International Energy Agency

Energy Technology Perspectives 2010

Oslo, 27 August 2010

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

The context

- **Need a global energy technology revolution to meet climate change and energy security challenges.**
- **Some early signs of progress, but much more needs to be done.**
  - **Which technologies can play a role?**
  - **What are the costs and benefits?**
  - **What policies are needed?**

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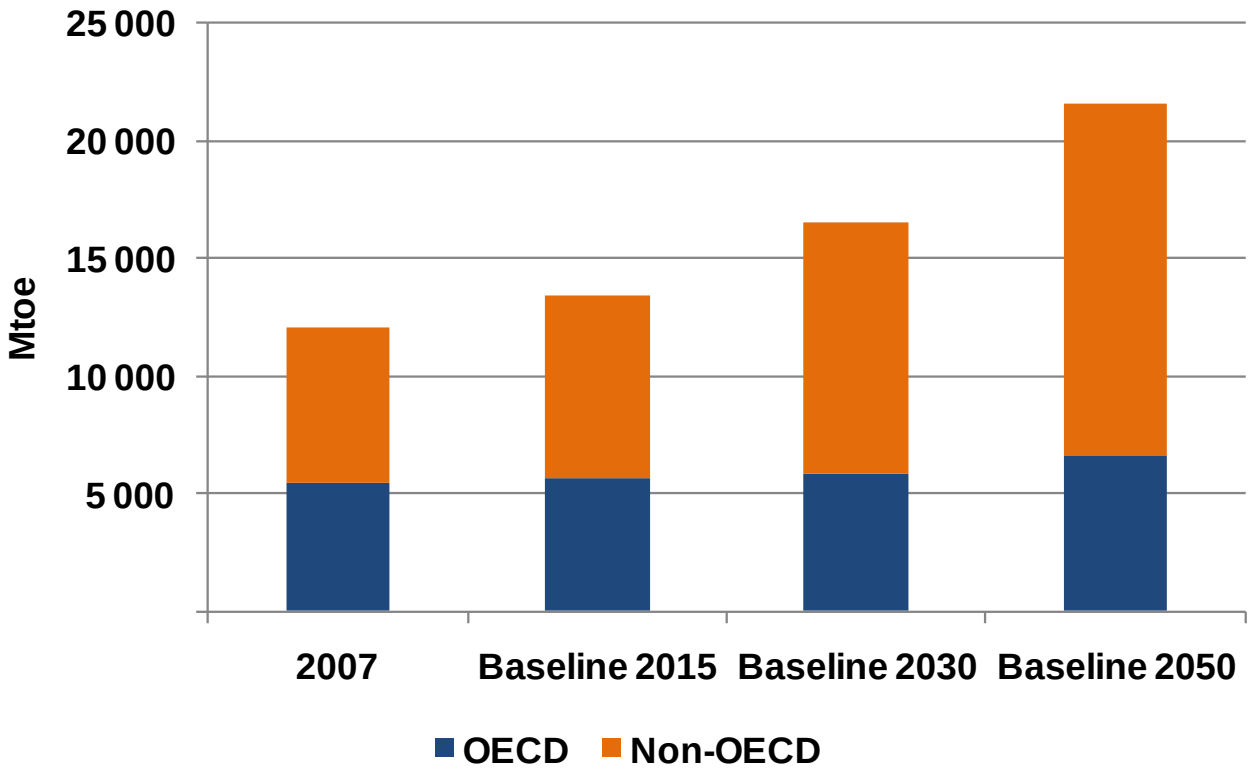
OECD and non-OECD primary energy demand in the Baseline scenario



Primary energy demand in non-OECD countries is projected to increase much faster than in OECD countries in the Baseline scenario.

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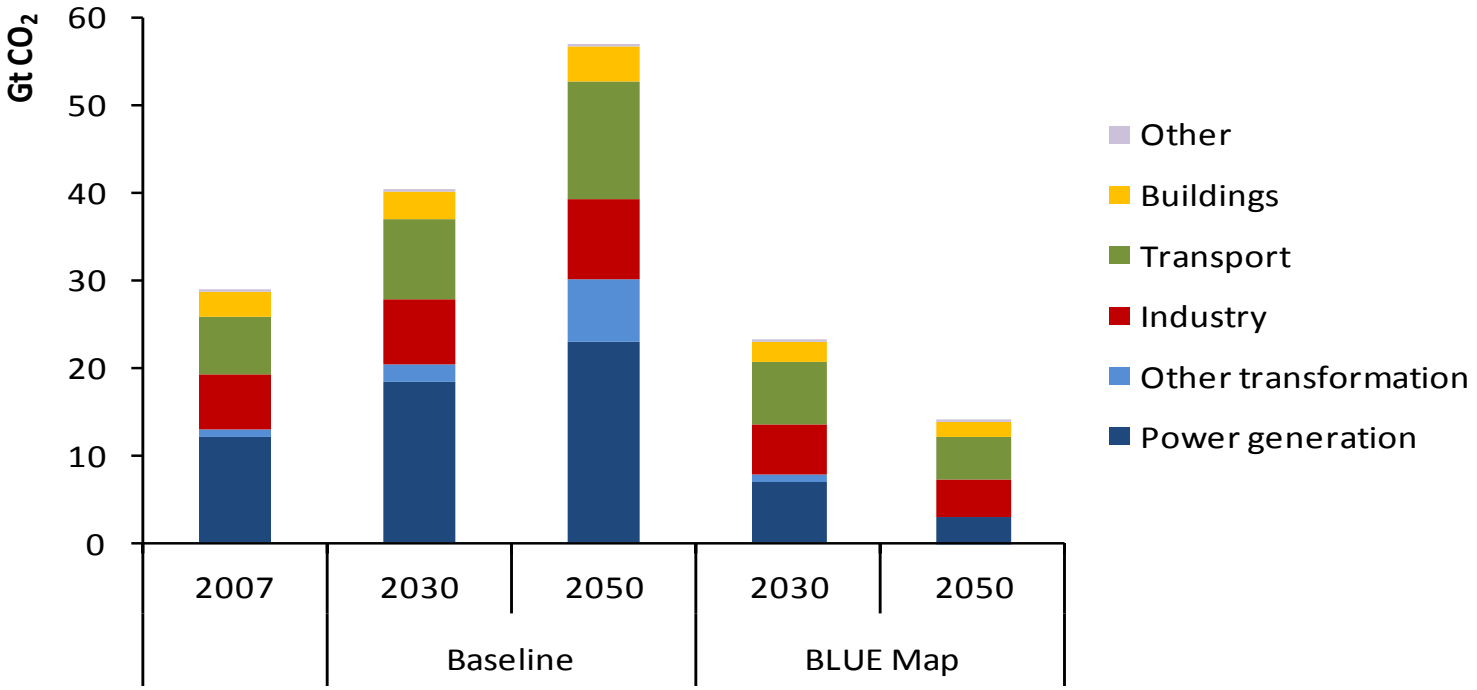
Global energy-related CO_2 emissions in the Baseline and BLUE Map scenarios



Global CO_2 emissions double in the Baseline, but in the BLUE Map scenario abatement across all sectors reduces emissions to half 2005 levels by 2050.

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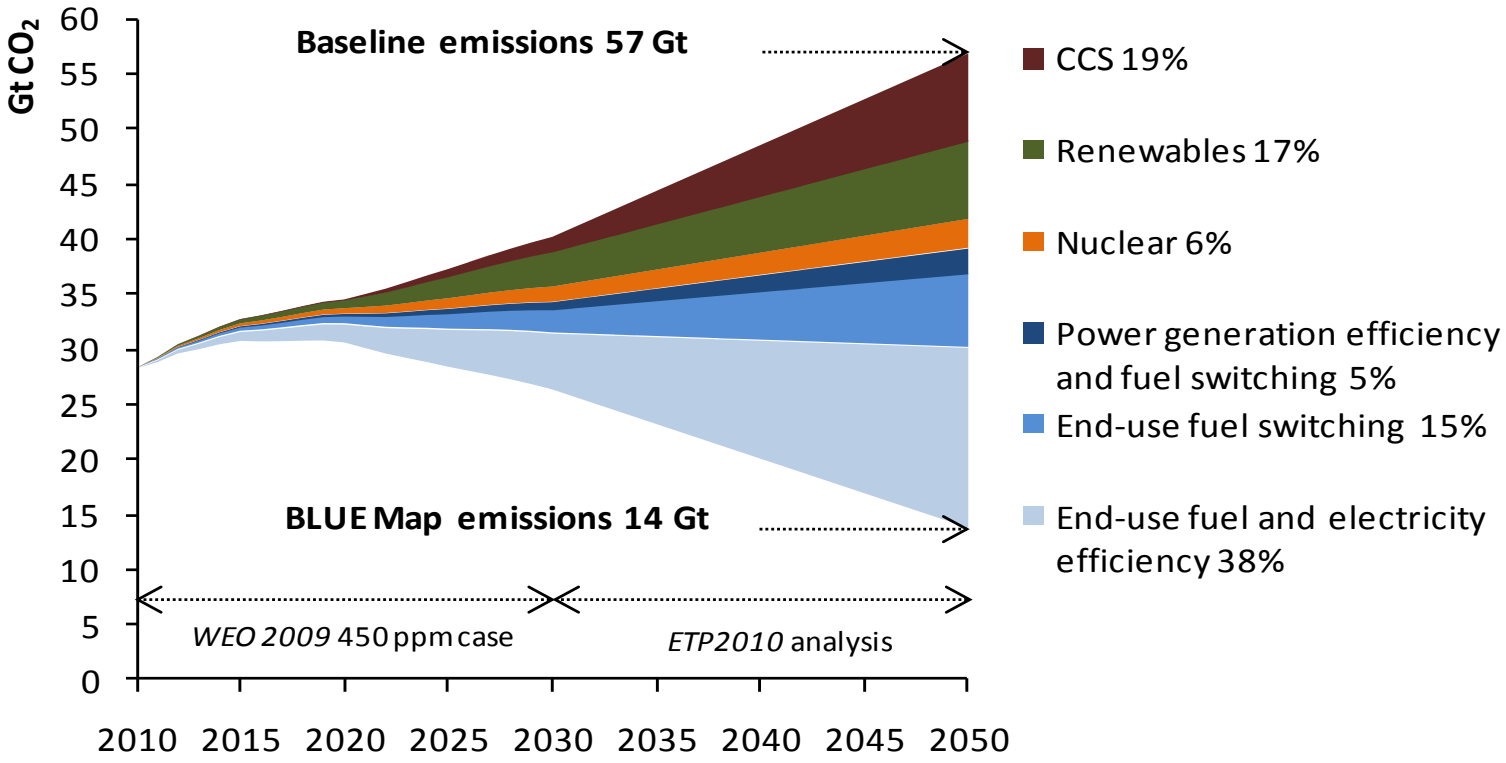
Key technologies for reducing global CO_2 emissions



A wide range of technologies will be necessary to reduce energy-related CO_2 emissions substantially.

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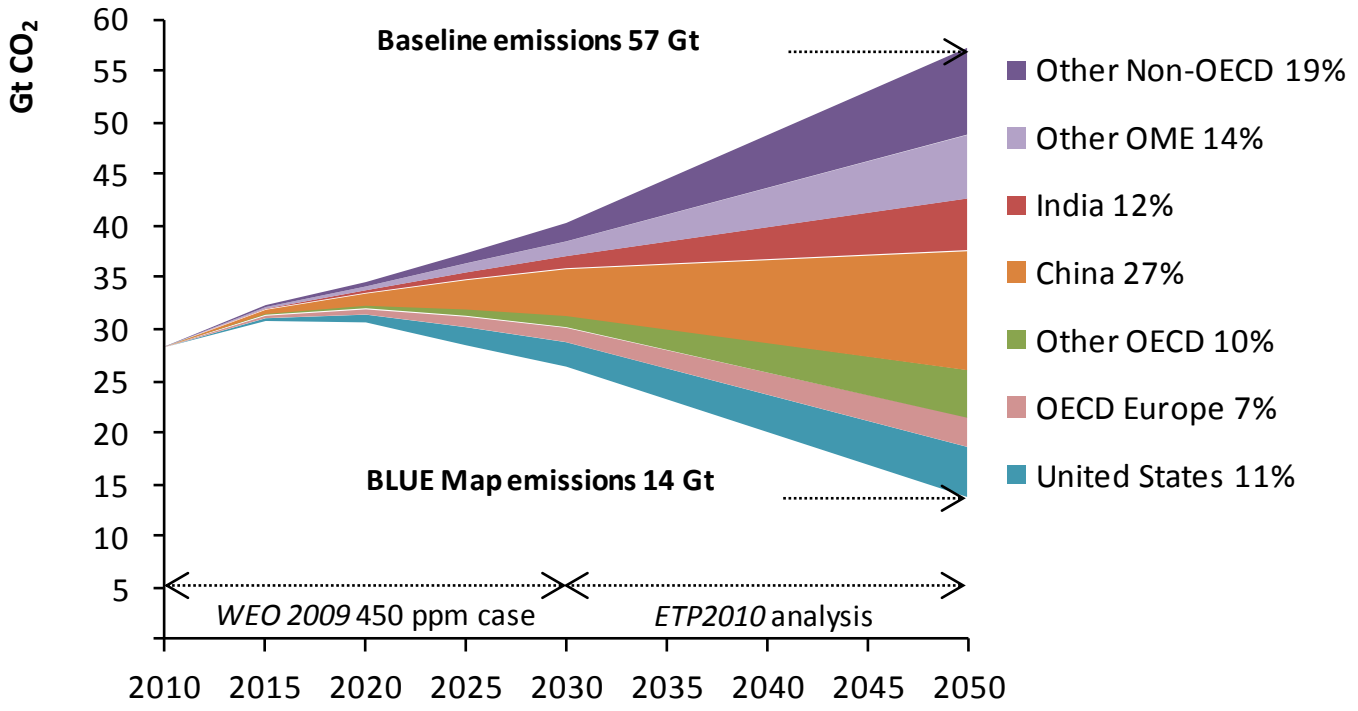
World energy-related CO_2 emissions abatement by region



In the BLUE Map scenario, most of the reductions in energy-related CO_2 emissions are in non-OECD countries.

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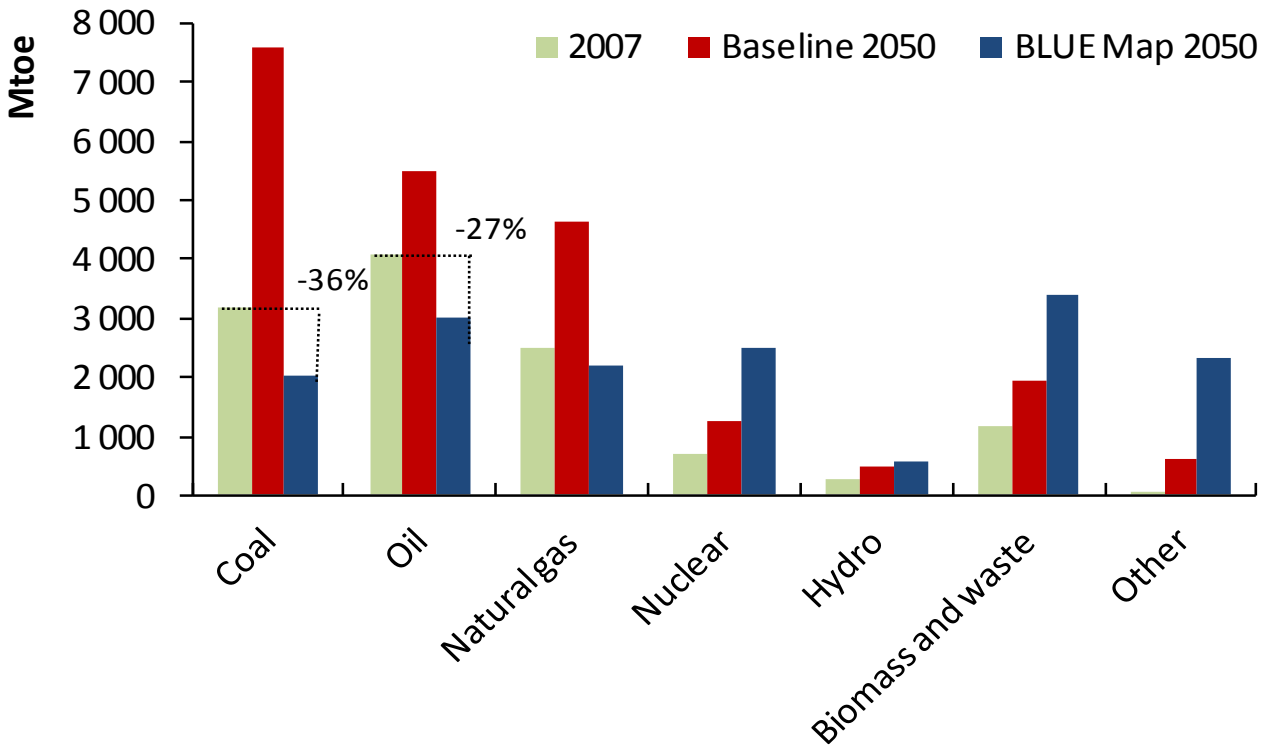
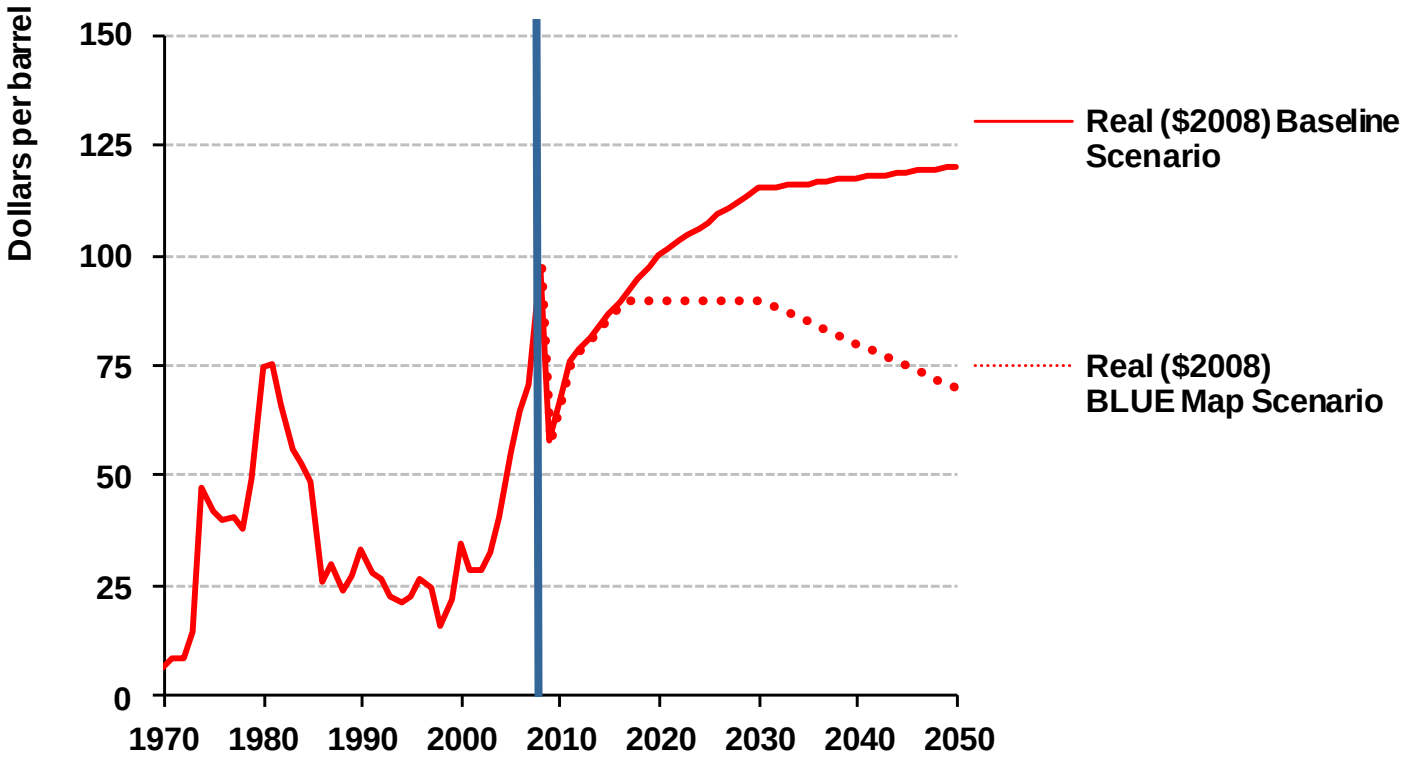
Primary energy demand by fuel and by scenario



By 2050, coal, oil and gas demand are all lower than today under the BLUE Map scenario.

Crude oil price



Impact of CO_2 price on costs for crude oil:

2020 50 USD/t CO_2= 21 USD/bbl: 90+21 =111 USD/bbl

2030 110 USD/t CO_2= 43 USD/bbl: 90+43 =133 USD/bbl

2050 175 USD/t CO_2= 73 USD/bbl: 70+73 =143 USD/bbl

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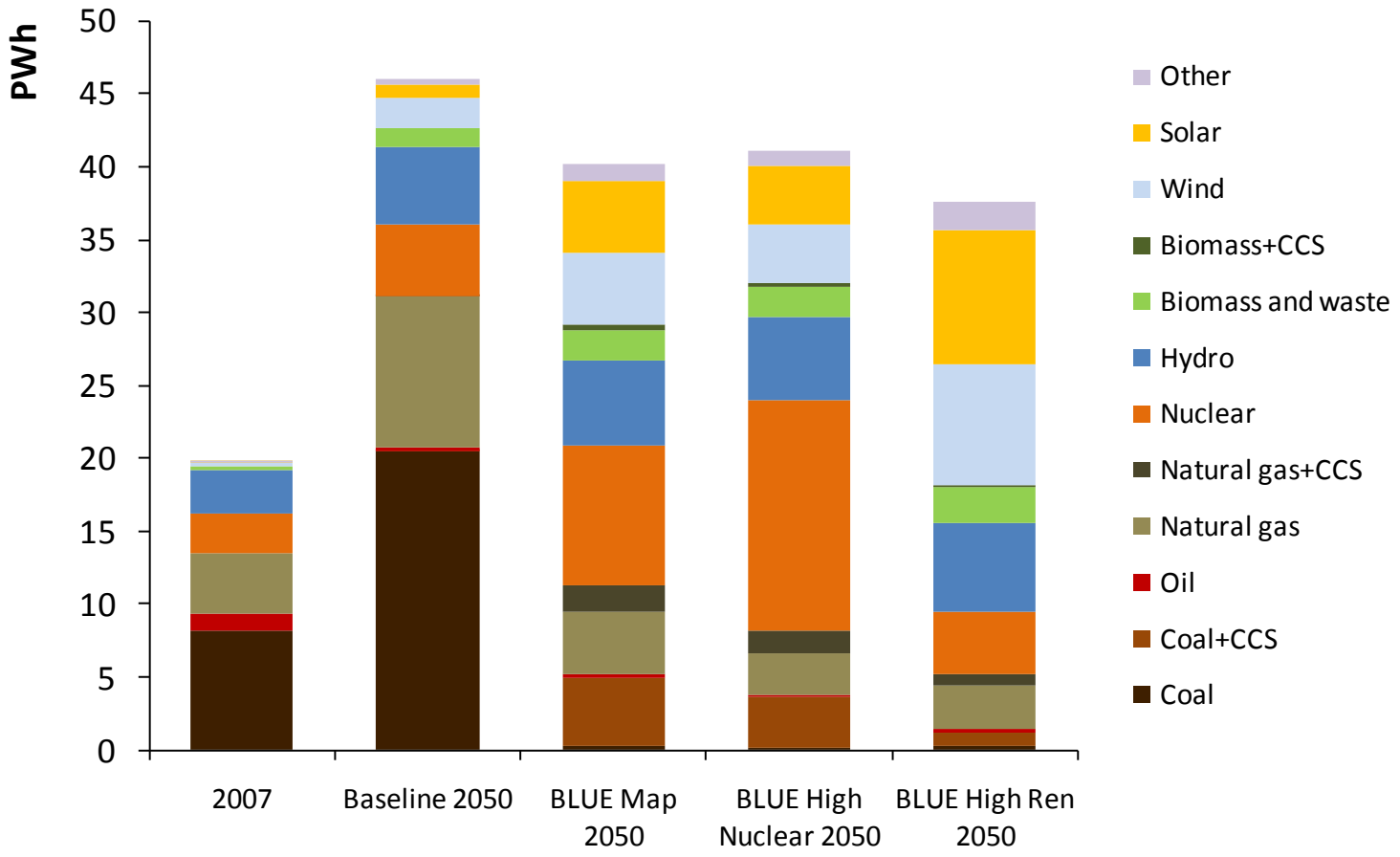
Decarbonising the power sector – a new age of electrification?



A mix of renewables, nuclear and fossil-fuels with CCS will be needed to decarbonise the electricity sector.

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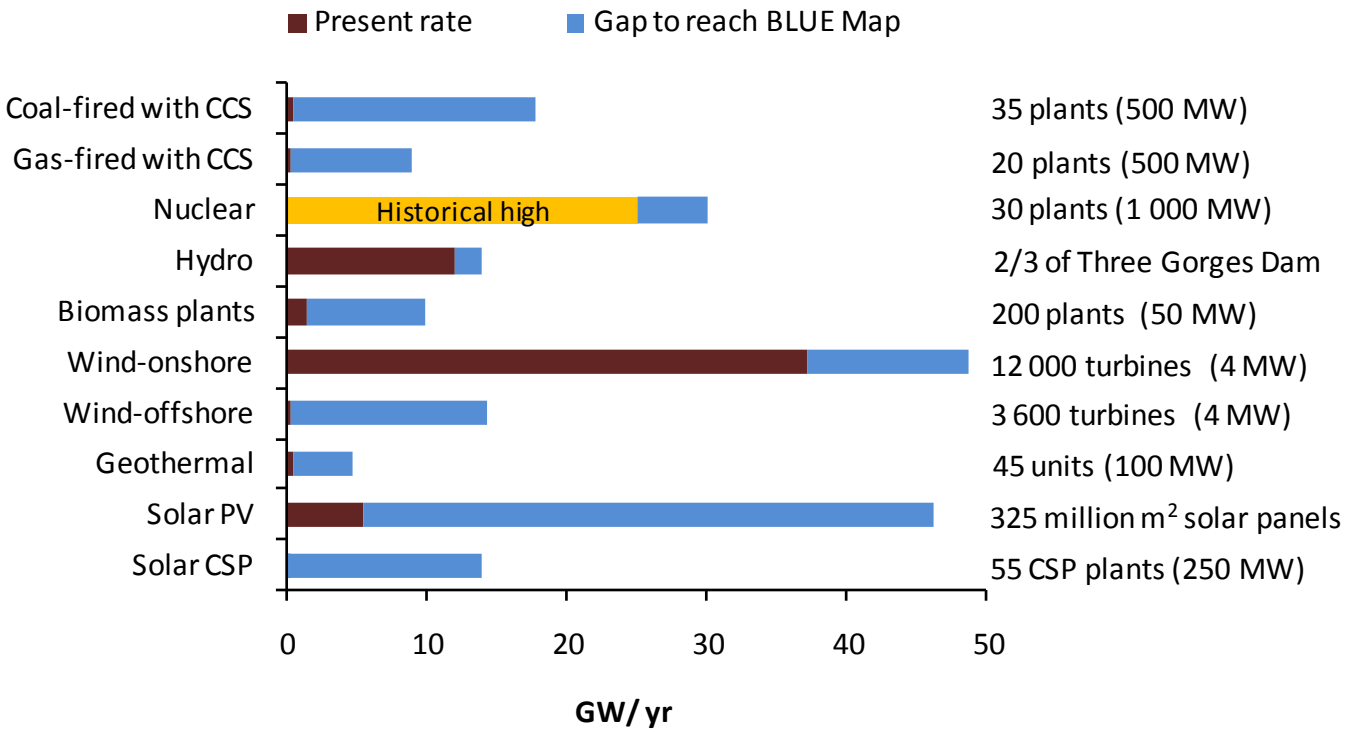
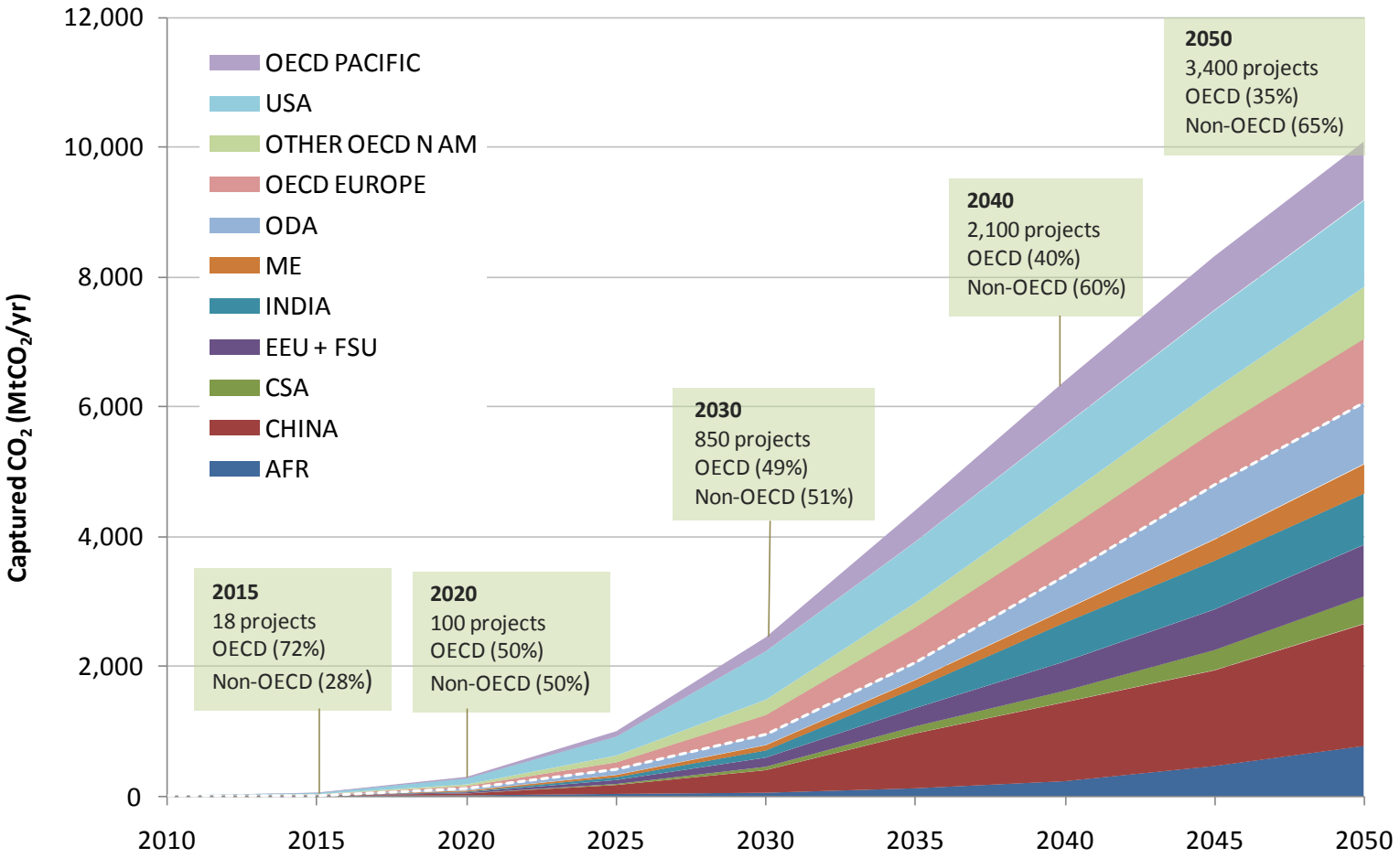
Average annual electricity capacity additions to 2050, BLUE Map scenario



Annual rates of investment in many low-carbon technologies must be massively increased from today's levels.

CCS Roadmap



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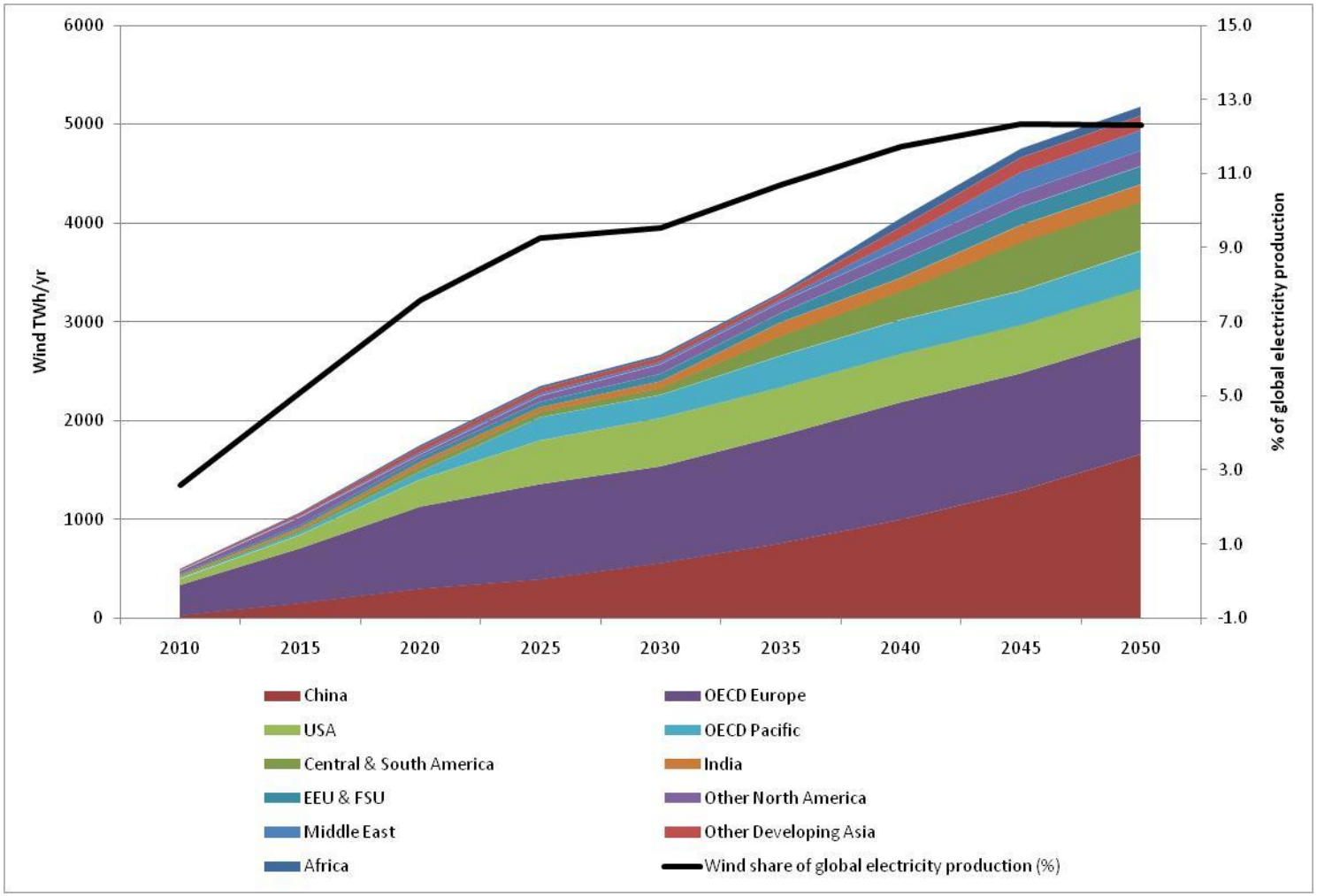
Wind Roadmap



Wind has the potential to provide 12% of global electricity production in 2050

PV Roadmap

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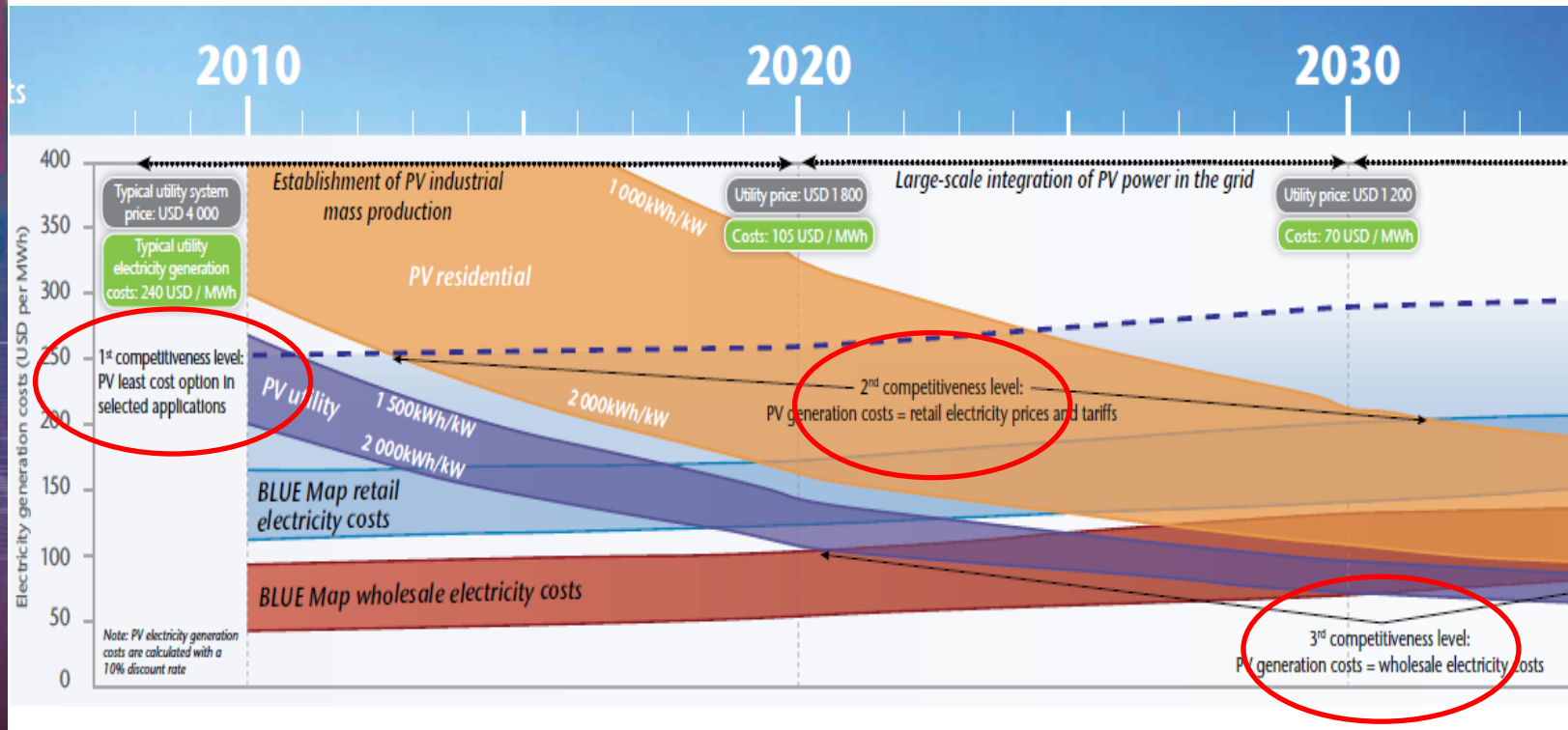

PV can provide 5% of global electricity generation in 2030, 11% in 2050

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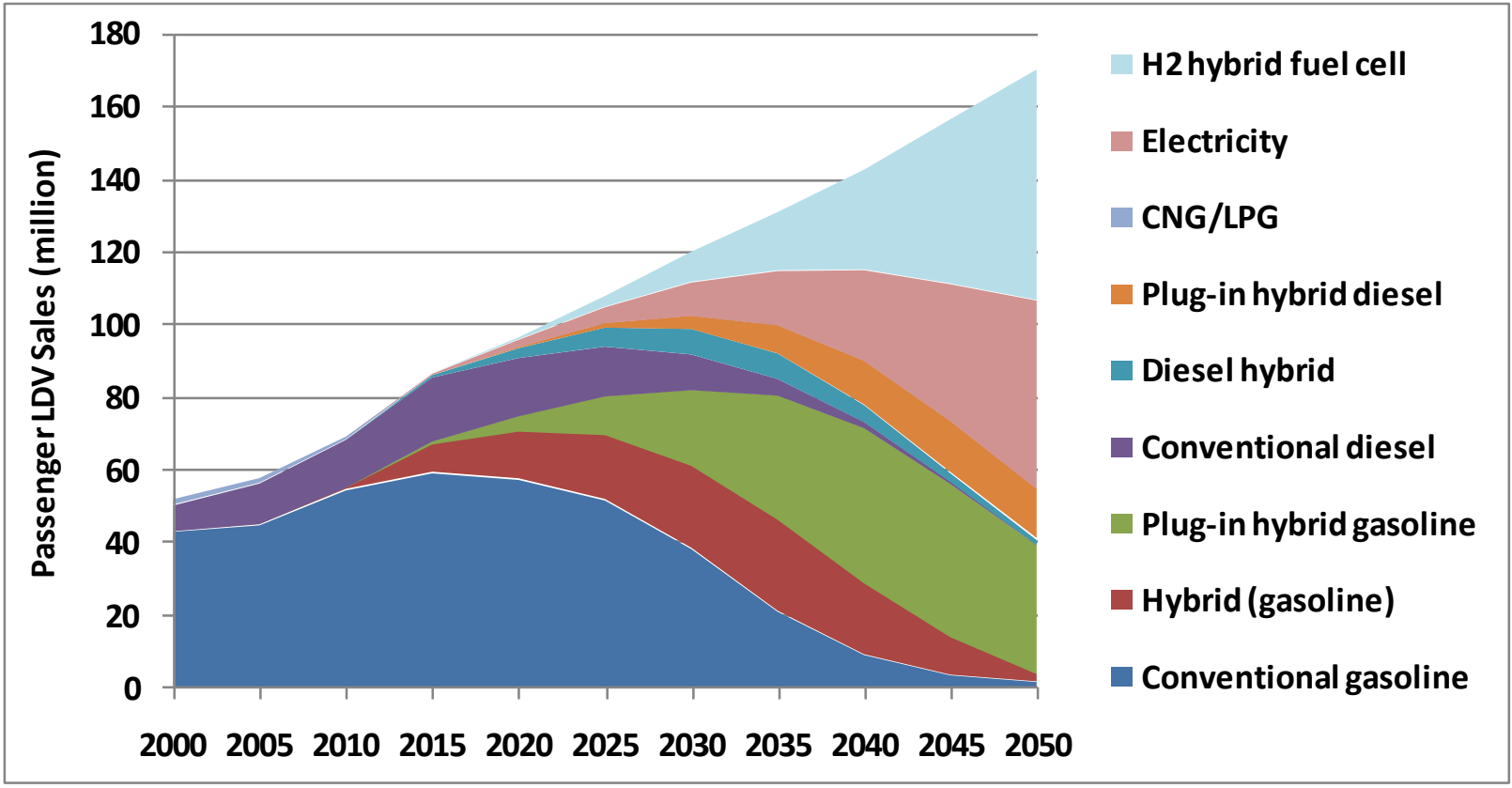
Electric Vehicle Roadmap

Light-duty vehicle sales by technology type to 2050



Unprecedented rates of change in market penetration of advanced technologies

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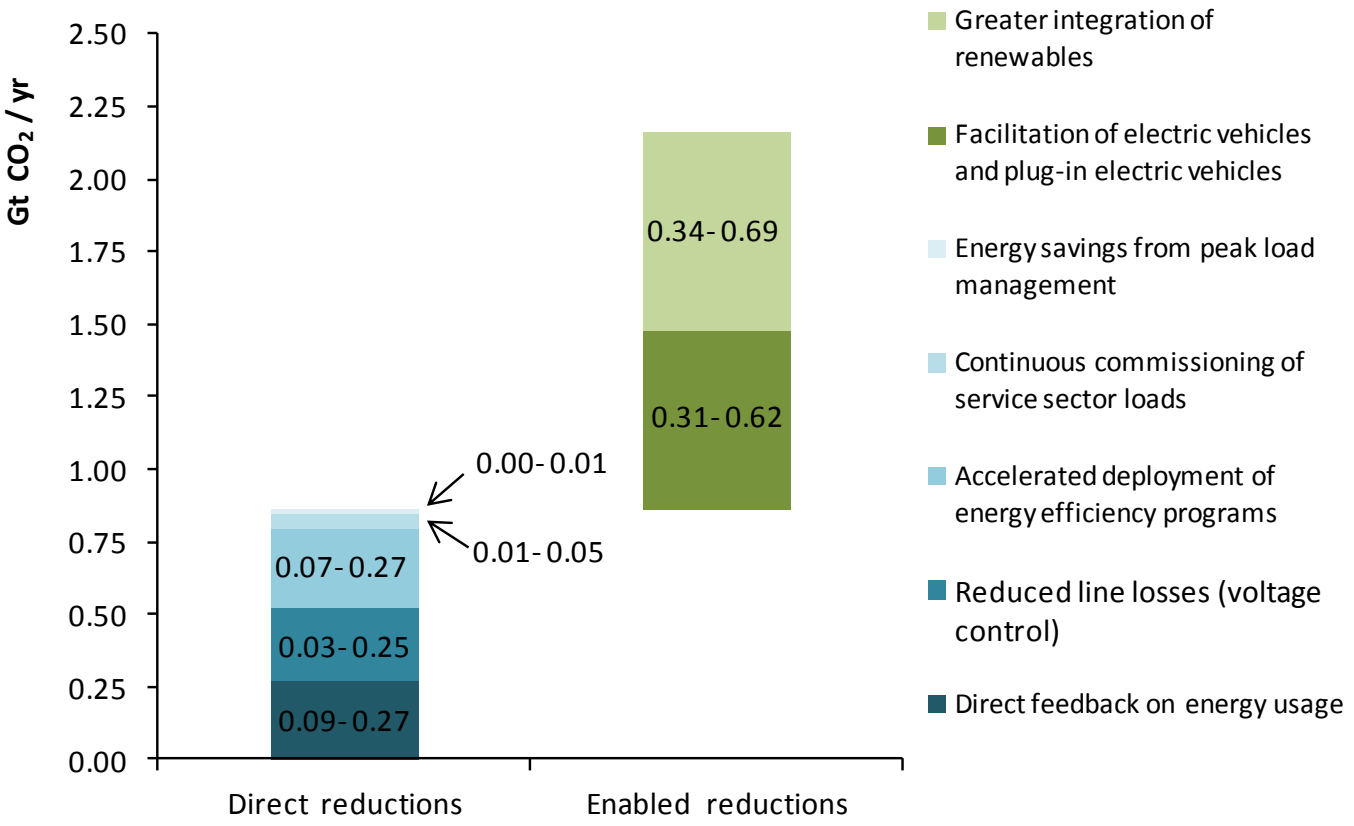
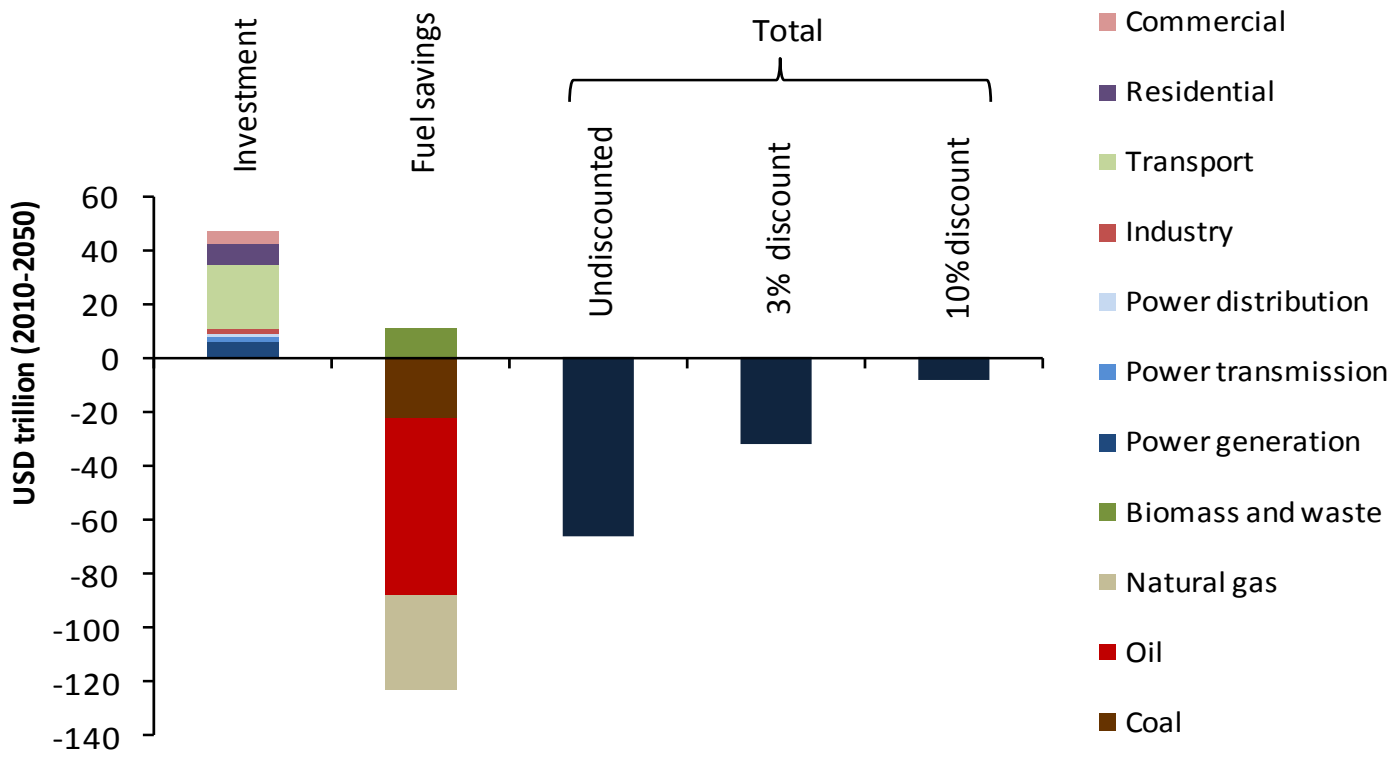
Smart grid CO_2 reductions in 2050



Smart grids allow better management of the grid and can facilitate the deployment of low-carbon technologies, such as renewables and electric vehicles.

Additional investment and fuel savings, 2010-2050



Even using a 10% discount rate, fuel savings in the BLUE Map scenario more than offset the additional investment required.

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Environmental co-impacts of electricity generation technologies

Energy Technologies	Life Cycle Impacts (Pre- and Post-Generation)			Power Generation Impacts			CO_2 Emissions *t/MWh*
	Air	Water	Land	Air	Water	Land	
Coal - USC	*Baseline Technology for Relative Assessments Below*						0.777
Coal - Biomass	Positive	Positive	Variable / Uncertain	Variable / Uncertain	Minimal	Minimal	0.622
Coal - CCS	Negative	Negative	Negative	Variable / Uncertain	Negative	Minimal	0.142
Coal - IGCC	Minimal	Variable / Uncertain	Minimal	Positive	Positive	Minimal	0.708
NGCC	Positive	Positive	Positive	Positive	Positive	Positive	0.403
Nuclear	Positive	Variable / Uncertain	Variable / Uncertain	Positive	Negative	Positive	0.005
Solar - CSP	Positive	Positive	Positive	Positive	Negative	Minimal	0.017
Solar - PV	Positive	Positive	Positive	Positive	Positive	Minimal	0.009
Wind	Positive	Positive	Positive	Positive	Positive	Variable / Uncertain	0.002

Most renewable technologies have positive environmental co-impacts.

OECD EUROPE

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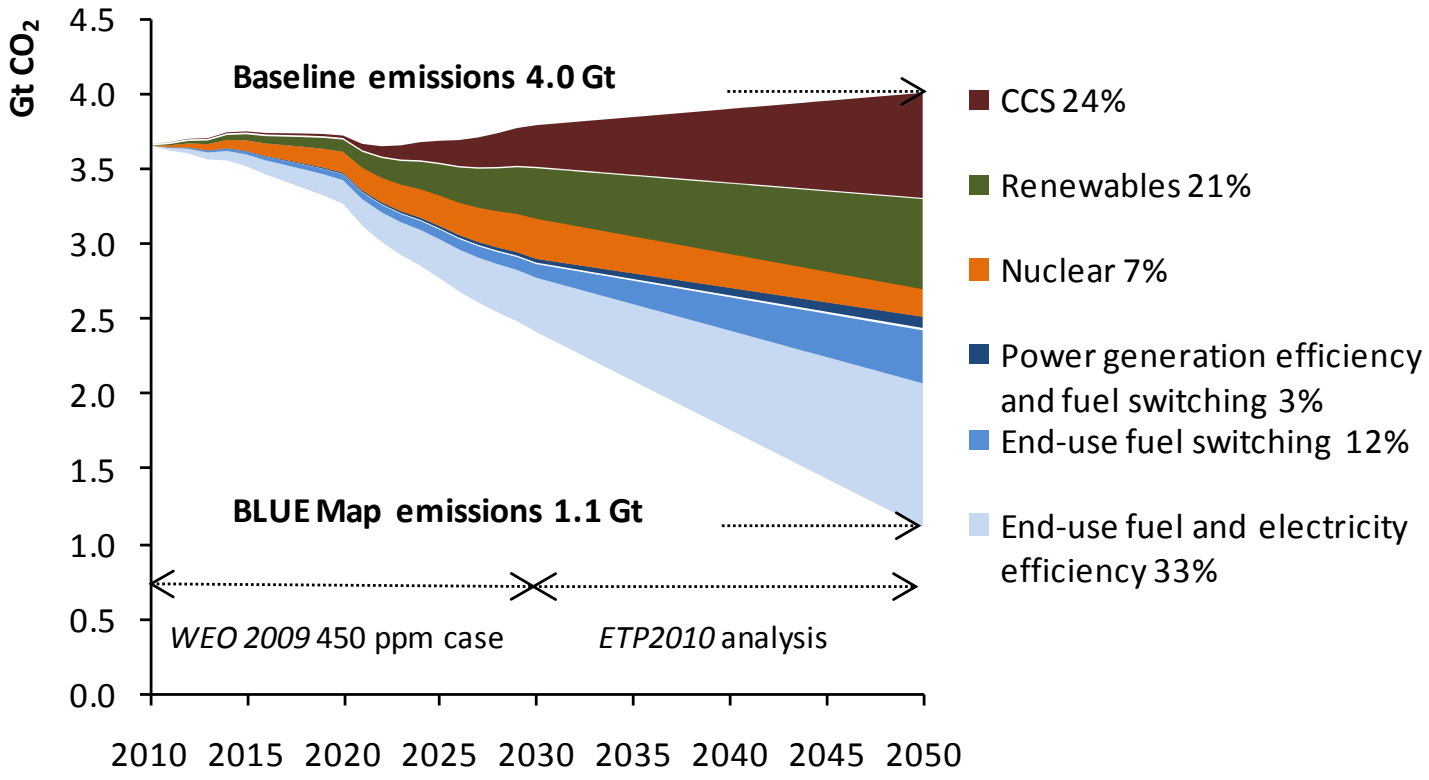
Contributions to emissions reductions in OECD Europe



End-use sector measures contribute nearly two-thirds of the emissions reductions between the Baseline and BLUE scenarios in 2050.

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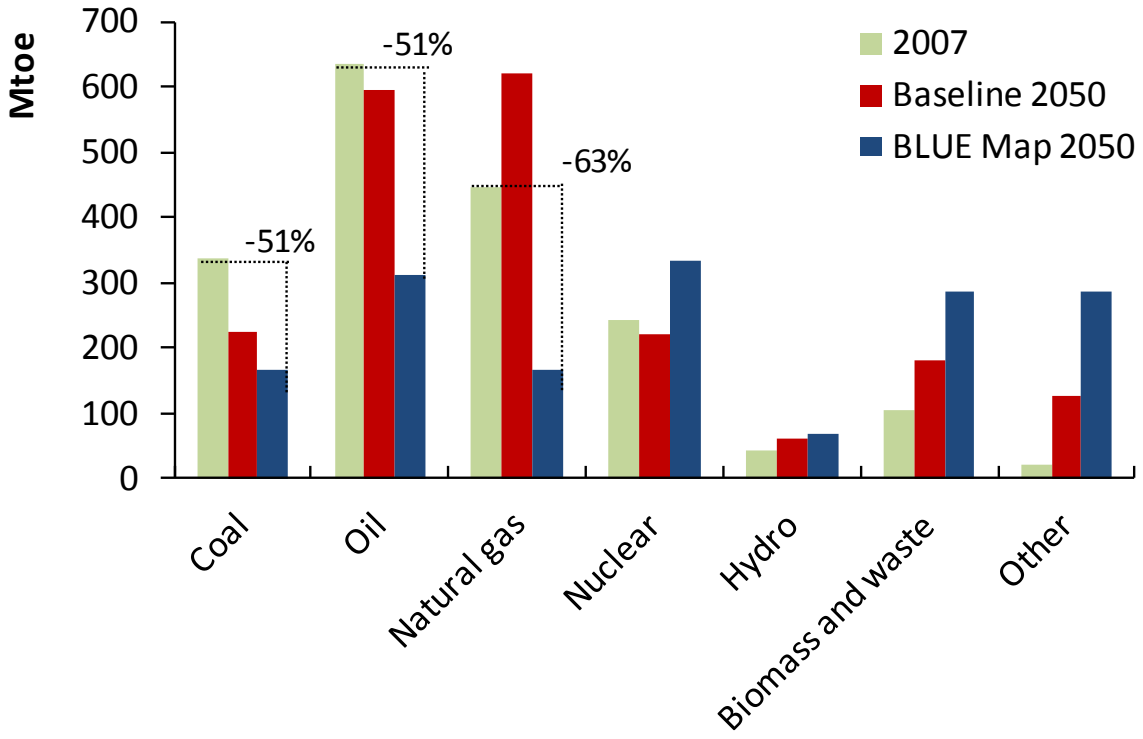
Primary energy demand by fuel and by scenario in OECD Europe



Fossil fuel demand is reduced to one half under the BLUE Map scenario.

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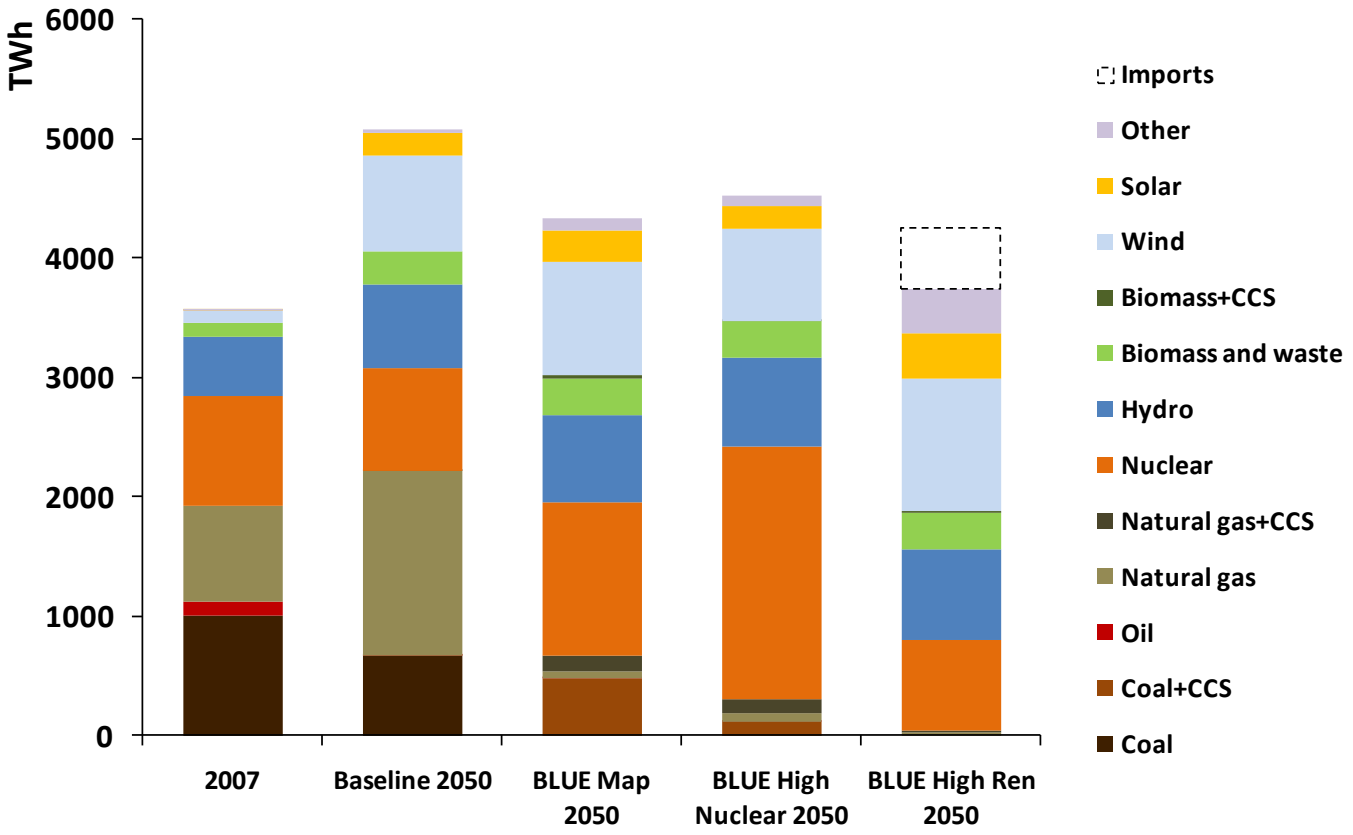
Decarbonisation of power generation in OECD Europe



A mix of nuclear, renewables and fossil-fuels with CCS will be needed to decarbonise the electricity sector.

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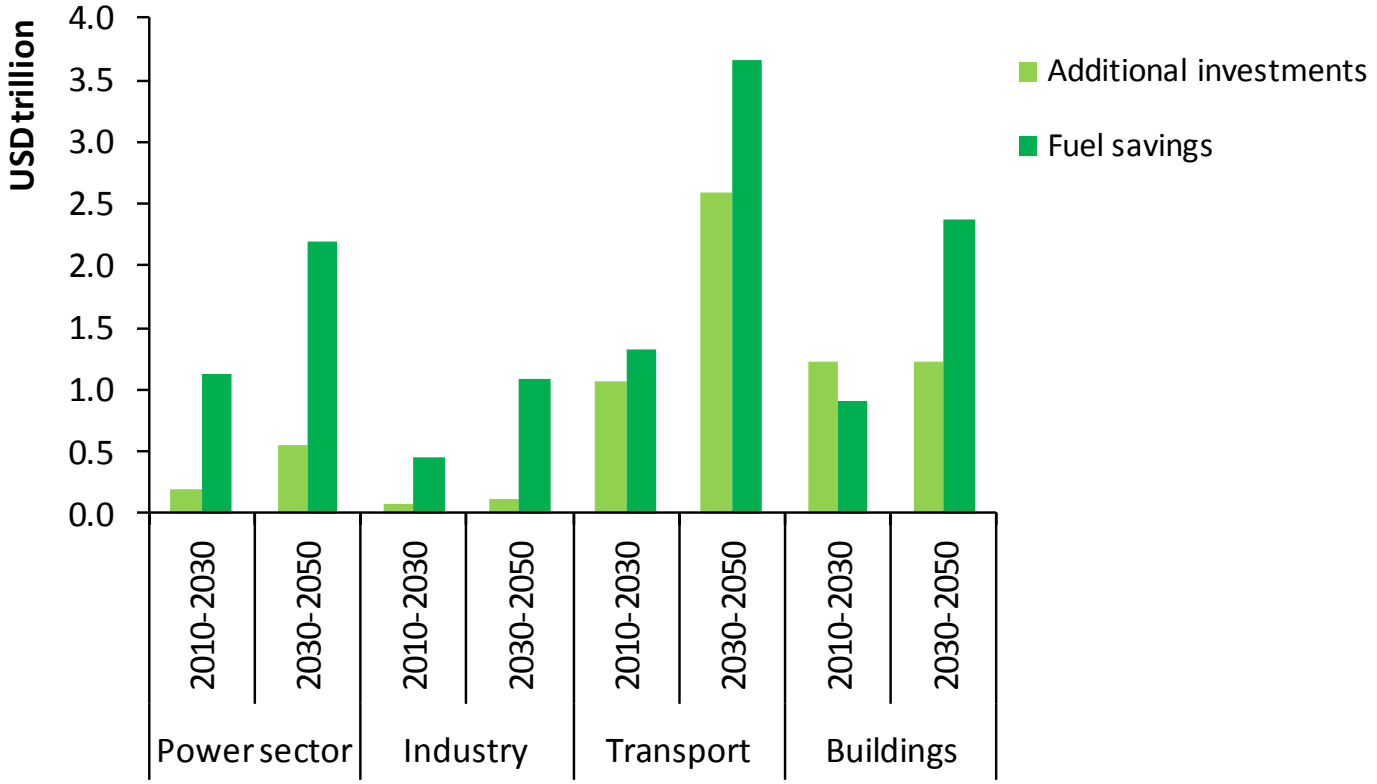
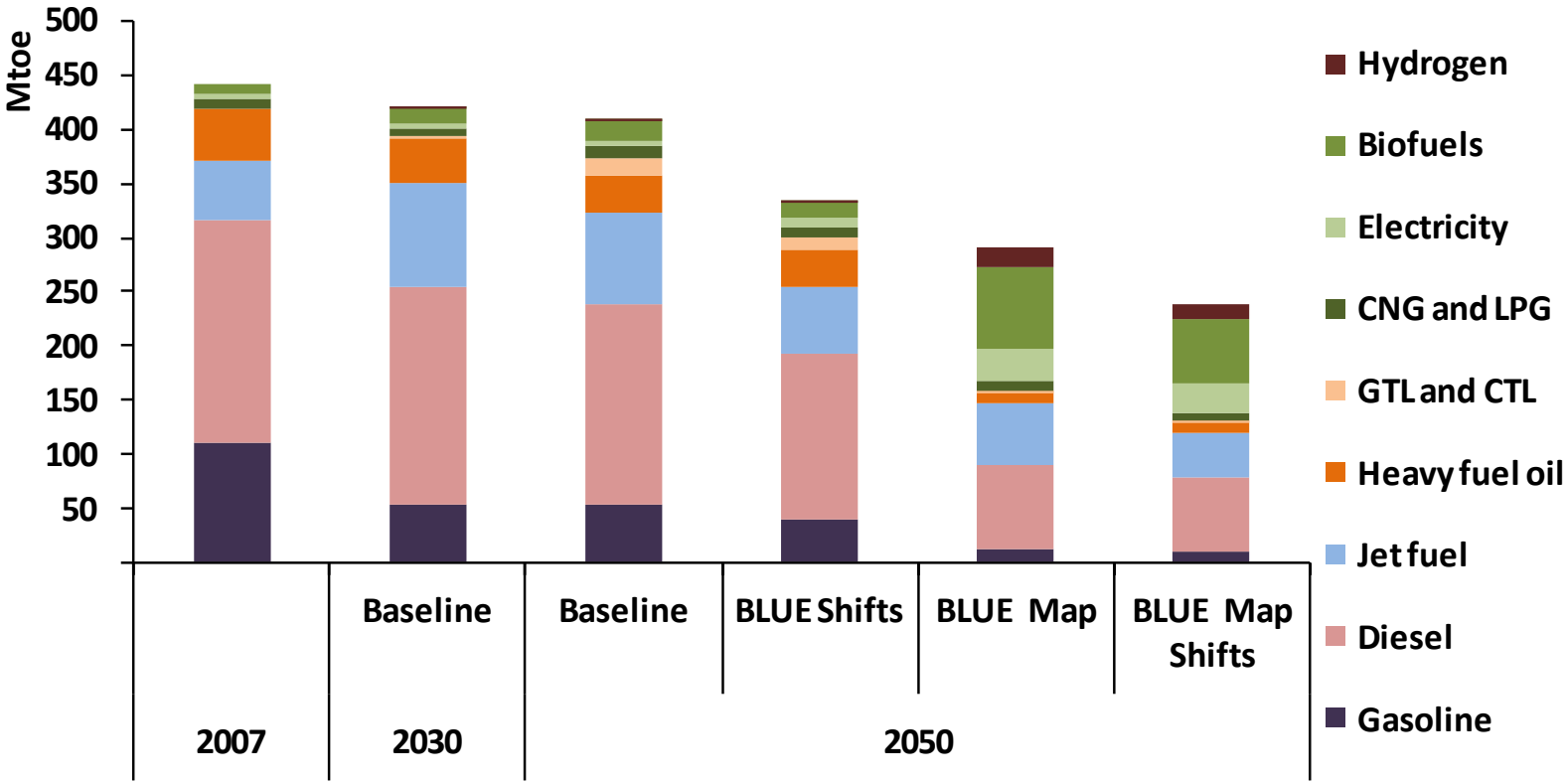
Additional investment needs and fuel cost savings for OECD Europe



Large investment needs in transport and the building sectors may be compensated by fuel savings.

Fuel use in the transport in OECD Europe



The use of fossil fuels in the transport sector falls by over 60% in the BLUE Map scenario

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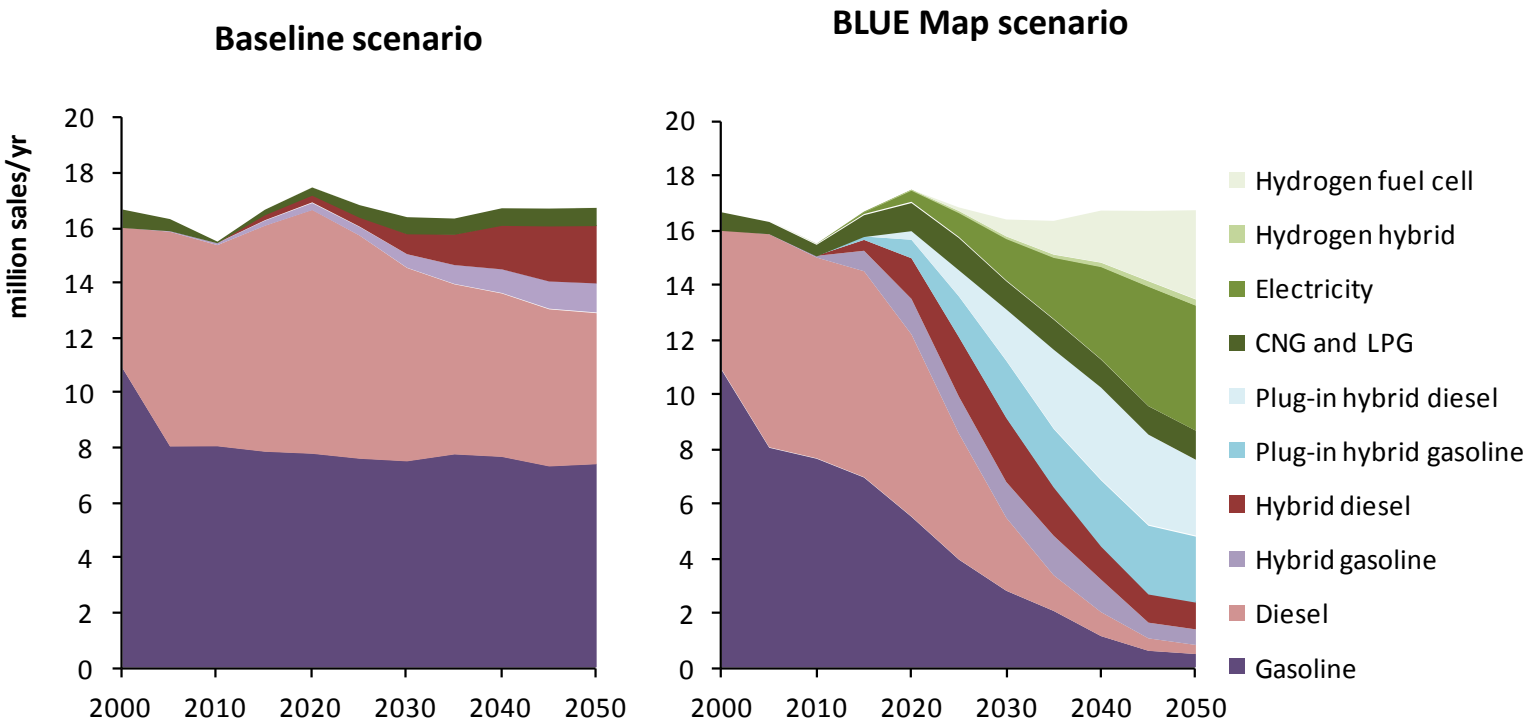
Passenger light-duty vehicles sales by technology in OECD Europe in the Baseline and BLUE Map scenarios



A wide range of new LDV technologies contribute to emissions reductions under the BLUE scenario.

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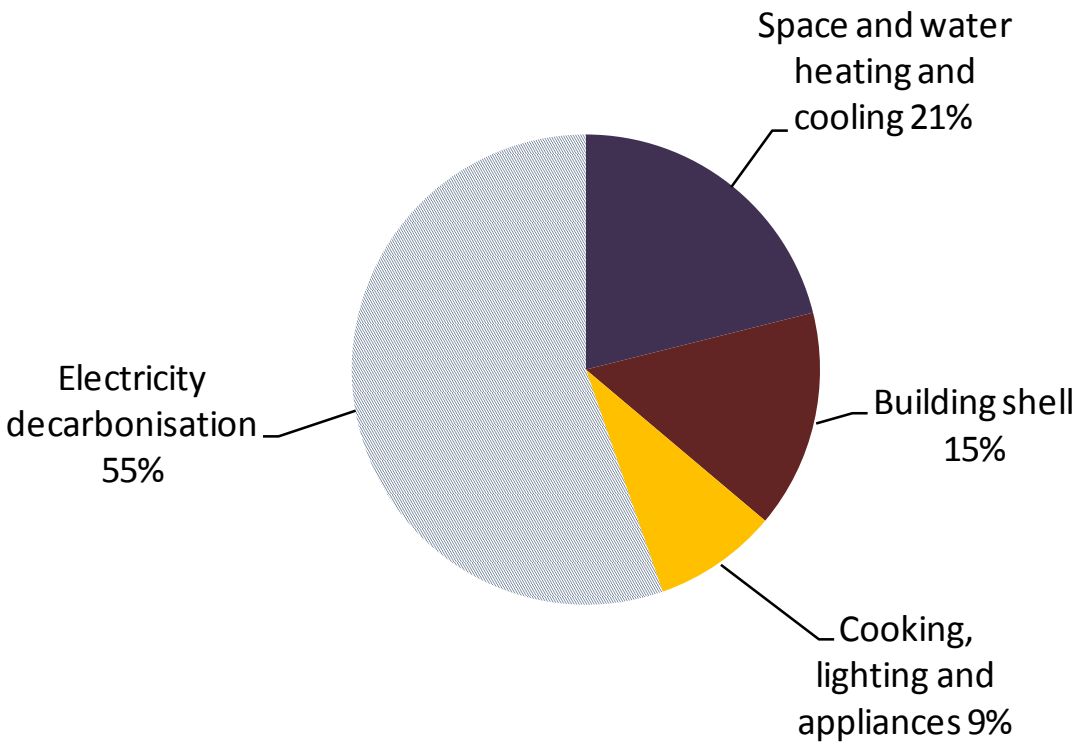
CO_2 emissions in the buildings sector in OECD Europe



Decarbonisation of the electricity sector contributes over half of emissions reduction in the buildings sector.

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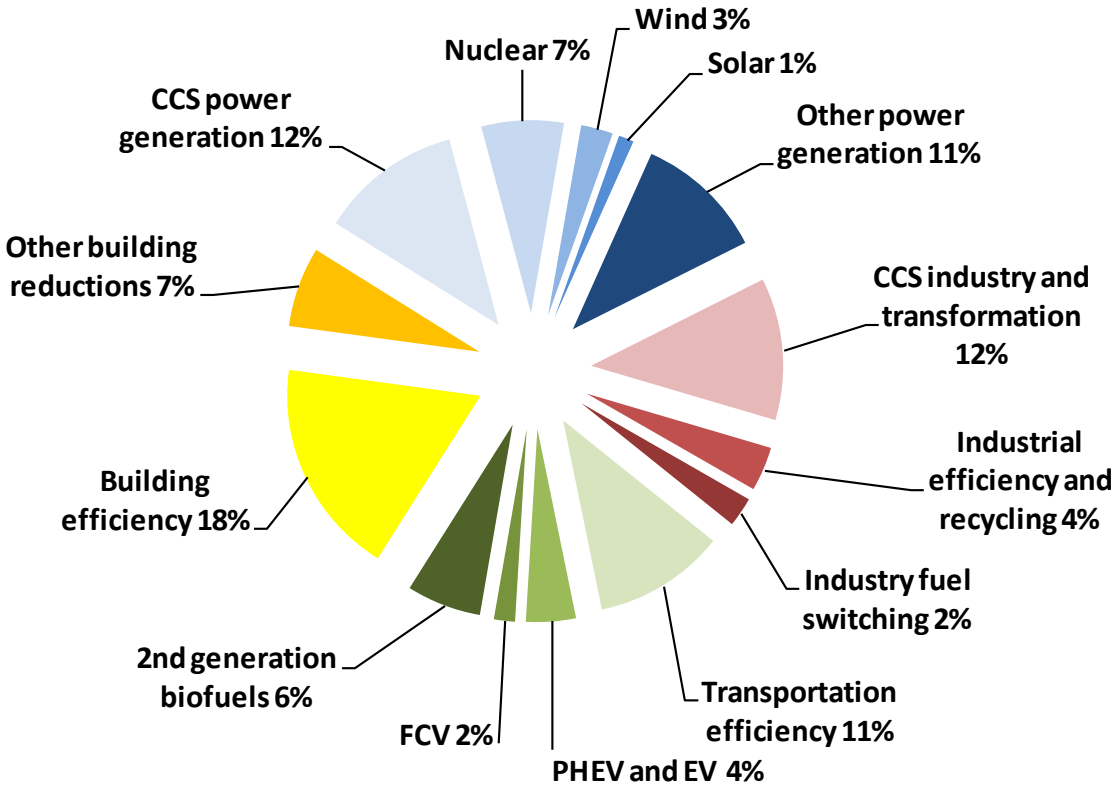
Contributions to emissions reductions in OECD Europe



Reductions in the buildings and power sector represent the largest savings

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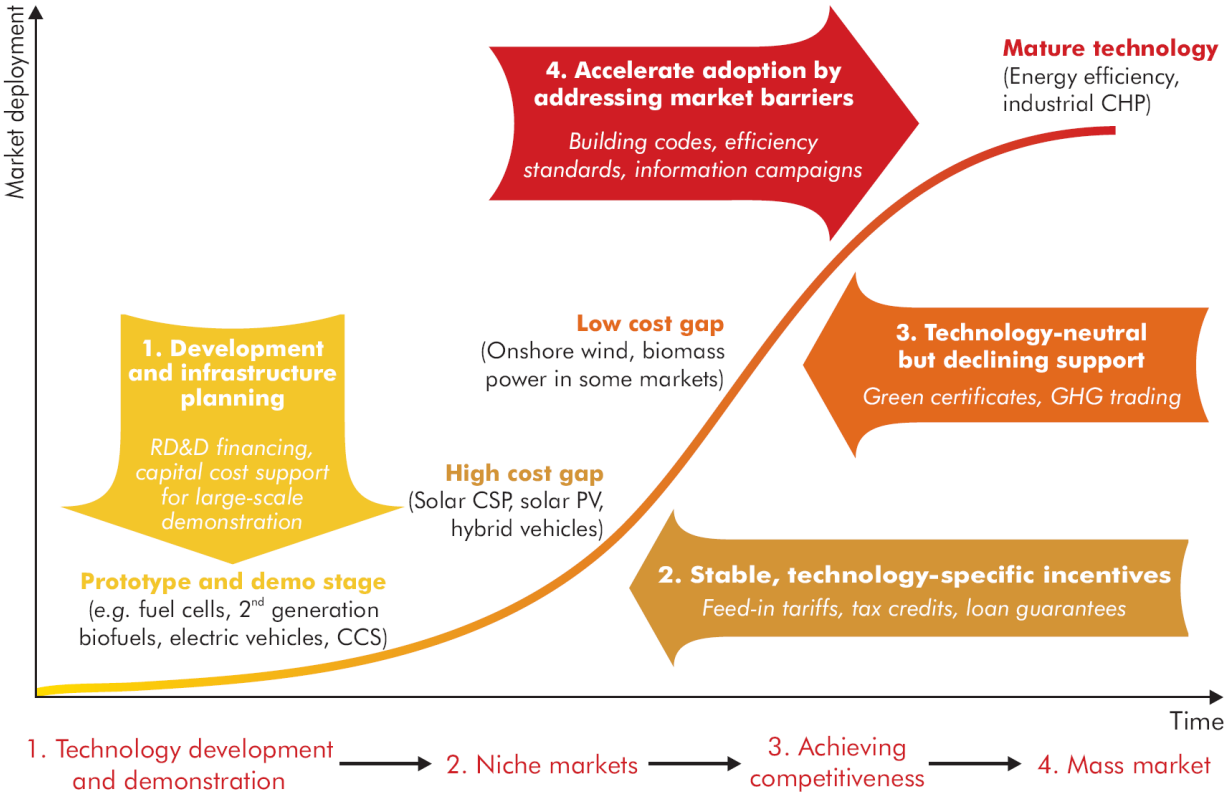
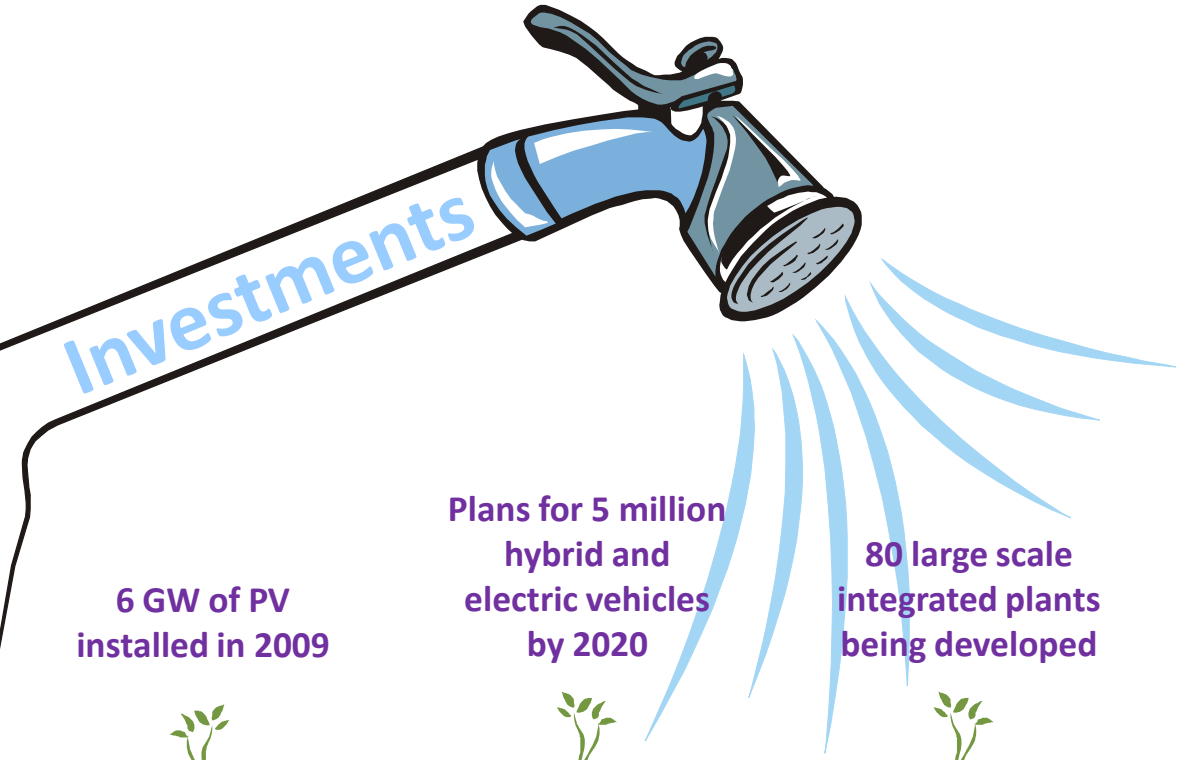
Policies for supporting low-carbon technologies



Government support policies need to be appropriately tailored to the stage(s) of technological development.

The first green shoots of an energy technology revolution…



Renewables	Transport	Carbon capture and storage	Energy efficiency	Research and development
6 GW of PV installed in 2009	Plans for 5 million hybrid and electric vehicles by 2020	80 large scale integrated plants being developed	Global sales of CFLs @ 3500 million/yr	1/3 funding increase between 2005 and 2008

…much more needs to be done

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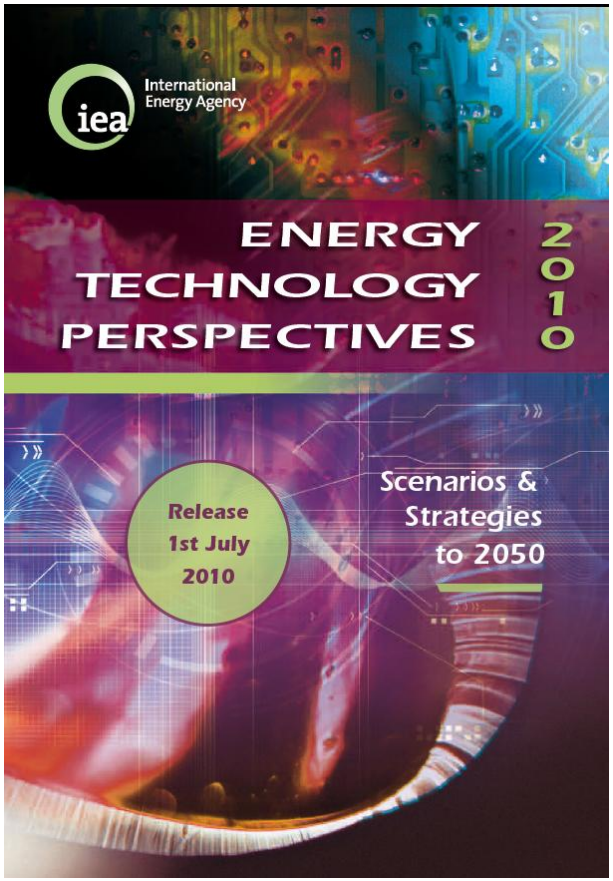

Thank You

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