**	**-0.8**	**-0.8**	**-0.8**	**-1.0**	**-1.2**	**-1.7**	**-2.1**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.4	-0.5	-0.6	-0.7	-0.8	-0.8	-0.8	-1.0	-1.2	-1.7	-2.1
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.0**	**-1.2**	**-0.5**	**0.0**	**0.0**	**0.0**	**0.0**	**-0.1**	**0.0**	**0.0**	**0.1**
LULUCF	**4**	**LULUCF**		**-9.3**	**-9.0**	**-6.5**	**-7.5**	**-7.1**	**-7.3**	**-7.3**	**-7.5**	**-7.5**	**-7.4**	**-8.0**

Source: G4M, GLOBIOM

Denmark

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**1.4**	**0.8**	**-0.1**	**-0.3**	**0.0**	**0.1**	**0.1**	**-0.2**	**-0.5**	**-0.8**	**-1.0**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	1.4	0.8	0.0	-0.1	0.4	0.7	0.8	0.7	0.6	0.4	0.3
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	0.0	-0.1	-0.3	-0.4	-0.5	-0.7	-0.9	-1.0	-1.2	-1.4	-1.5
Forest Land converted		Deforestation	Biomass, soil	0.0	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**4.6**	**4.4**	**4.1**	**3.9**	**3.8**	**3.8**	**3.8**	**3.8**	**3.7**	**3.7**	**3.7**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	4.6	4.4	4.1	3.9	3.8	3.8	3.8	3.8	3.7	3.7	3.7
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**0.8**	**0.8**	**0.8**	**0.8**	**0.8**	**0.9**	**1.0**	**1.1**	**1.2**	**1.1**	**1.1**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.8	0.7	0.7	0.7	0.6	0.8	0.9	1.0	1.1	1.1	1.1
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	0.0	0.1	0.1	0.1	0.2	0.2	0.1	0.1	0.0	0.0	0.0
Total Wetlands	**4D**	**Wetlands**		**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Total Settlements	**4E**	**Settlements**		**0.0**	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.1**	**0.0**	**-0.3**	**-0.4**	**-0.3**	**-0.3**	**-0.3**	**-0.2**	**-0.2**	**-0.2**	**-0.2**
LULUCF	**4**	**LULUCF**		**7.1**	**6.1**	**4.7**	**4.3**	**4.5**	**4.7**	**4.9**	**4.6**	**4.4**	**4.0**	**3.8**

Source: G4M, GLOBIOM

Estonia

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-0.6**	**-4.8**	**-2.1**	**-0.5**	**1.7**	**1.8**	**2.2**	**2.1**	**2.3**	**2.4**	**2.2**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-0.1	-4.8	-2.3	-0.7	1.9	2.3	2.8	2.9	3.2	3.4	3.2
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.5	-0.6	-0.6	-0.7	-0.7	-0.8	-0.9	-1.0	-1.0	-1.1	-1.2
Forest Land converted		Deforestation	Biomass, soil	0.1	0.6	0.9	0.8	0.6	0.4	0.3	0.2	0.1	0.1	0.1
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**-0.2**	**-0.1**	**0.0**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1	0.0
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.5**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.3**	**-0.3**	**-0.3**	**-0.3**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	-0.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Total Wetlands	**4D**	**Wetlands**		**0.8**	**1.2**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**	**1.0**
Total Settlements	**4E**	**Settlements**		**0.0**	**0.0**	**0.1**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-0.2**	**0.9**	**0.3**	**-0.2**	**-0.2**	**-0.2**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
LULUCF	**4**	**LULUCF**		**-0.2**	**-3.0**	**-0.9**	**0.1**	**2.5**	**2.7**	**3.0**	**2.9**	**2.9**	**3.0**	**2.9**

Source: G4M, GLOBIOM

Finland

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-28.9**	**-30.3**	**-32.4**	**-24.1**	**-22.6**	**-20.5**	**-17.6**	**-13.2**	**-8.2**	**-4.2**	**-2.1**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-32.2	-35.4	-37.9	-28.8	-24.8	-21.4	-17.7	-12.8	-7.5	-3.2	-0.9
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.5	-0.5	-0.6	-0.7	-0.7	-0.8	-0.9	-1.1	-1.2	-1.3	-1.5
Forest Land converted		Deforestation	Biomass, soil	3.7	5.6	6.0	5.4	2.9	1.8	1.1	0.7	0.5	0.3	0.3
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**4.6**	**4.8**	**5.0**	**5.0**	**5.0**	**4.7**	**4.4**	**4.5**	**4.6**	**4.8**	**5.0**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	3.9	4.0	4.1	4.0	4.0	3.9	3.8	3.7	3.6	3.6	3.6
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.8	0.9	0.9	1.0	1.1	0.8	0.6	0.8	1.0	1.2	1.3
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**1.0**	**0.9**	**0.9**	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	**1.0**	**1.0**	**1.0**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	1.0	0.9	0.9	1.1	1.1	1.1	1.1	1.1	1.0	0.9	0.9
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total Wetlands	**4D**	**Wetlands**		**1.7**	**2.1**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**	**2.2**
Total Settlements	**4E**	**Settlements**		**0.0**	**0.0**	**0.0**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-6.2**	**-8.0**	**-6.0**	**-6.5**	**-6.1**	**-6.0**	**-5.9**	**-6.2**	**-6.4**	**-6.1**	**-5.9**
LULUCF	**4**	**LULUCF**		**-27.8**	**-30.5**	**-30.2**	**-22.0**	**-20.1**	**-18.3**	**-15.7**	**-11.6**	**-6.7**	**-2.2**	**0.3**

Source: G4M, GLOBIOM

France

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-27.2**	**-45.1**	**-42.1**	**-43.5**	**-30.1**	**-31.6**	**-31.6**	**-31.3**	**-33.1**	**-32.3**	**-31.6**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-40.0	-59.3	-52.3	-48.3	-29.5	-27.3	-23.7	-19.5	-19.5	-16.3	-14.1
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-3.1	-6.2	-8.2	-10.1	-11.9	-13.7	-15.6	-17.2	-18.5	-19.5	-20.3
Forest Land converted		Deforestation	Biomass, soil	15.9	20.3	18.4	14.9	11.3	9.5	7.7	5.5	4.9	3.5	2.9
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**17.7**	**16.8**	**15.8**	**15.1**	**14.3**	**14.4**	**14.4**	**12.2**	**9.9**	**11.4**	**12.9**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	15.3	14.5	13.7	13.0	12.3	12.2	12.1	11.9	11.7	11.6	11.5
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	2.4	2.3	2.2	2.1	2.1	2.2	2.3	0.2	-1.8	-0.2	1.4
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-17.9**	**-17.9**	**-17.9**	**-18.3**	**-18.6**	**-19.3**	**-20.1**	**-19.9**	**-19.9**	**-19.7**	**-19.6**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-17.9	-17.9	-17.9	-18.3	-18.6	-19.3	-20.1	-19.9	-19.9	-19.7	-19.6
Total Wetlands	**4D**	**Wetlands**		**-2.2**	**-1.9**	**-2.4**	**-2.4**	**-2.4**	**-2.4**	**-2.4**	**-2.4**	**-2.4**	**-2.4**	**-2.4**
Total Settlements	**4E**	**Settlements**		**7.3**	**7.5**	**7.5**	**5.1**	**4.6**	**3.7**	**3.0**	**2.6**	**2.3**	**2.0**	**1.8**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-5.4**	**-4.7**	**-5.3**	**-5.7**	**-5.2**	**-4.8**	**-4.4**	**-4.2**	**-3.9**	**-3.6**	**-3.5**
LULUCF	**4**	**LULUCF**		**-27.6**	**-45.3**	**-44.4**	**-49.6**	**-37.4**	**-40.0**	**-41.0**	**-43.0**	**-47.1**	**-44.7**	**-42.4**

Source: G4M, GLOBIOM

Germany

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-39.8**	**-38.0**	**-45.3**	**-50.2**	**-46.8**	**-45.7**	**-43.9**	**-44.3**	**-44.3**	**-42.1**	**-40.1**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-44.3	-41.7	-46.5	-48.7	-42.9	-40.1	-37.0	-36.2	-35.3	-32.5	-30.3
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-2.7	-4.2	-5.1	-5.9	-6.6	-7.4	-8.1	-8.8	-9.4	-9.8	-10.0
Forest Land converted		Deforestation	Biomass, soil	7.2	7.9	6.2	4.4	2.7	1.8	1.2	0.7	0.3	0.2	0.2
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**13.2**	**13.0**	**12.7**	**12.4**	**12.2**	**11.9**	**11.6**	**11.4**	**11.2**	**11.0**	**10.8**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	12.7	12.4	12.1	11.7	11.3	10.9	10.5	10.3	10.1	9.8	9.5
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.5	0.6	0.6	0.8	0.9	1.0	1.1	1.1	1.1	1.2	1.3
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**21.2**	**20.5**	**19.8**	**19.2**	**18.6**	**18.9**	**19.1**	**19.1**	**19.2**	**20.0**	**20.8**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	20.2	19.4	18.6	17.7	17.0	16.9	16.8	16.8	16.9	17.9	19.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	1.0	1.1	1.3	1.4	1.6	1.9	2.3	2.3	2.4	2.1	1.8
Total Wetlands	**4D**	**Wetlands**		**3.0**	**2.7**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**	**2.5**
Total Settlements	**4E**	**Settlements**		**1.8**	**1.4**	**1.7**	**1.6**	**1.6**	**1.5**	**1.4**	**1.3**	**1.3**	**1.2**	**1.2**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-6.6**	**-14.5**	**-6.7**	**-5.3**	**-5.6**	**-5.6**	**-5.5**	**-5.4**	**-5.4**	**-5.2**	**-5.1**
LULUCF	**4**	**LULUCF**		**-7.2**	**-14.9**	**-15.3**	**-19.7**	**-17.4**	**-16.4**	**-14.7**	**-15.3**	**-15.4**	**-12.5**	**-9.9**

Source: G4M, GLOBIOM

Greece

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-0.8**	**-2.0**	**-2.8**	**-1.3**	**-0.5**	**-0.5**	**-0.3**	**-0.3**	**-0.2**	**-0.3**	**-0.1**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-0.7	-2.0	-2.7	-1.2	-0.4	-0.4	-0.2	-0.2	-0.1	-0.1	0.0
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Forest Land converted		Deforestation	Biomass, soil	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**-0.3**	**-0.4**	**-0.5**	**-0.5**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.5**	**-0.5**	**-0.5**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.3	-0.3	-0.3
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	-0.2	-0.2	-0.3	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.2**	**-0.7**	**-1.2**	**-1.4**	**-1.7**	**-1.5**	**-1.2**	**-1.1**	**-1.0**	**-0.8**	**-0.7**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.2	-0.7	-1.2	-1.4	-1.7	-1.5	-1.2	-1.1	-1.0	-0.8	-0.7
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Harvested Wood Products		**Harvested Wood Products**		**0.0**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.1**
LULUCF	**4**	**LULUCF**		**-1.1**	**-2.9**	**-4.2**	**-2.9**	**-2.3**	**-2.1**	**-1.7**	**-1.6**	**-1.4**	**-1.3**	**-1.1**

Source: G4M, GLOBIOM

Hungary

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-1.6**	**-2.2**	**-2.7**	**-2.4**	**-2.9**	**-3.1**	**-3.7**	**-4.0**	**-4.3**	**-4.4**	**-4.4**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-1.6	-1.5	-1.7	-1.2	-1.1	-0.7	-0.8	-0.7	-0.8	-0.8	-0.7
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.6	-1.1	-1.5	-1.9	-2.3	-2.7	-3.1	-3.4	-3.5	-3.7	-3.7
Forest Land converted		Deforestation	Biomass, soil	0.6	0.5	0.6	0.7	0.6	0.4	0.2	0.1	0.1	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**-0.5**	**-0.6**	**-0.6**	**-0.6**	**-0.7**	**-0.8**	**-0.8**	**-0.9**	**-1.0**	**-1.1**	**-1.2**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	-0.5	-0.6	-0.6	-0.6	-0.6	-0.7	-0.8	-0.9	-1.0	-1.1	-1.2
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.3**	**-0.5**	**-0.8**	**-0.8**	**-0.8**	**-0.9**	**-0.9**	**-0.9**	**-1.0**	**-1.0**	**-0.9**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.3	-0.5	-0.8	-0.8	-0.8	-0.9	-0.9	-0.9	-1.0	-1.0	-0.9
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.1**	**0.1**	**0.1**	**0.2**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-0.6**	**-0.7**	**-0.5**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.4**	**-0.3**
LULUCF	**4**	**LULUCF**		**-3.0**	**-3.9**	**-4.5**	**-4.1**	**-4.5**	**-5.0**	**-5.7**	**-6.1**	**-6.5**	**-6.7**	**-6.8**

Source: G4M, GLOBIOM

Ireland

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-2.8**	**-2.3**	**-2.5**	**-2.8**	**-3.0**	**-3.0**	**-2.9**	**-2.9**	**-3.1**	**-3.3**	**-3.5**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-1.0	-0.6	-0.7	-0.5	-0.5	-0.1	0.3	0.8	1.1	1.4	1.7
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-1.9	-2.1	-2.3	-2.5	-2.8	-3.1	-3.5	-3.9	-4.3	-4.8	-5.3
Forest Land converted		Deforestation	Biomass, soil	0.1	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**-0.2**	**-0.3**	**-0.4**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.0	0.0	0.1	0.0	0.0	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.1	0.1	0.1	0.2	0.3	0.1	0.0	-0.1	-0.2
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**5.2**	**5.1**	**5.1**	**5.1**	**5.1**	**5.0**	**4.9**	**4.7**	**4.4**	**4.3**	**4.1**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	5.2	5.1	5.1	5.0	4.9	4.8	4.7	4.6	4.4	4.2	4.1
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	0.0	0.0	0.0	0.1	0.2	0.2	0.2	0.1	0.0	0.0	0.0
Total Wetlands	**4D**	**Wetlands**		**1.4**	**2.3**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**	**1.9**
Total Settlements	**4E**	**Settlements**		**0.1**	**0.2**	**0.2**	**0.3**	**0.3**	**0.3**	**0.2**	**0.2**	**0.2**	**0.2**	**0.1**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-1.0**	**-0.8**	**-0.6**	**-0.6**	**-0.6**	**-0.6**	**-0.7**	**-0.8**	**-0.8**	**-0.8**	**-0.8**
LULUCF	**4**	**LULUCF**		**2.9**	**4.6**	**4.2**	**4.1**	**3.8**	**3.7**	**3.5**	**3.1**	**2.5**	**2.0**	**1.4**

Source: G4M, GLOBIOM

Italy

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-29.2**	**-31.8**	**-34.6**	**-34.8**	**-33.5**	**-33.7**	**-34.0**	**-32.6**	**-30.2**	**-28.0**	**-24.9**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-26.4	-26.7	-27.7	-26.2	-22.8	-21.1	-19.7	-17.0	-13.7	-10.8	-7.4
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-3.6	-6.0	-7.9	-9.8	-11.7	-13.4	-14.8	-16.0	-16.7	-17.3	-17.6
Forest Land converted		Deforestation	Biomass, soil	0.8	0.9	1.0	1.3	1.0	0.8	0.5	0.4	0.3	0.2	0.1
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**2.0**	**1.7**	**1.4**	**0.9**	**0.5**	**0.7**	**0.8**	**1.3**	**1.8**	**1.6**	**1.4**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	1.6	1.3	0.9	0.6	0.3	0.3	0.3	0.7	1.1	0.9	0.8
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.4	0.5	0.5	0.4	0.2	0.4	0.5	0.6	0.7	0.7	0.6
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-3.5**	**-5.0**	**-6.5**	**-6.9**	**-7.3**	**-6.5**	**-5.8**	**-6.1**	**-6.5**	**-6.0**	**-5.5**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	-1.5	-1.4	-1.4	-1.3	-1.3	-1.3	-1.4	-1.3	-1.3	-1.4	-1.4
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-1.9	-3.6	-5.2	-5.6	-6.0	-5.2	-4.5	-4.8	-5.2	-4.6	-4.1
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**6.1**	**5.5**	**5.5**	**6.0**	**5.5**	**4.8**	**4.0**	**3.3**	**2.9**	**2.6**	**2.3**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.3**	**1.8**	**1.5**	**1.6**	**1.7**	**1.6**	**1.5**	**1.6**	**1.7**	**1.2**	**0.8**
LULUCF	**4**	**LULUCF**		**-24.1**	**-27.8**	**-32.7**	**-33.1**	**-33.0**	**-33.2**	**-33.6**	**-32.4**	**-30.3**	**-28.6**	**-25.9**

Source: G4M, GLOBIOM

Latvia

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-3.8**	**-5.7**	**-6.1**	**-4.8**	**2.2**	**0.1**	**-0.8**	**-1.1**	**-0.5**	**-0.7**	**-0.4**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-5.3	-6.6	-6.6	-5.6	-2.6	-1.3	-0.3	-0.1	1.0	1.1	1.6
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	0.4	0.0	-0.3	-0.5	-0.8	-1.1	-1.5	-1.8	-2.0	-2.3	-2.6
Forest Land converted		Deforestation	Biomass, soil	1.1	0.9	0.8	1.3	5.6	2.6	1.0	0.7	0.6	0.5	0.6
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**2.7**	**2.6**	**2.5**	**2.3**	**2.2**	**2.2**	**2.2**	**1.8**	**1.3**	**1.6**	**1.8**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	2.7	2.6	2.5	2.3	2.2	2.2	2.1	1.9	1.7	1.8	1.8
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.4	-0.2	0.0
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**0.5**	**0.5**	**0.4**	**0.4**	**0.3**	**0.3**	**0.2**	**0.2**	**0.1**	**-0.1**	**-0.3**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.7	0.7	0.6	0.6	0.5	0.5	0.5	0.4	0.3	0.3	0.2
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3	-0.5
Total Wetlands	**4D**	**Wetlands**		**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Total Settlements	**4E**	**Settlements**		**-0.1**	**-0.1**	**-0.1**	**0.0**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.2**	**0.7**	**0.9**	**-0.1**	**-0.1**	**-0.2**	**-0.2**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
LULUCF	**4**	**LULUCF**		**-0.2**	**-1.9**	**-2.3**	**-2.0**	**4.8**	**2.5**	**1.6**	**0.8**	**0.9**	**0.7**	**1.1**

Source: G4M, GLOBIOM

Lithuania

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-8.6**	**-8.1**	**-6.9**	**-7.6**	**-8.7**	**-9.0**	**-9.5**	**-9.4**	**-9.3**	**-9.4**	**-9.2**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-8.3	-7.6	-6.1	-6.6	-7.8	-7.8	-8.0	-7.6	-7.3	-7.1	-6.7
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.4	-0.6	-0.8	-1.0	-1.2	-1.4	-1.6	-1.9	-2.1	-2.3	-2.5
Forest Land converted		Deforestation	Biomass, soil	0.1	0.1	0.0	0.0	0.2	0.2	0.1	0.1	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**3.2**	**3.2**	**3.3**	**3.1**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**	**2.9**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	3.1	3.1	3.2	3.0	2.9	2.8	2.8	2.8	2.8	2.7	2.7
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-2.1**	**-2.1**	**-2.1**	**-2.4**	**-2.6**	**-2.6**	**-2.6**	**-2.4**	**-2.1**	**-2.1**	**-2.1**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-2.2	-2.2	-2.2	-2.4	-2.7	-2.7	-2.7	-2.4	-2.2	-2.2	-2.2
Total Wetlands	**4D**	**Wetlands**		**0.5**	**0.9**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**	**0.5**
Total Settlements	**4E**	**Settlements**		**0.2**	**0.3**	**0.3**	**0.2**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-0.1**	**-0.3**	**-0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**-0.1**	**-0.2**	**-0.3**	**-0.3**
LULUCF	**4**	**LULUCF**		**-6.8**	**-6.1**	**-5.0**	**-6.0**	**-7.6**	**-7.9**	**-8.5**	**-8.3**	**-8.1**	**-8.2**	**-8.1**

Source: G4M, GLOBIOM

Luxembourg

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-0.6**	**-0.3**	**-0.2**	**-0.1**	**-0.1**	**-0.1**	**-0.2**	**-0.3**	**-0.3**	**-0.3**	**-0.3**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-0.7	-0.5	-0.3	-0.3	-0.2	-0.2	-0.2	-0.2	-0.1	-0.1	-0.1
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2	-0.3
Forest Land converted		Deforestation	Biomass, soil	0.2	0.3	0.3	0.3	0.3	0.3	0.2	0.1	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
LULUCF	**4**	**LULUCF**		**-0.6**	**-0.4**	**-0.2**	**-0.2**	**-0.2**	**-0.2**	**-0.3**	**-0.4**	**-0.4**	**-0.4**	**-0.4**

Source: G4M, GLOBIOM

Malta

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Forest Land converted		Deforestation	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
LULUCF	**4**	**LULUCF**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Source: G4M, GLOBIOM

Netherlands

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-0.7**	**-0.6**	**-0.4**	**-0.7**	**-0.8**	**-0.8**	**-0.9**	**-0.8**	**-0.7**	**-0.7**	**-0.7**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-2.3	-2.0	-1.3	-1.0	-0.7	-0.6	-0.5	-0.4	-0.4	-0.5	-0.5
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.1	-0.2	-0.3	-0.4	-0.5	-0.6	-0.7	-0.7	-0.7	-0.7	-0.8
Forest Land converted		Deforestation	Biomass, soil	1.7	1.7	1.2	0.7	0.5	0.4	0.3	0.4	0.4	0.5	0.6
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**2.1**	**2.1**	**2.1**	**2.1**	**2.1**	**1.8**	**1.6**	**1.8**	**2.0**	**2.0**	**2.1**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	1.9	1.9	1.9	1.9	1.9	1.8	1.7	1.7	1.7	1.7	1.8
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.2	0.2	0.2	0.2	0.2	0.1	-0.1	0.1	0.2	0.3	0.3
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**4.8**	**4.6**	**4.4**	**4.2**	**4.1**	**3.9**	**3.8**	**3.6**	**3.5**	**3.5**	**3.4**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	5.1	4.9	4.7	4.5	4.4	4.2	4.1	4.0	3.9	3.9	3.8
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4	-0.4	-0.4
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Total Settlements	**4E**	**Settlements**		**0.8**	**0.9**	**1.0**	**0.9**	**0.8**	**0.7**	**0.7**	**0.7**	**0.7**	**0.7**	**0.7**
Total Other land	**4F**	**Other land**		**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Harvested Wood Products		**Harvested Wood Products**		**0.3**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**	**0.0**	**0.0**
LULUCF	**4**	**LULUCF**		**7.4**	**7.3**	**7.4**	**6.8**	**6.4**	**5.9**	**5.4**	**5.6**	**5.6**	**5.6**	**5.7**

Source: G4M, GLOBIOM

Poland

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-48.3**	**-41.6**	**-36.7**	**-33.2**	**-32.9**	**-30.5**	**-26.8**	**-26.4**	**-25.6**	**-25.1**	**-25.7**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-48.9	-40.2	-34.1	-29.3	-27.7	-24.0	-19.3	-18.0	-16.6	-15.6	-15.8
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	0.4	-1.7	-2.9	-4.2	-5.4	-6.6	-7.6	-8.4	-9.0	-9.5	-9.8
Forest Land converted		Deforestation	Biomass, soil	0.2	0.3	0.3	0.3	0.2	0.1	0.1	0.0	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.9**	**0.6**	**0.4**	**0.1**	**-0.3**	**-0.8**	**-1.4**	**-3.1**	**-4.8**	**-3.2**	**-1.6**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.8	0.5	0.2	0.1	-0.1	-0.4	-0.6	-1.3	-2.0	-1.9	-1.9
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.1	0.1	0.2	0.0	-0.2	-0.5	-0.7	-1.7	-2.7	-1.2	0.3
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**0.0**	**-0.2**	**-0.4**	**-0.5**	**-0.7**	**-1.0**	**-1.4**	**-2.0**	**-2.5**	**-3.0**	**-3.5**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.7	0.7	0.6	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.6	-0.8	-1.1	-1.1	-1.2	-1.6	-1.9	-2.5	-3.0	-3.5	-4.0
Total Wetlands	**4D**	**Wetlands**		**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**	**4.4**
Total Settlements	**4E**	**Settlements**		**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.2**	**0.1**	**0.1**	**0.1**	**0.1**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-1.8**	**-5.1**	**-3.3**	**-1.2**	**-2.2**	**-2.8**	**-3.4**	**-3.2**	**-3.2**	**-3.0**	**-2.9**
LULUCF	**4**	**LULUCF**		**-44.7**	**-41.9**	**-35.5**	**-30.4**	**-31.5**	**-30.7**	**-28.4**	**-30.2**	**-31.7**	**-29.9**	**-29.3**

Source: G4M, GLOBIOM

Portugal

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-8.0**	**-9.0**	**-11.6**	**-11.0**	**-10.8**	**-10.3**	**-11.3**	**-11.1**	**-10.8**	**-10.7**	**-10.8**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-6.7	-7.0	-8.7	-6.7	-5.5	-4.4	-5.1	-4.4	-3.7	-3.3	-3.5
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-4.3	-5.2	-5.7	-6.2	-6.6	-7.0	-7.3	-7.5	-7.6	-7.8	-7.6
Forest Land converted		Deforestation	Biomass, soil	2.9	3.2	2.9	1.9	1.3	1.1	1.0	0.8	0.5	0.4	0.3
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.5**	**0.5**	**0.4**	**0.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.4	0.4	0.3	0.1	0.0	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**0.1**	**0.2**	**0.3**	**0.4**	**0.6**	**0.6**	**0.6**	**0.4**	**0.4**	**0.3**	**0.3**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	-0.7	-0.6	-0.6	-0.6	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5	-0.5
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	0.8	0.8	0.9	1.0	1.1	1.1	1.1	1.0	0.9	0.8	0.8
Total Wetlands	**4D**	**Wetlands**		**0.3**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
Total Settlements	**4E**	**Settlements**		**0.6**	**1.0**	**1.2**	**2.0**	**1.7**	**1.3**	**1.1**	**0.9**	**0.8**	**0.7**	**0.7**
Total Other land	**4F**	**Other land**		**-2.4**	**-2.3**	**-2.2**	**-2.2**	**-2.2**	**-2.2**	**-2.2**	**-2.2**	**-2.2**	**-2.2**	**-2.2**
Harvested Wood Products		**Harvested Wood Products**		**-0.6**	**-0.8**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.2**	**-0.2**
LULUCF	**4**	**LULUCF**		**-9.5**	**-10.0**	**-11.8**	**-10.4**	**-10.5**	**-10.5**	**-11.8**	**-11.8**	**-11.7**	**-11.6**	**-11.8**

Source: G4M, GLOBIOM

Romania

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-24.6**	**-22.9**	**-23.4**	**-16.4**	**-17.0**	**-18.7**	**-18.2**	**-16.5**	**-14.8**	**-12.4**	**-10.3**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-25.4	-22.9	-25.2	-18.0	-15.6	-13.2	-12.1	-9.5	-7.6	-5.1	-3.1
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-3.0	-3.7	-4.3	-4.9	-5.6	-6.2	-6.7	-7.1	-7.2	-7.3	-7.3
Forest Land converted		Deforestation	Biomass, soil	3.8	3.7	6.0	6.5	4.3	0.7	0.6	0.1	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**-2.3**	**-3.3**	**-4.3**	**-3.9**	**-3.6**	**-3.7**	**-3.7**	**-4.1**	**-4.5**	**-4.6**	**-4.8**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	-1.8	-2.8	-3.8	-3.6	-3.4	-3.4	-3.4	-3.7	-4.1	-4.2	-4.4
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	-0.5	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.4	-0.5
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-1.5**	**-1.4**	**-1.3**	**-1.3**	**-1.3**	**-1.4**	**-1.5**	**-1.6**	**-1.6**	**-1.6**	**-1.7**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	-1.5	-1.4	-1.4	-1.3	-1.3	-1.4	-1.6	-1.6	-1.6	-1.7	-1.7
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Wetlands	**4D**	**Wetlands**		**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**
Total Settlements	**4E**	**Settlements**		**1.8**	**1.8**	**1.8**	**1.0**	**0.9**	**0.8**	**0.6**	**0.5**	**0.5**	**0.4**	**0.4**
Total Other land	**4F**	**Other land**		**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
Harvested Wood Products		**Harvested Wood Products**		**1.6**	**0.7**	**1.1**	**0.5**	**0.3**	**-0.2**	**-0.5**	**-0.5**	**-0.6**	**-0.8**	**-1.0**
LULUCF	**4**	**LULUCF**		**-24.4**	**-24.5**	**-25.5**	**-19.7**	**-20.2**	**-22.7**	**-22.9**	**-21.7**	**-20.5**	**-18.6**	**-17.0**

Source: G4M, GLOBIOM

Slovakia

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-8.2**	**-3.8**	**-2.9**	**-4.7**	**-3.8**	**-3.7**	**-3.2**	**-3.0**	**-3.3**	**-2.8**	**-2.9**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-7.9	-3.5	-2.5	-4.3	-3.3	-3.1	-2.5	-2.3	-2.4	-1.9	-1.9
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.4	-0.5	-0.5	-0.6	-0.6	-0.7	-0.8	-0.8	-0.9	-0.9	-1.0
Forest Land converted		Deforestation	Biomass, soil	0.1	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**-0.8**	**-0.8**	**-0.8**	**-0.9**	**-0.9**	**-0.9**	**-0.9**	**-0.9**	**-0.9**	**-0.9**	**-1.0**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	-0.7	-0.7	-0.7	-0.7	-0.8	-0.8	-0.8	-0.8	-0.8	-0.8	-0.9
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.3**	**-0.4**	**-0.5**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.3	-0.4	-0.5
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.0**	**0.0**	**0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.1**	**-0.7**	**-0.7**	**-0.3**	**-0.5**	**-0.7**	**-0.9**	**-0.9**	**-0.9**	**-0.8**	**-0.7**
LULUCF	**4**	**LULUCF**		**-9.1**	**-5.5**	**-4.6**	**-6.1**	**-5.5**	**-5.5**	**-5.2**	**-5.1**	**-5.3**	**-4.9**	**-5.0**

Source: G4M, GLOBIOM

Slovenia

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-7.0**	**-5.2**	**-4.7**	**-4.6**	**-4.9**	**-4.9**	**-4.9**	**-4.5**	**-4.0**	**-3.7**	**-3.4**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-9.1	-7.7	-6.4	-4.5	-4.4	-4.1	-4.0	-3.4	-2.7	-2.3	-1.9
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.7	-0.8	-0.9	-1.0	-1.1	-1.2	-1.3	-1.3	-1.4	-1.5	-1.6
Forest Land converted		Deforestation	Biomass, soil	2.7	3.3	2.6	1.0	0.6	0.5	0.4	0.3	0.1	0.0	0.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**	**0.2**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**	**-0.1**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1
Total Wetlands	**4D**	**Wetlands**		**0.0**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Total Settlements	**4E**	**Settlements**		**0.3**	**0.3**	**0.3**	**-0.5**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**0.0**	**-0.1**	**0.1**	**0.4**	**0.6**	**0.6**	**0.5**	**0.4**	**0.4**	**0.4**	**0.3**
LULUCF	**4**	**LULUCF**		**-6.6**	**-4.9**	**-4.1**	**-4.5**	**-4.1**	**-4.1**	**-4.2**	**-3.9**	**-3.5**	**-3.3**	**-3.0**

Source: G4M, GLOBIOM

Spain

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-28.9**	**-28.9**	**-29.3**	**-31.0**	**-31.8**	**-32.2**	**-32.6**	**-31.8**	**-31.5**	**-30.8**	**-29.9**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-25.1	-25.1	-25.4	-26.5	-26.6	-26.3	-25.8	-24.4	-23.6	-22.1	-20.6
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-6.4	-6.8	-7.3	-7.8	-8.3	-8.8	-9.2	-9.5	-9.8	-10.0	-10.1
Forest Land converted		Deforestation	Biomass, soil	2.5	3.0	3.3	3.3	3.1	2.9	2.4	2.1	1.9	1.2	0.8
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**-1.5**	**-1.5**	**-1.5**	**-1.7**	**-1.8**	**-1.8**	**-1.7**	**-1.9**	**-2.1**	**-2.9**	**-3.8**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	-0.9	-0.8	-0.8	-1.0	-1.2	-1.3	-1.3	-1.5	-1.6	-1.8	-2.0
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	-0.6	-0.7	-0.7	-0.6	-0.6	-0.5	-0.4	-0.4	-0.5	-1.2	-1.8
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-1.2**	**-1.4**	**-1.7**	**-2.5**	**-3.3**	**-3.2**	**-3.1**	**-2.3**	**-1.6**	**-1.4**	**-1.3**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-1.2	-1.4	-1.7	-2.5	-3.3	-3.2	-3.1	-2.3	-1.6	-1.4	-1.3
Total Wetlands	**4D**	**Wetlands**		**0.0**	**-0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total Settlements	**4E**	**Settlements**		**0.5**	**0.8**	**1.0**	**1.2**	**1.3**	**1.1**	**0.9**	**0.8**	**0.7**	**0.6**	**0.5**
Total Other land	**4F**	**Other land**		**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**	**0.1**
Harvested Wood Products		**Harvested Wood Products**		**-2.6**	**-2.0**	**-1.2**	**-0.7**	**-0.7**	**-0.7**	**-0.7**	**-0.6**	**-0.6**	**-0.6**	**-0.5**
LULUCF	**4**	**LULUCF**		**-33.6**	**-32.9**	**-32.6**	**-34.4**	**-36.2**	**-36.7**	**-37.1**	**-35.8**	**-35.0**	**-35.0**	**-34.8**

Source: G4M, GLOBIOM

Sweden

LULUCF emissions Reference scenario

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-49.0**	**-5.8**	**-37.6**	**-40.7**	**-36.0**	**-37.6**	**-37.9**	**-37.4**	**-37.4**	**-36.7**	**-36.1**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-51.6	-9.4	-41.5	-42.8	-35.6	-36.1	-35.7	-34.6	-34.3	-33.4	-32.8
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-0.1	-0.6	-1.1	-1.6	-2.1	-2.6	-3.0	-3.4	-3.6	-3.7	-3.7
Forest Land converted		Deforestation	Biomass, soil	2.6	4.3	5.0	3.7	1.6	1.1	0.8	0.6	0.5	0.4	0.3
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**4.1**	**3.9**	**3.8**	**3.8**	**3.8**	**3.8**	**3.8**	**3.7**	**3.6**	**3.6**	**3.6**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	4.1	3.9	3.7	3.7	3.6	3.6	3.5	3.4	3.3	3.2	3.1
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.4	0.4
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-0.4**	**-0.4**	**-0.4**	**-0.8**	**-0.8**	**-0.7**	**-0.7**	**-0.7**	**-0.7**	**-0.6**	**-0.6**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	-0.5	-0.4	-0.4	-0.8	-0.8	-0.8	-0.7	-0.7	-0.7	-0.7	-0.7
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
Total Wetlands	**4D**	**Wetlands**		**0.3**	**0.4**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**
Total Settlements	**4E**	**Settlements**		**0.6**	**0.7**	**0.7**	**1.0**	**0.8**	**0.8**	**0.6**	**0.5**	**0.4**	**0.4**	**0.3**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-9.5**	**-17.0**	**-11.1**	**-9.3**	**-9.4**	**-8.6**	**-7.7**	**-7.1**	**-6.4**	**-5.8**	**-5.4**
LULUCF	**4**	**LULUCF**		**-53.9**	**-18.1**	**-44.3**	**-45.7**	**-41.2**	**-41.9**	**-41.6**	**-40.6**	**-40.1**	**-39.0**	**-38.0**

Source: G4M, GLOBIOM

United Kingdom **LULUCF emissions Reference scenario**

LULUCF CO2 emissions in Mt CO2	UNFCCC CRF	Source	Pool	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Forest Land	**4A**			**-17.3**	**-16.5**	**-14.5**	**-13.0**	**-12.0**	**-12.0**	**-11.9**	**-11.3**	**-10.9**	**-10.1**	**-9.5**
Forest Land remaining Forest Land	4A.1	Forest management	Biomass, soil, dom	-16.4	-15.8	-14.1	-11.8	-10.1	-9.5	-9.0	-8.1	-7.5	-6.6	-5.9
Land converted to Forest Land	4A.2	Afforestation/ reforestation	Biomass, soil	-2.2	-2.7	-3.1	-3.4	-3.8	-4.0	-4.2	-4.4	-4.5	-4.6	-4.6
Forest Land converted		Deforestation	Biomass, soil	1.2	2.0	2.7	2.2	1.8	1.5	1.3	1.2	1.1	1.1	1.0
Total Cropland	**4B**	**Cropland management**	**Biomass, soil**	**11.4**	**11.7**	**12.0**	**12.0**	**12.1**	**12.0**	**12.0**	**12.3**	**12.7**	**12.6**	**12.4**
Cropland remaining Cropland	4B.1	Cropland management	Biomass, soil	10.4	10.5	10.7	10.7	10.7	10.8	10.8	10.8	10.7	10.4	10.2
Land converted to Cropland	4B.2	Cropland management	Biomass, soil	1.0	1.2	1.3	1.3	1.4	1.3	1.1	1.6	2.0	2.1	2.2
Total Grassland	**4C**	**Grassland management**	**Biomass, soil**	**-9.7**	**-9.6**	**-9.5**	**-9.5**	**-9.4**	**-9.3**	**-9.2**	**-9.1**	**-9.1**	**-9.0**	**-8.9**
Grassland remaining Grassland	4C.1	Grassland management	Biomass, soil	-3.5	-3.5	-3.4	-3.3	-3.3	-3.2	-3.1	-3.1	-3.0	-2.9	-2.9
Land converted to Grassland	4C.2	Grassland management	Biomass, soil	-6.2	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.1	-6.0	-6.0	-6.0
Total Wetlands	**4D**	**Wetlands**		**0.5**	**0.5**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
Total Settlements	**4E**	**Settlements**		**6.2**	**6.0**	**5.9**	**5.9**	**5.8**	**5.6**	**5.4**	**5.2**	**5.1**	**5.1**	**5.0**
Total Other land	**4F**	**Other land**		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Harvested Wood Products		**Harvested Wood Products**		**-2.1**	**-1.3**	**-1.0**	**-0.8**	**-0.7**	**-0.8**	**-0.7**	**-0.7**	**-0.7**	**-0.7**	**-0.6**
LULUCF	**4**	**LULUCF**		**-10.9**	**-9.1**	**-6.7**	**-4.9**	**-3.9**	**-4.0**	**-4.1**	**-3.2**	**-2.3**	**-1.7**	**-1.2**

Source: G4M, GLOBIOM

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MJ-01-15-793-EN-C

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ISBN: 978-92-79-52373-1