International Energy Agency

Energy Technology Perspectives 2010

Presentation to the Press
Washington, 1 July 2010

Much more needs to be done

...in the face of an energy technology revolution...

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

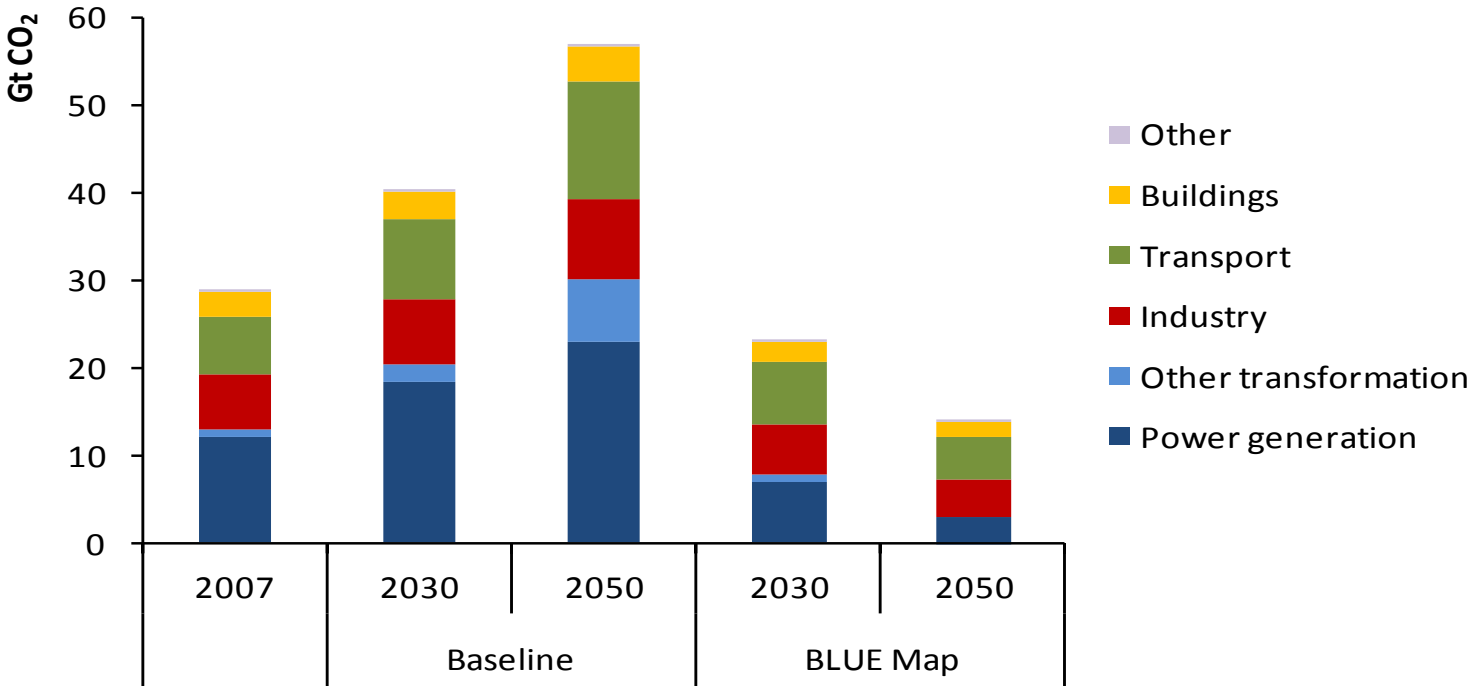
The context

- **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?**

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

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

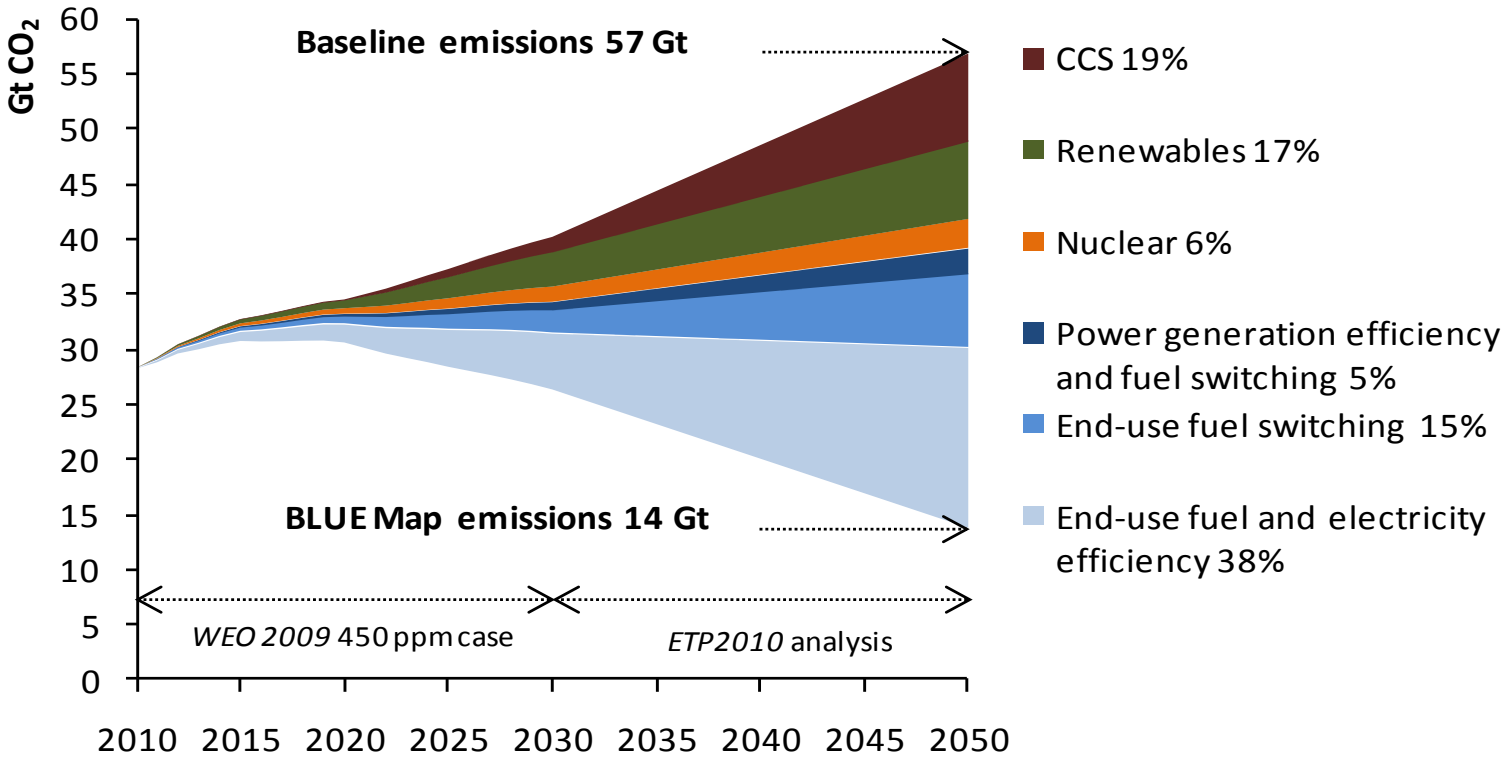


Global CO_2 emissions double in the Baseline, but in the BLUE Map scenario abatement across all sectors reduces emissions to half 2005 levels by 2050.

ENERGY TECHNOLOGY PERSPECTIVES 2010

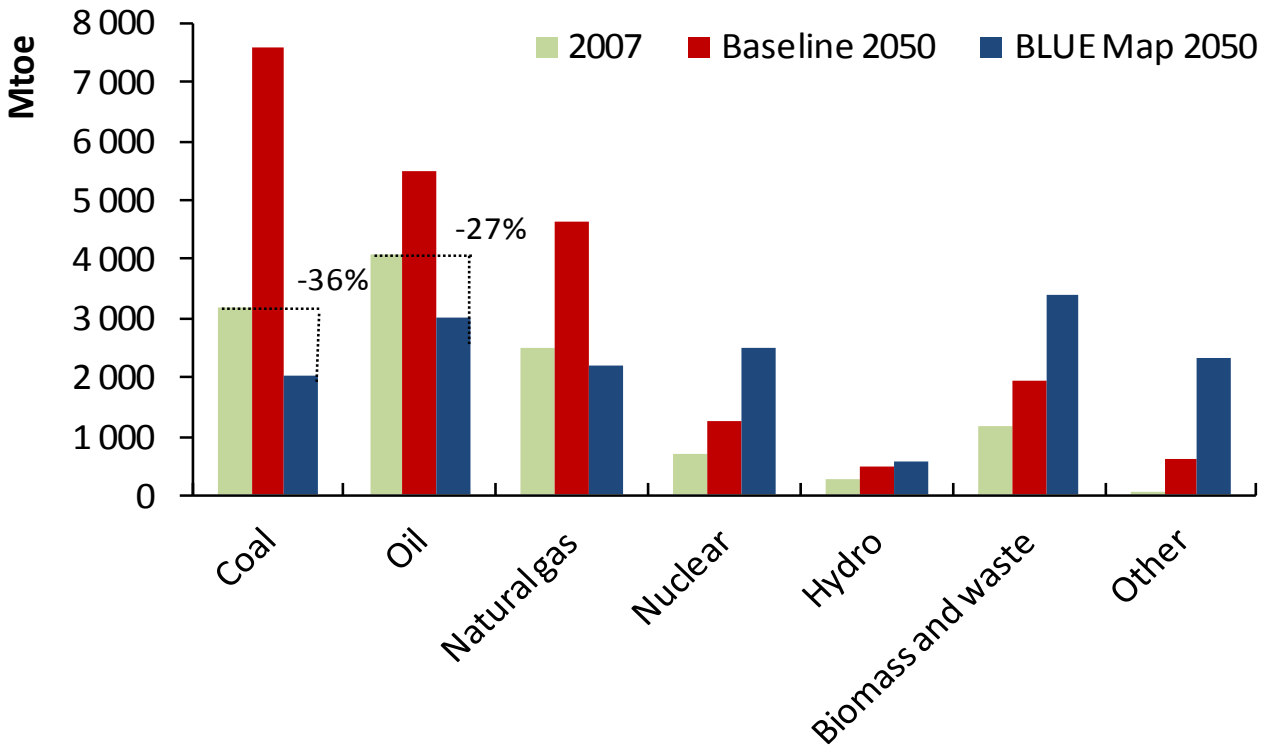
Scenarios & Strategies to 2050

Key technologies for reducing global CO_2 emissions



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

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.

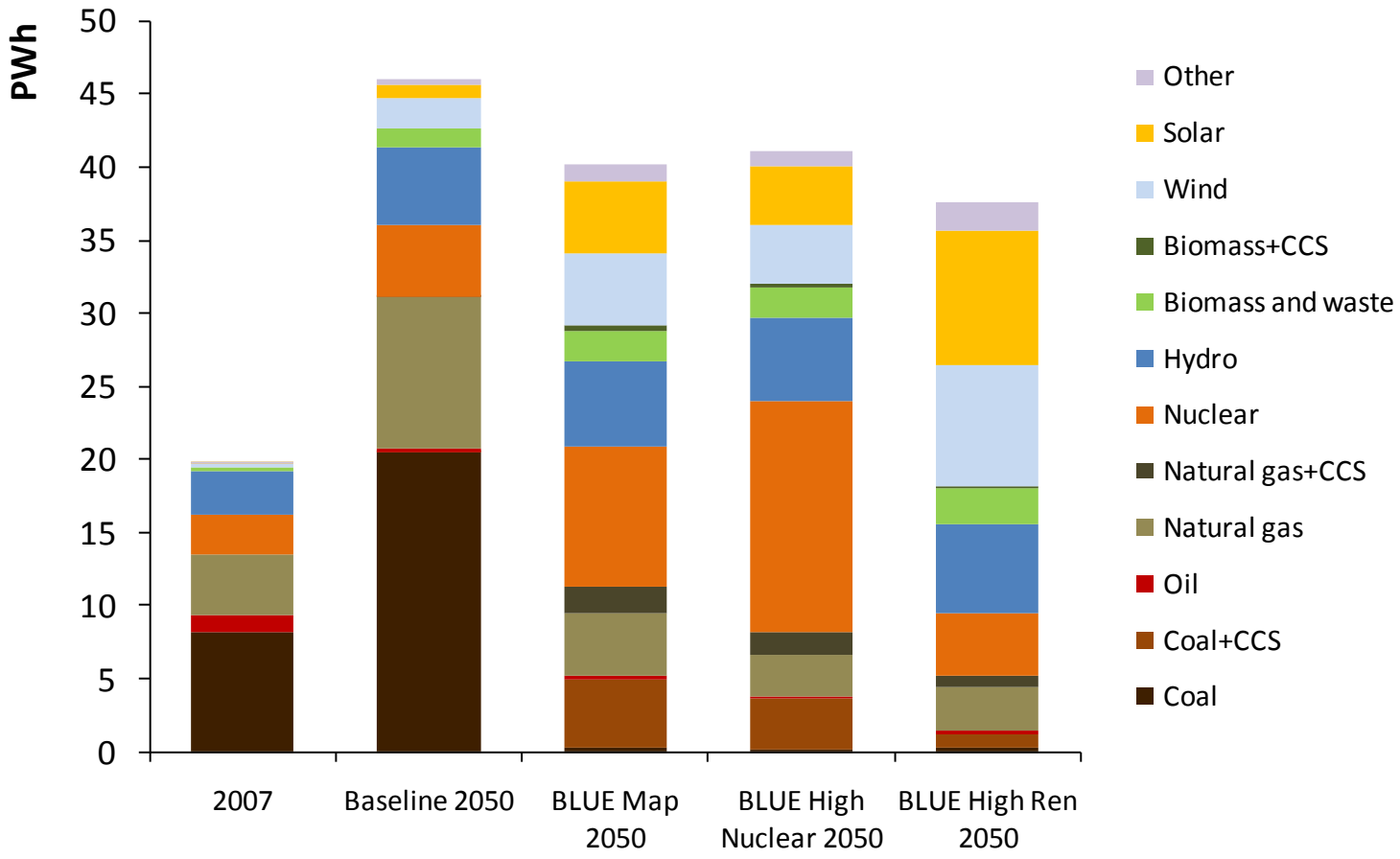
ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

Decarbonising the power sector – a new age of electrification?

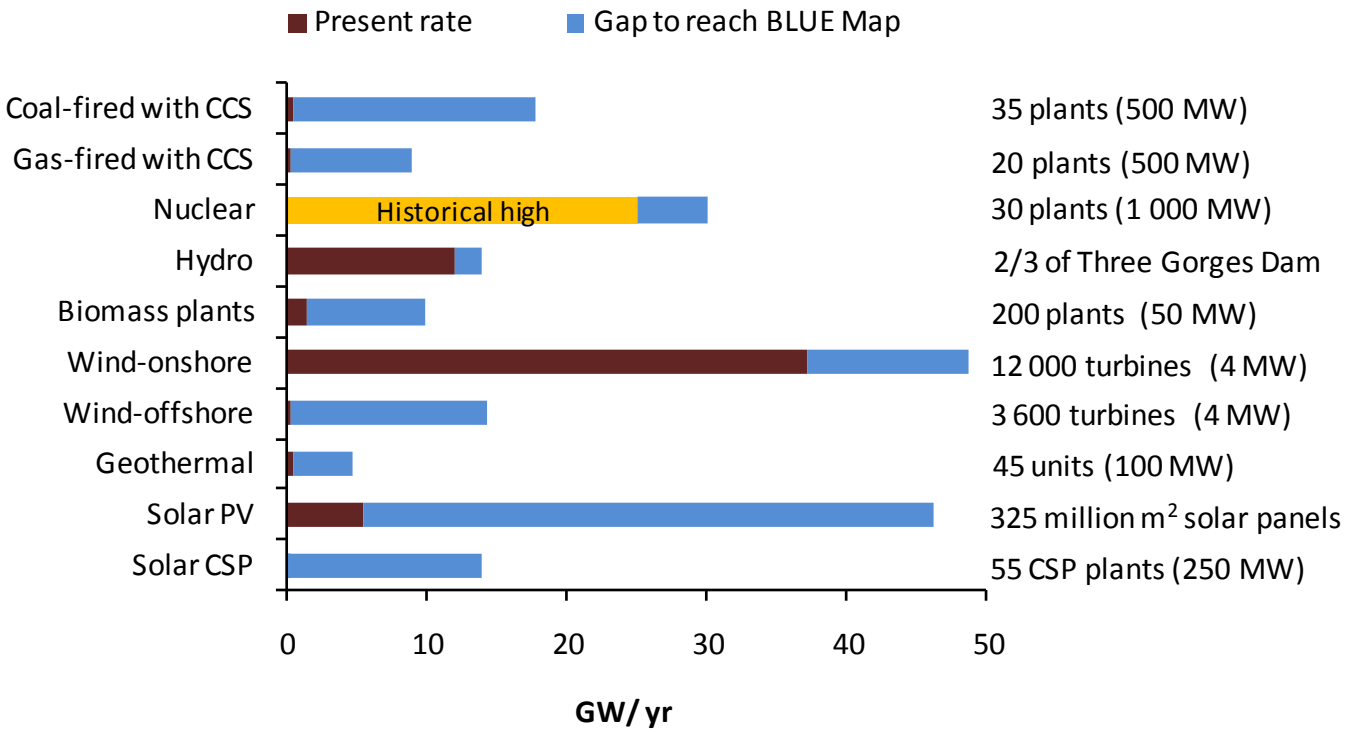


A mix of renewables, nuclear and fossil-fuels with CCS will be needed to decarbonise the electricity sector.

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

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.

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

Environmental co-impacts of electricity generation technologies

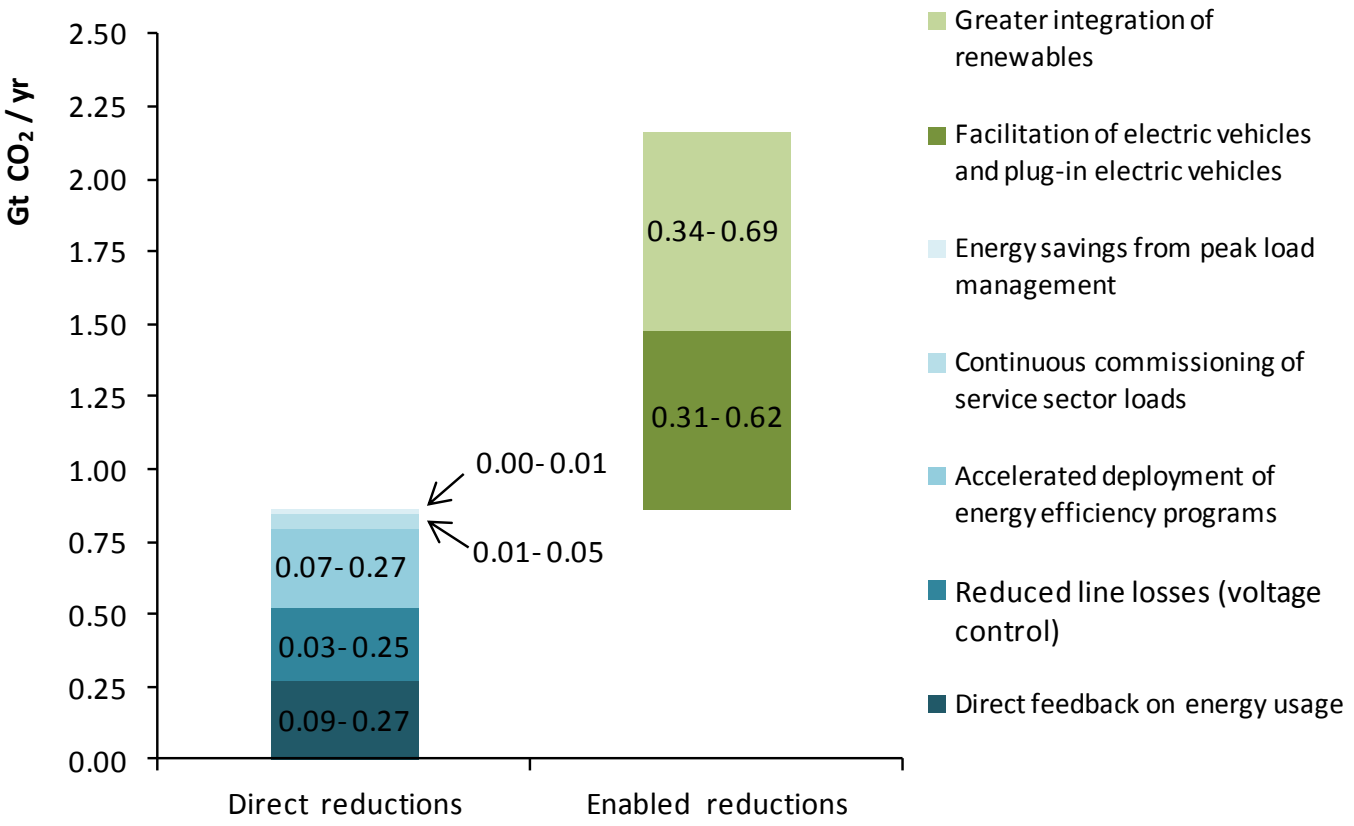
Energy Technologies	Life Cycle Impacts (Pre- and Post-Generation)			Power Generation Impacts			CO_2 Emissions *t/MWh*
	Air	Water	Land	Air	Water	Land	
Coal - USC	*Baseline Technology for Relative Assessments Below*						0.777
Coal - Biomass	Positive	Positive	Variable / Uncertain	Variable / Uncertain	Minimal	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.

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

Smart grid CO_2 reductions in 2050

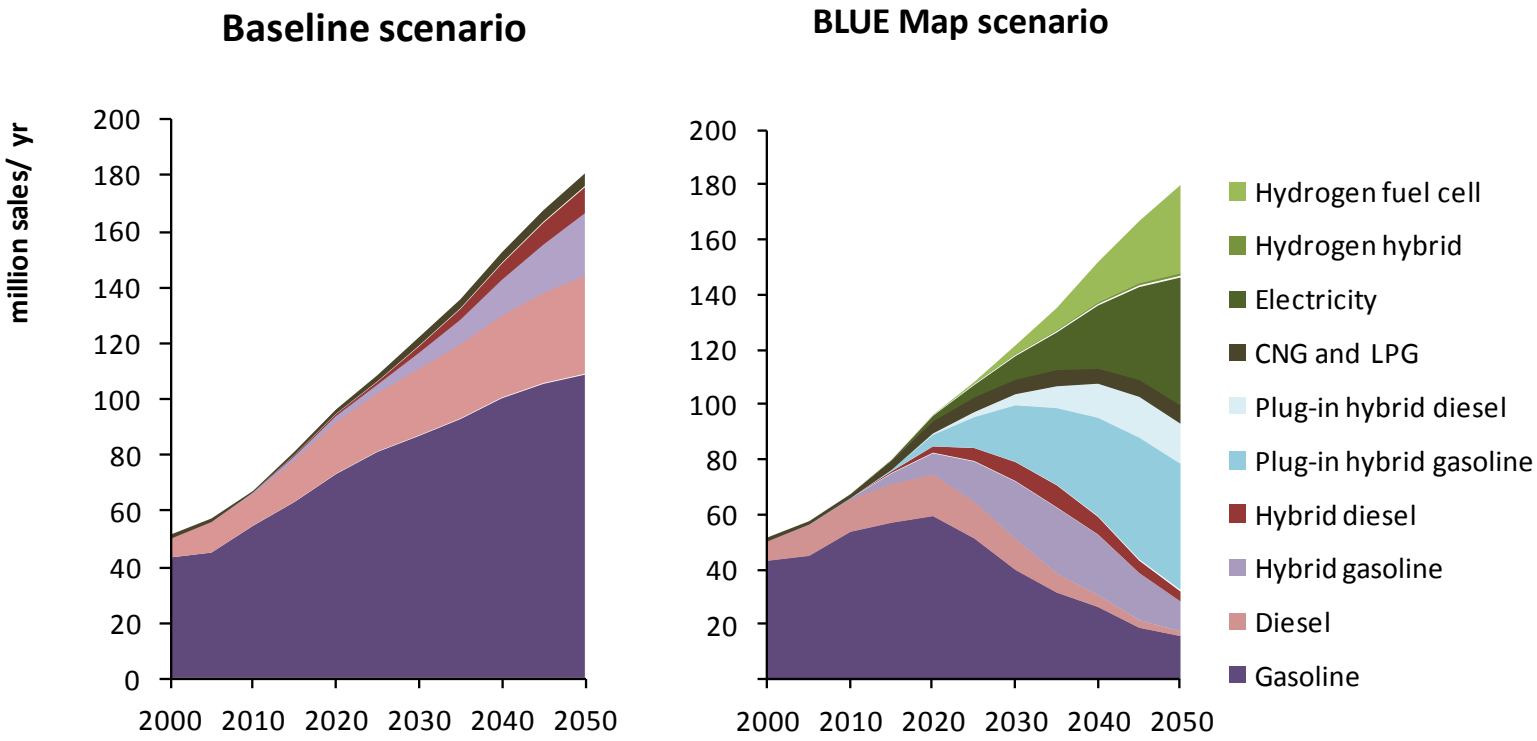


Smart grids allow better management of the grid and can facilitate the deployment of low-carbon technologies, such as renewables and electric vehicles.

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

Evolution of light-duty vehicle sales by technology

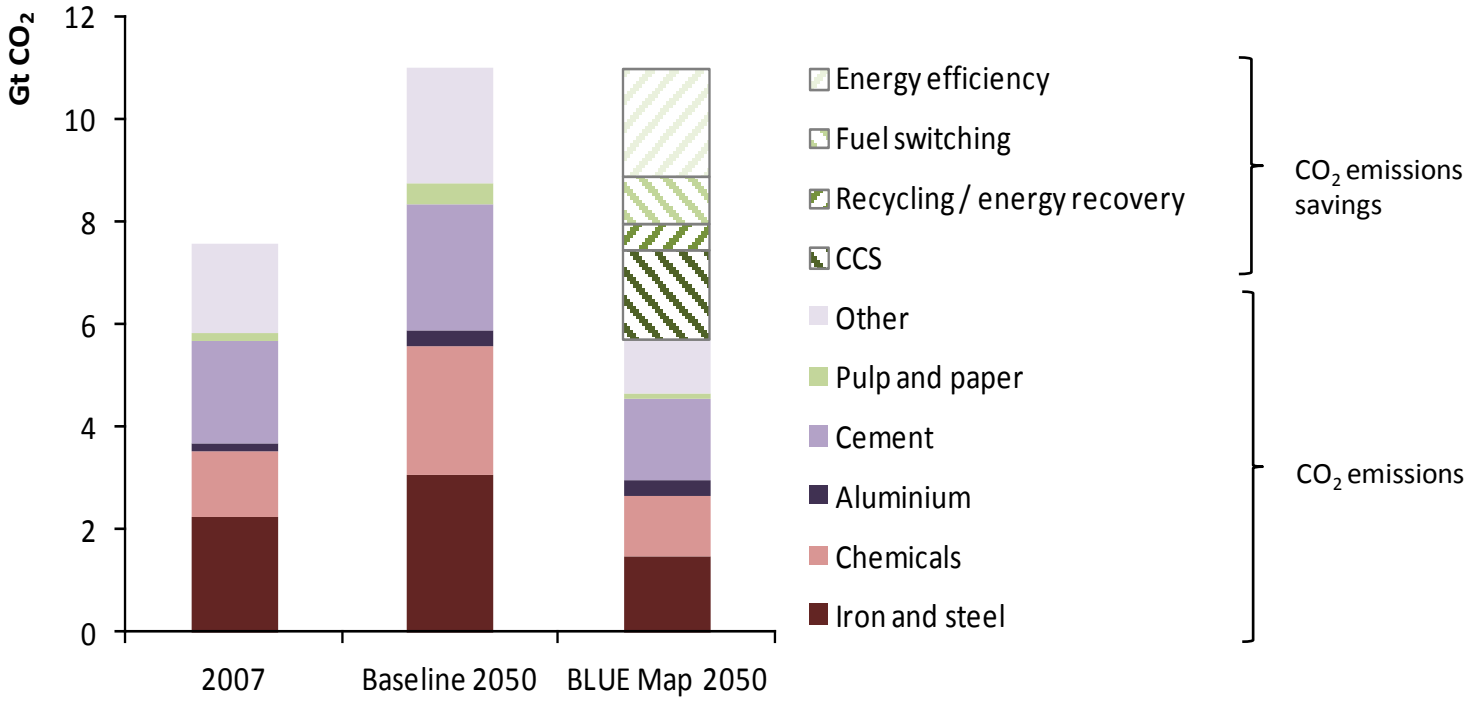


In the BLUE Map scenario advanced technologies, such as plug-in hybrid, all-electric and fuel-cell vehicles, dominate sales after 2030.

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

Direct energy and process CO_2 emissions in industry by sector

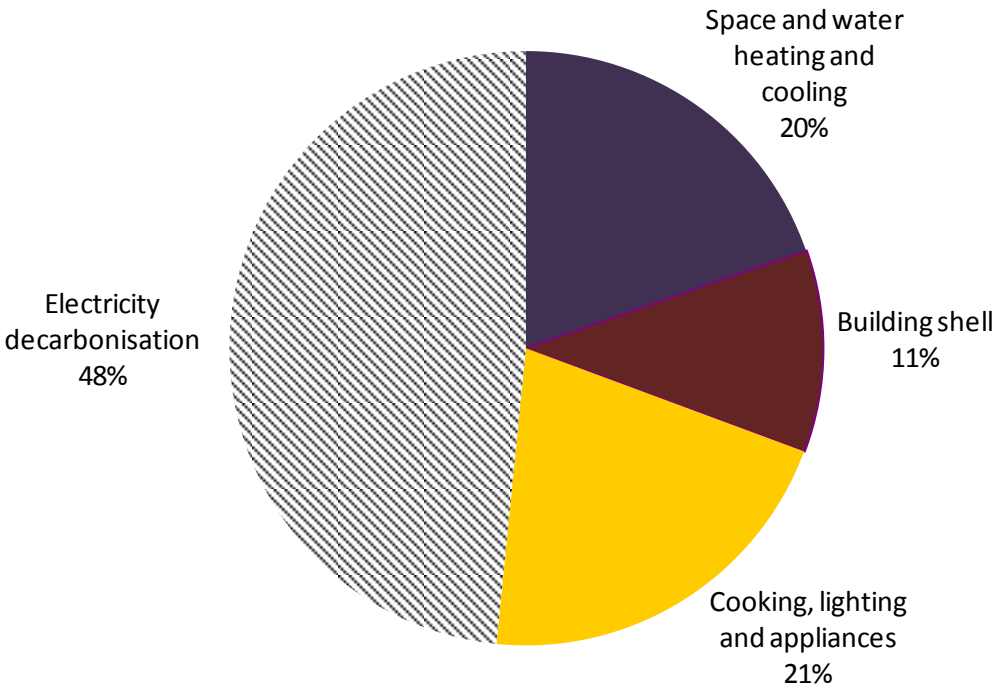


Energy efficiency and CCS are the two most important abatement options in industry.

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

Contributions to CO_2 emissions reductions in the buildings sector

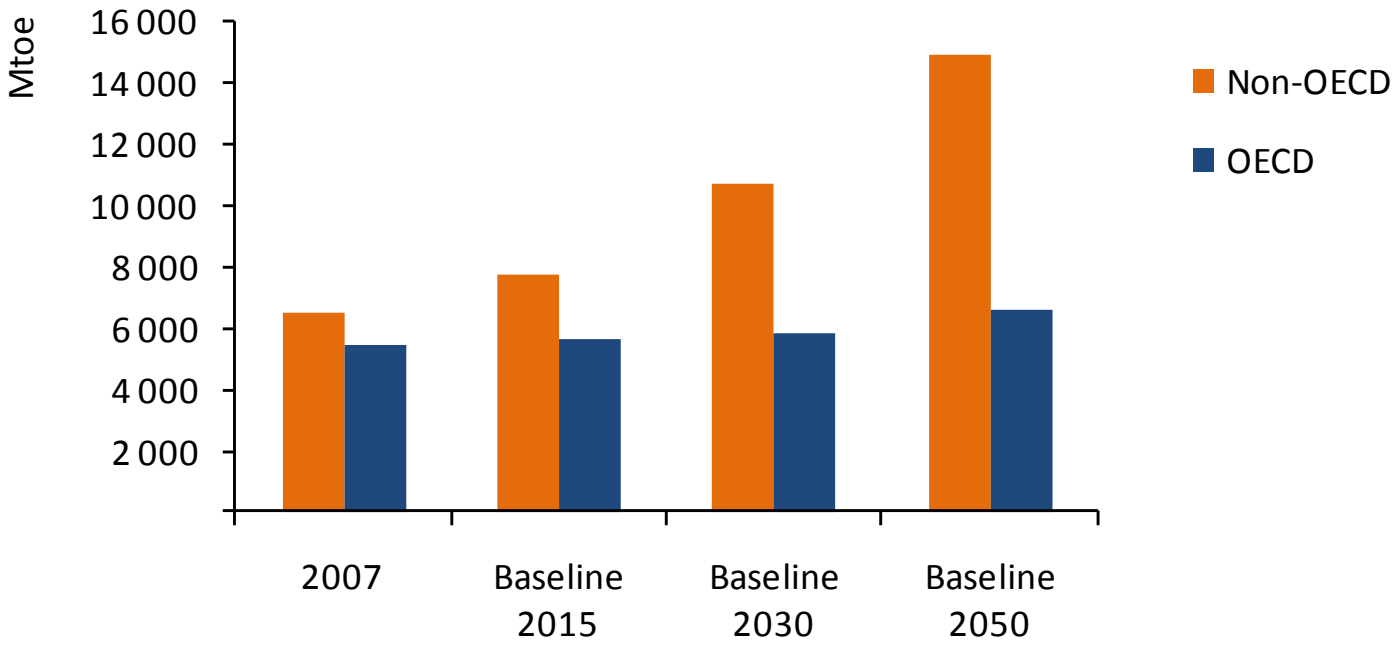


Decarbonisation of the electricity sector contributes around half of the emissions reduction in the buildings sector.

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

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

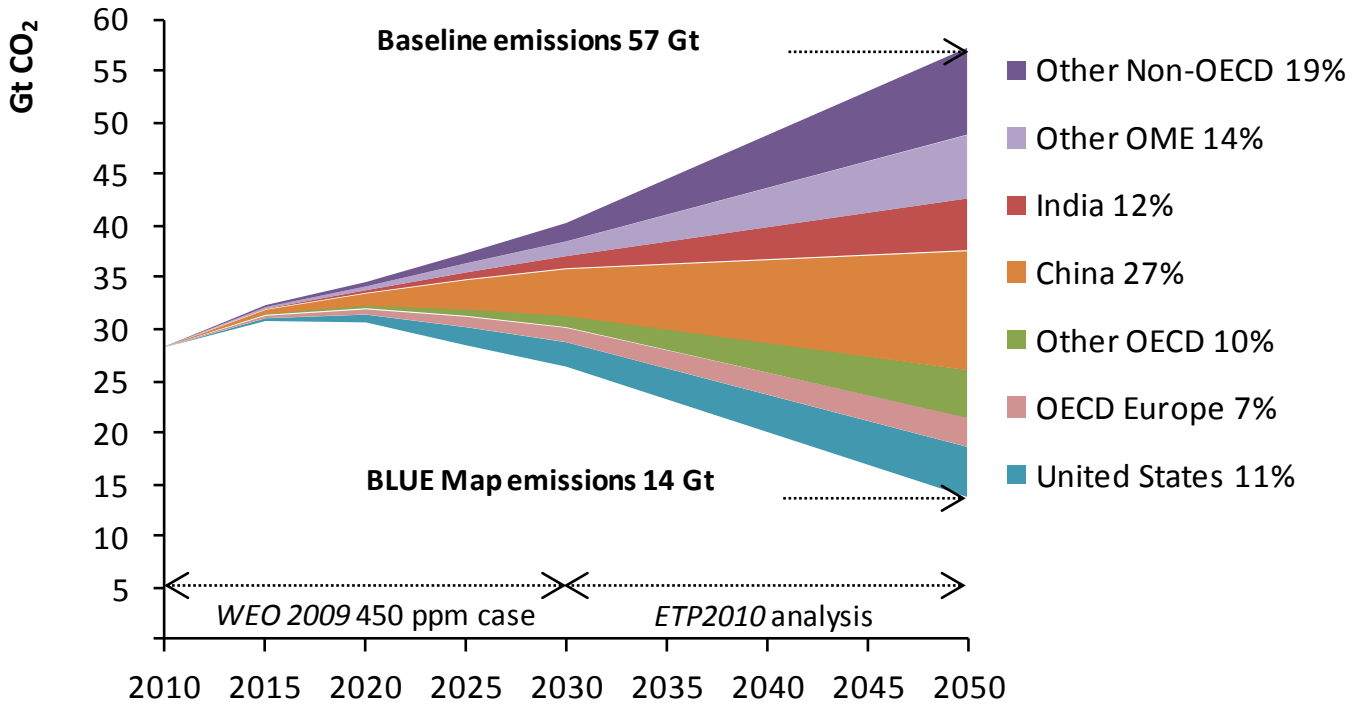


Primary energy demand in non-OECD countries is projected to increase much faster than in OECD countries in the Baseline scenario.

ENERGY TECHNOLOGY PERSPECTIVES 2010

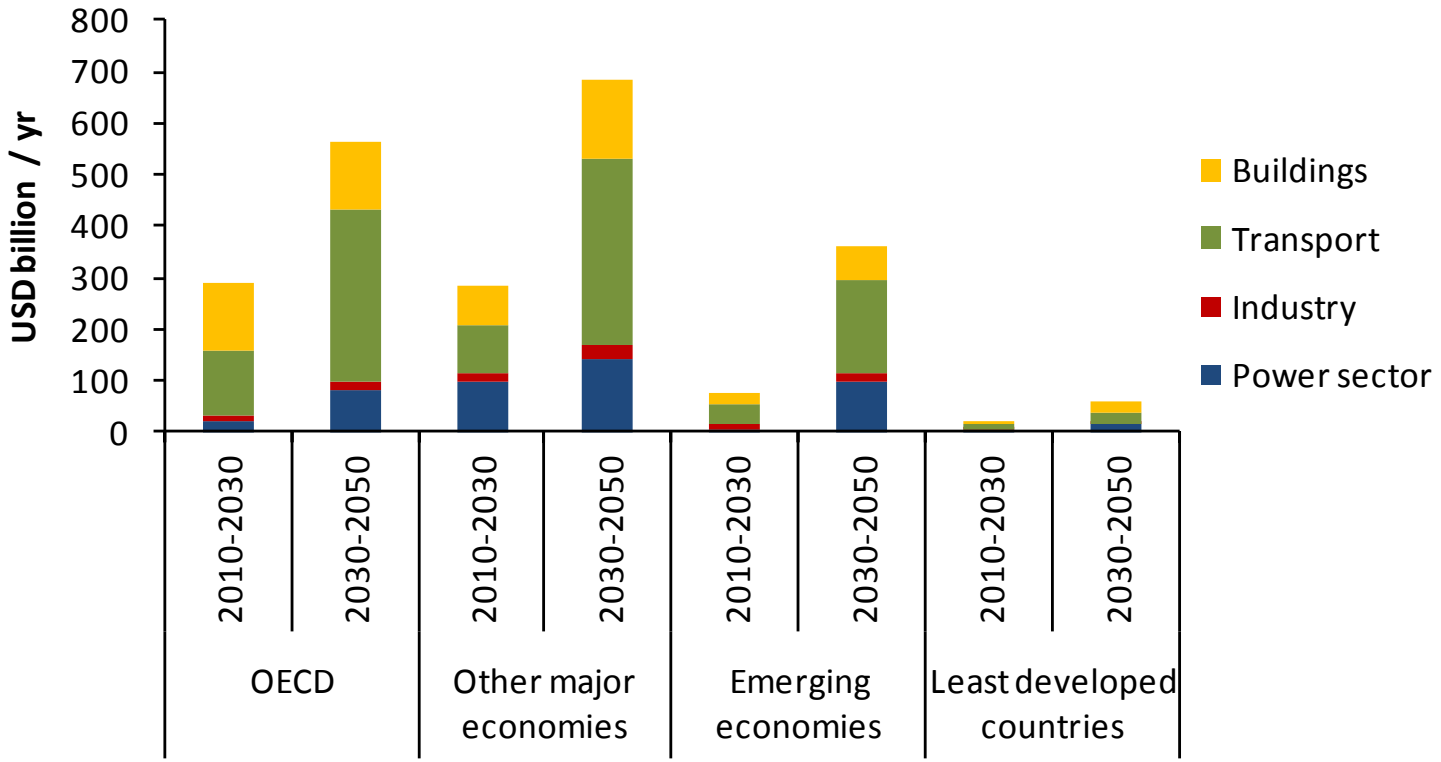
Scenarios & Strategies to 2050

World energy-related CO_2 emissions abatement by region



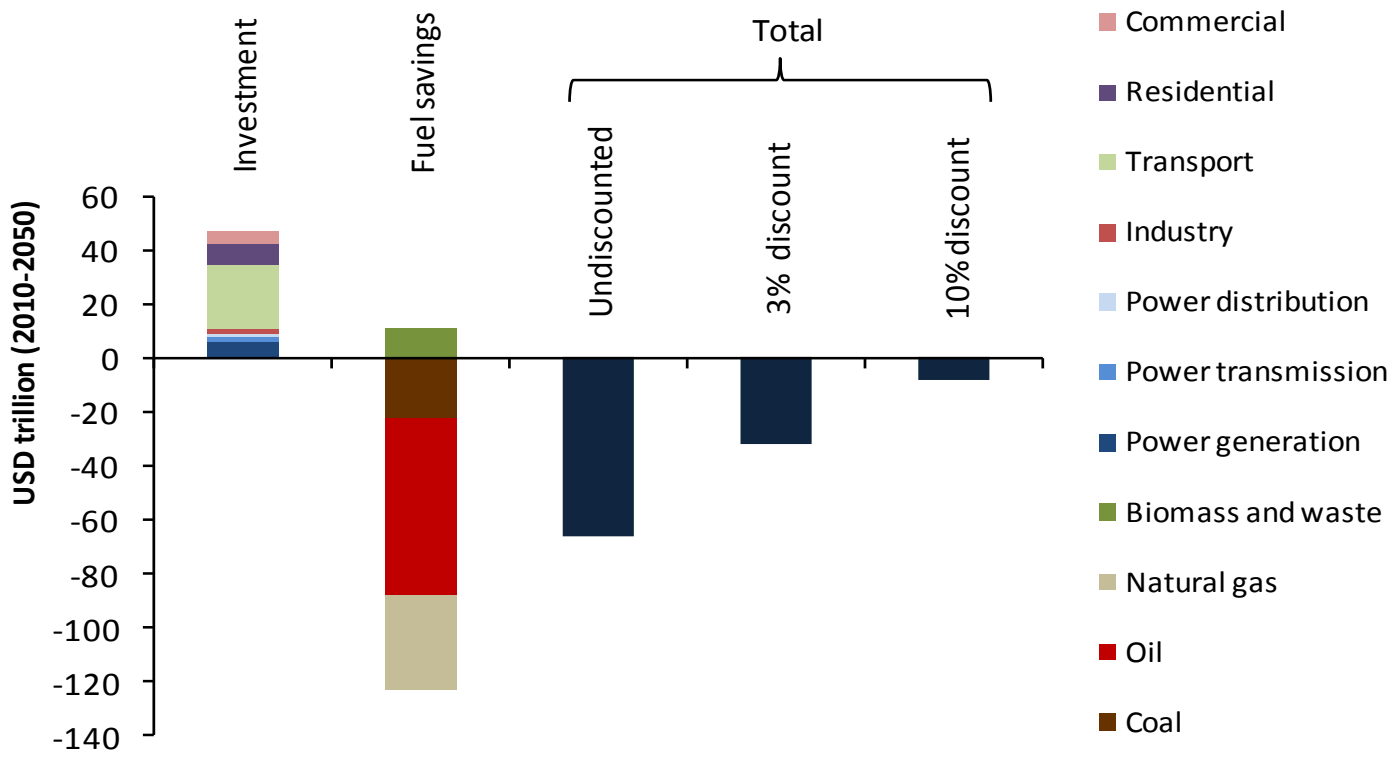
In the BLUE Map scenario, most of the reductions in energy-related CO_2 emissions are in non-OECD countries.

Additional investment needs in the BLUE Map scenario



Over the period to 2050, most of the additional investment in low-carbon technologies will be needed in non-OECD countries.

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.

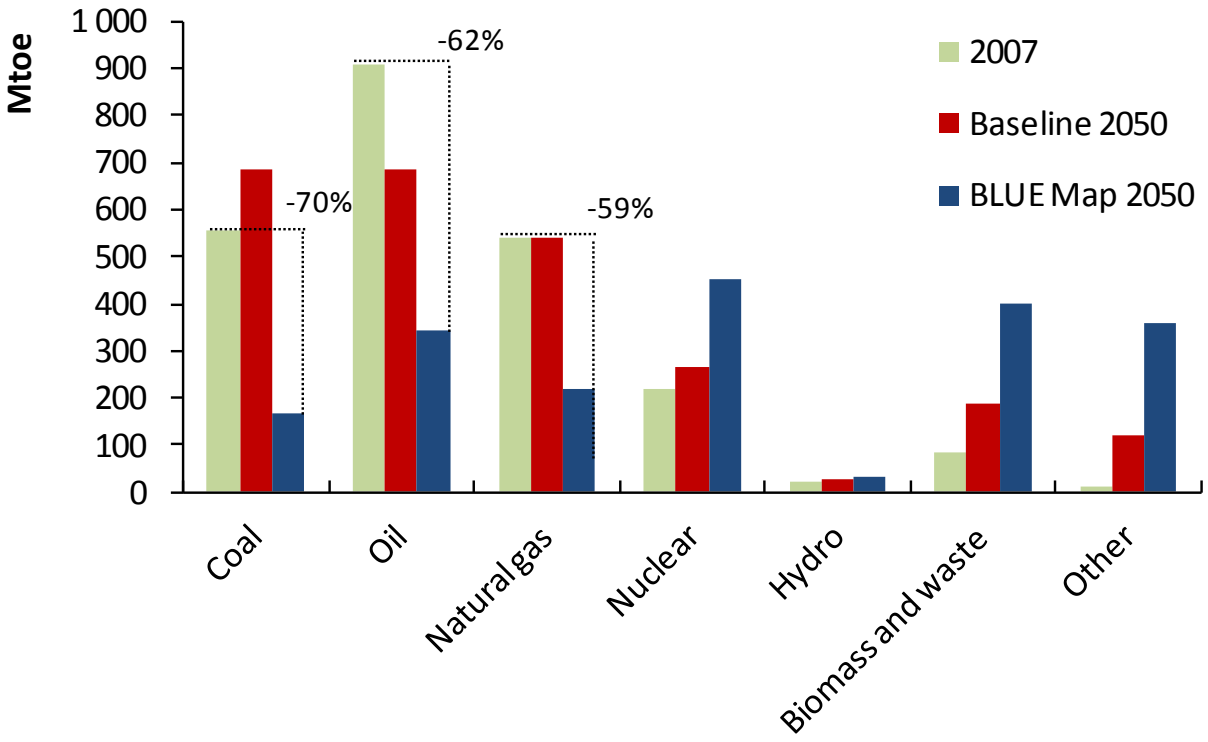
ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

Primary energy demand by fuel and by scenario in the United States

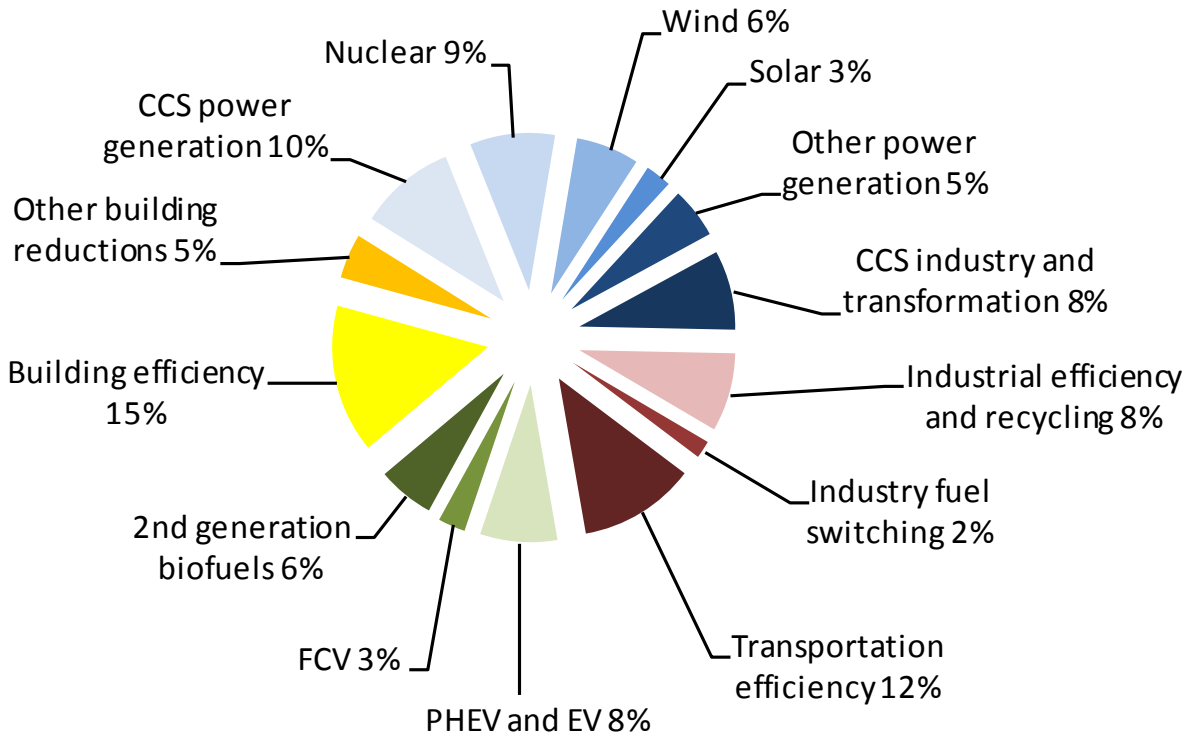


Fossil fuel demand in the United States is reduced by almost 2/3 under the BLUE Map scenario.

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

Contributions to CO_2 emissions reductions in the United States in 2050



A wide range of options are needed, with energy efficiency and decarbonising the power sector providing the largest emissions reductions.

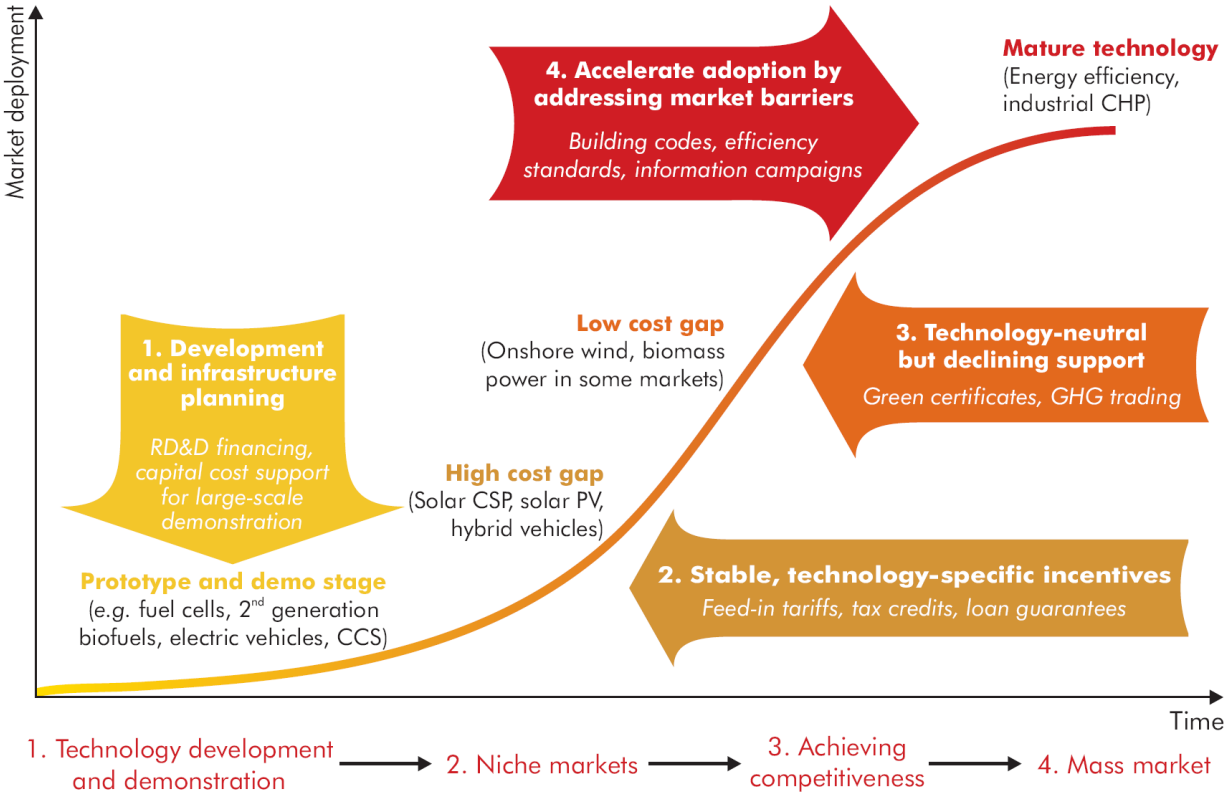
Technology policies

- Carbon pricing is important, but should be complemented by other policies
- Policies must be tailored to the technology's stage of development and reflect good design principles
- Public RD&D spending must at least double
- Governments need to implement best practices in energy RD&D
- A number of enabling actions are also needed:
  - Private sector leadership
  - Expanded human capacity
  - Greater government outreach and planning on infrastructure needs
  - Expanded, more effective international collaboration

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

Policies for supporting low-carbon technologies



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

ENERGY TECHNOLOGY PERSPECTIVES 2010

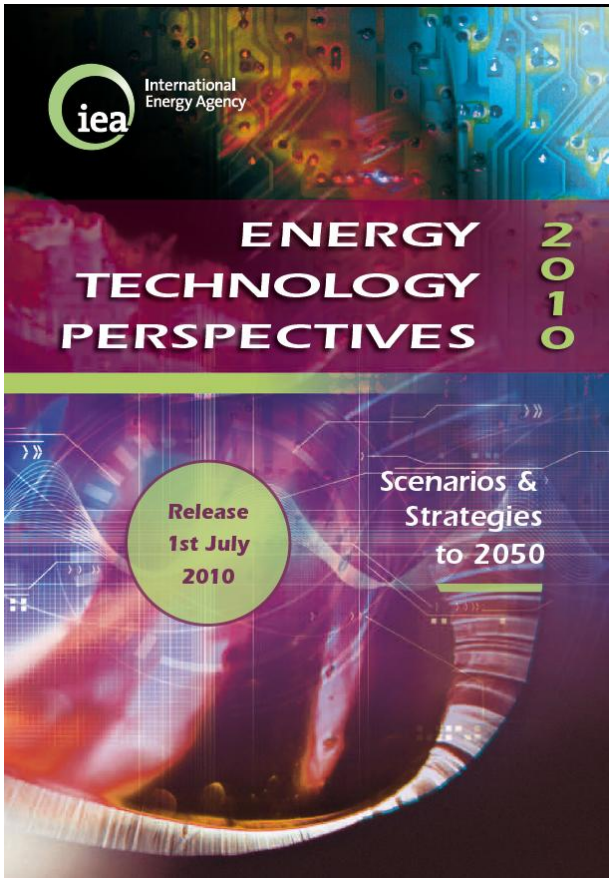
Scenarios & Strategies to 2050

Key messages

- **Some early signs of an energy technology revolution, but change is still fragile and fragmented**
- **Rapid, large-scale deployment of low carbon technologies is needed to halve CO_2 emissions by 2050**
- **This will also reduce fossil fuel use and improve energy security**
- **Fuel savings may outweigh additional investments**
- **Improved energy efficiency and decarbonising electricity are key; new technologies needed after 2030**
- **Urgent action required – emissions must peak by around 2020**
- **Non-OECD countries also need to cut emissions**
- **Governments must take lead to set the policy framework, but industry also has a role**

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050



Thank You

www.iea.org/techno/etp/index.asp

ANNEX

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

GDP projects

	2007-2015	2015-2030	2030-2050
OECD	**1.4**	**1.9**	**1.2**
OECD North America	1.8	2.3	1.4
United States	1.8	2.2	1.3
OECD Europe	1.0	1.8	0.7
OECD Pacific	1.3	1.3	1.7
Non-OECD	**5.7**	**4.1**	**3.4**
Economies in transition and non-OECD Europe	3.3	3.3	3.5
Middle East	4.5	4.0	2.5
Africa	4.7	3.1	3.1
Latin America	3.1	2.5	2.5
China	8.8	4.4	3.8
India	7.0	5.9	3.3
Other developing Asia	3.2	3.5	2.6
World	**3.3**	**3.0**	**2.6**

(% per year based on purchasing power parity)

Oil, gas and coal price assumptions

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

	Unit	2008	2030	2050
IEA crude oil imports	Barrel	97	115	120
Natural gas				
United States imports	*MBtu*	*8.3*	*11.4*	*11.9*
European imports	*MBtu*	*10.3*	*14.0*	*14.7*
Japanese imports	*MBtu*	*12.6*	*15.9*	*16.7*
OECD steam coal imports	Tonne	121	109	115

For the Baseline Scenario (in USD per unit)

	Unit	2008	2030	2050
IEA crude oil imports	Barrel	97	90	70
Natural gas				
United States imports	*MBtu*	*8.3*	*10.2*	*7.9*
European imports	*MBtu*	*10.3*	*11.0*	*8.6*
Japanese imports	*MBtu*	*12.6*	*12.5*	*9.7*
OECD steam coal imports	Tonne	121	65	58

For the BLUE Scenario (in USD per unit)

Carbon Price in the BLUE Map scenario

ENERGY TECHNOLOGY PERSPECTIVES 2010

Scenarios & Strategies to 2050

USD / t CO_2	2020	2030	2050
OECD	50	110	175
Non-OECD	0	65	175