International Energy Agency

Energy Technology Perspectives 2010

Washington, 1 July 2010

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The first green shoots of an energy technology revolution…

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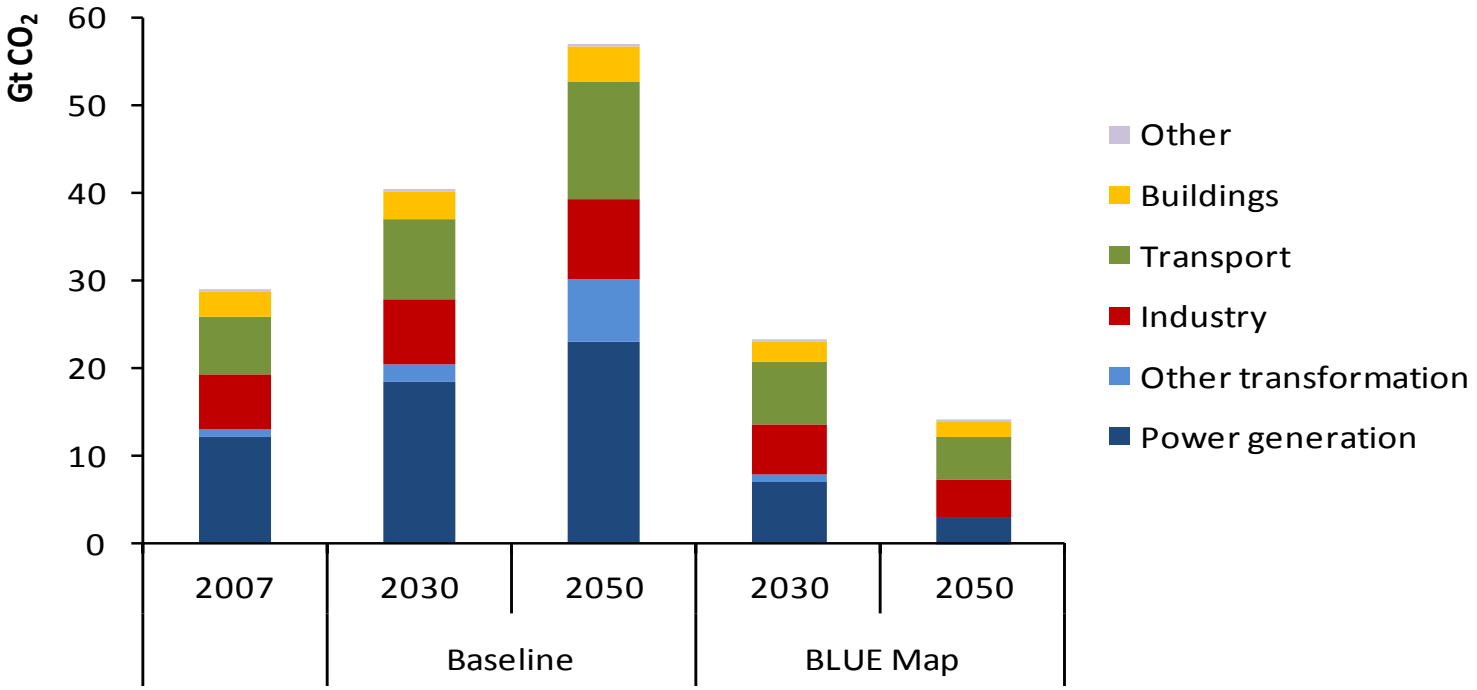
Global energy-related CO_2 emissions in the Baseline and BLUE Map scenarios



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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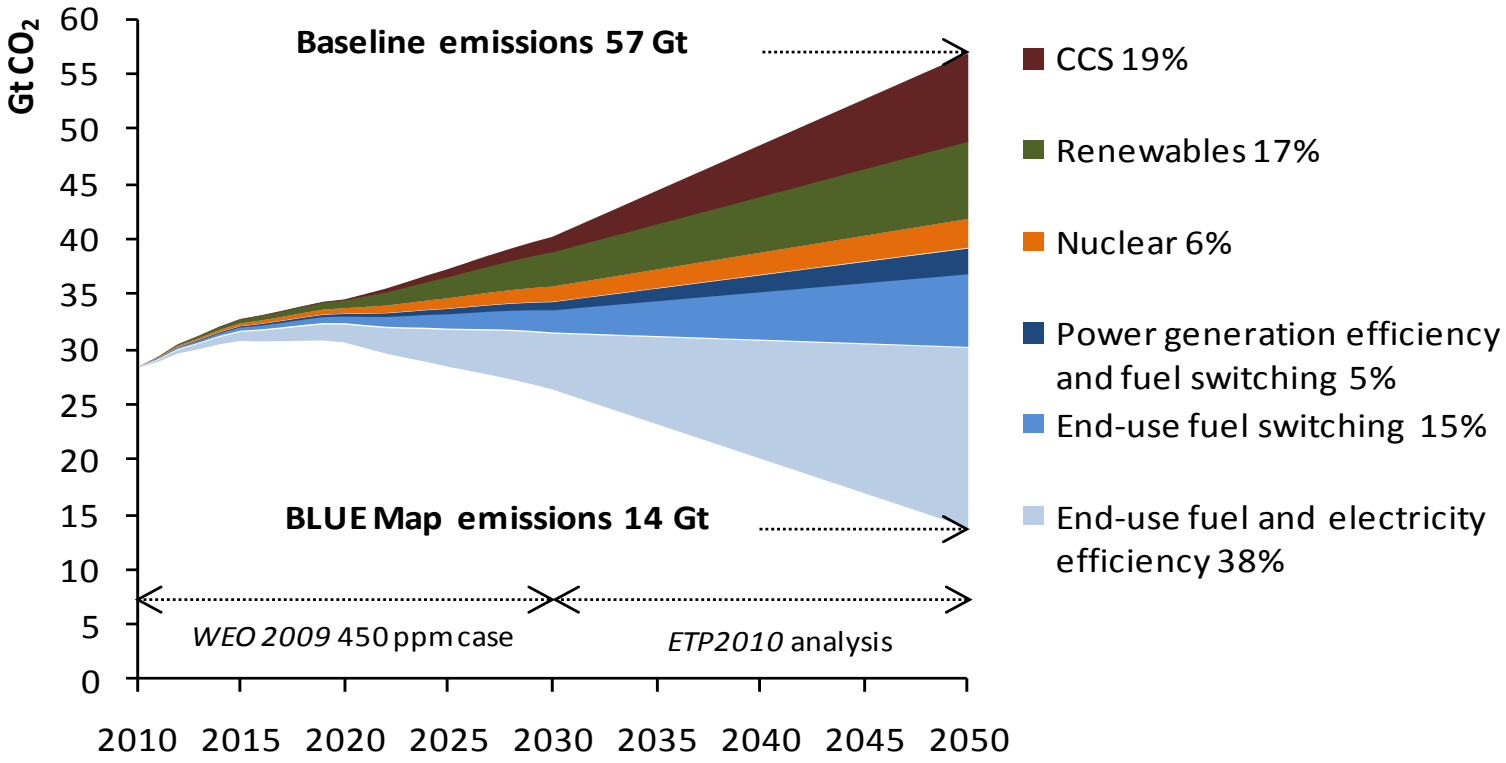
Key technologies for reducing global CO_2 emissions



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

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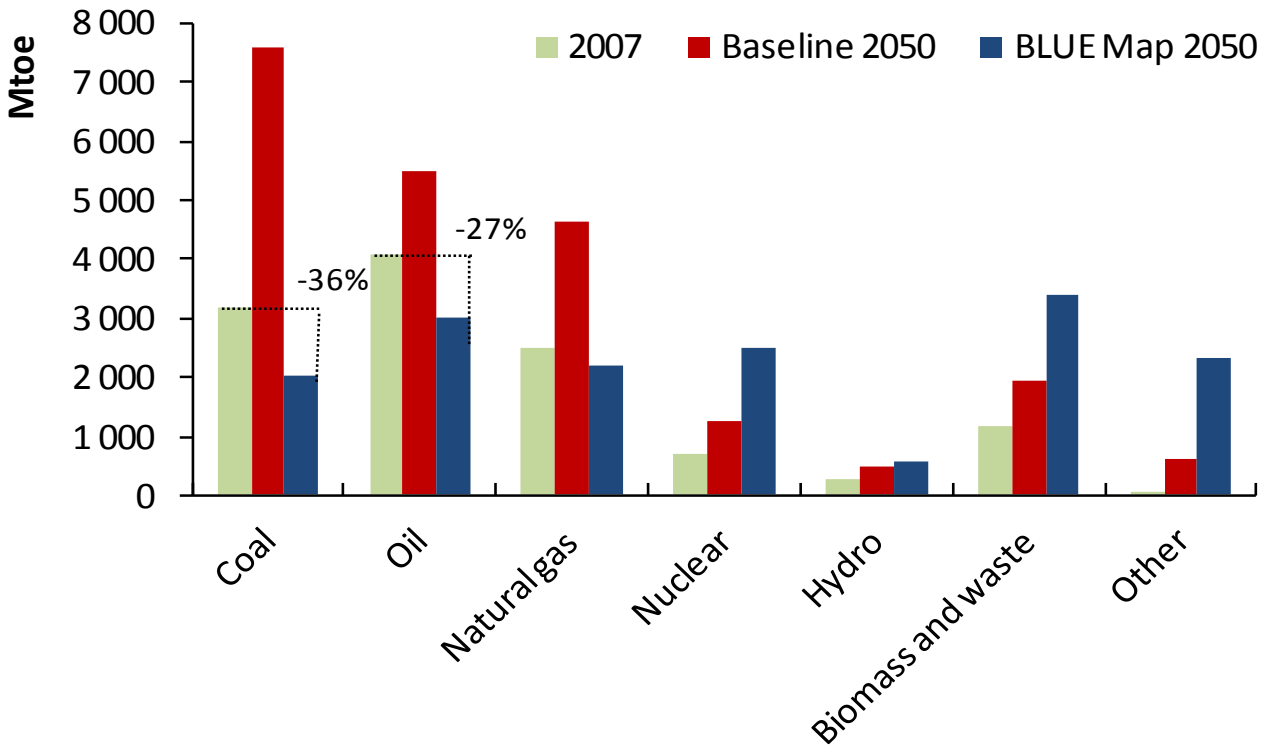
Primary energy demand by fuel and by scenario



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

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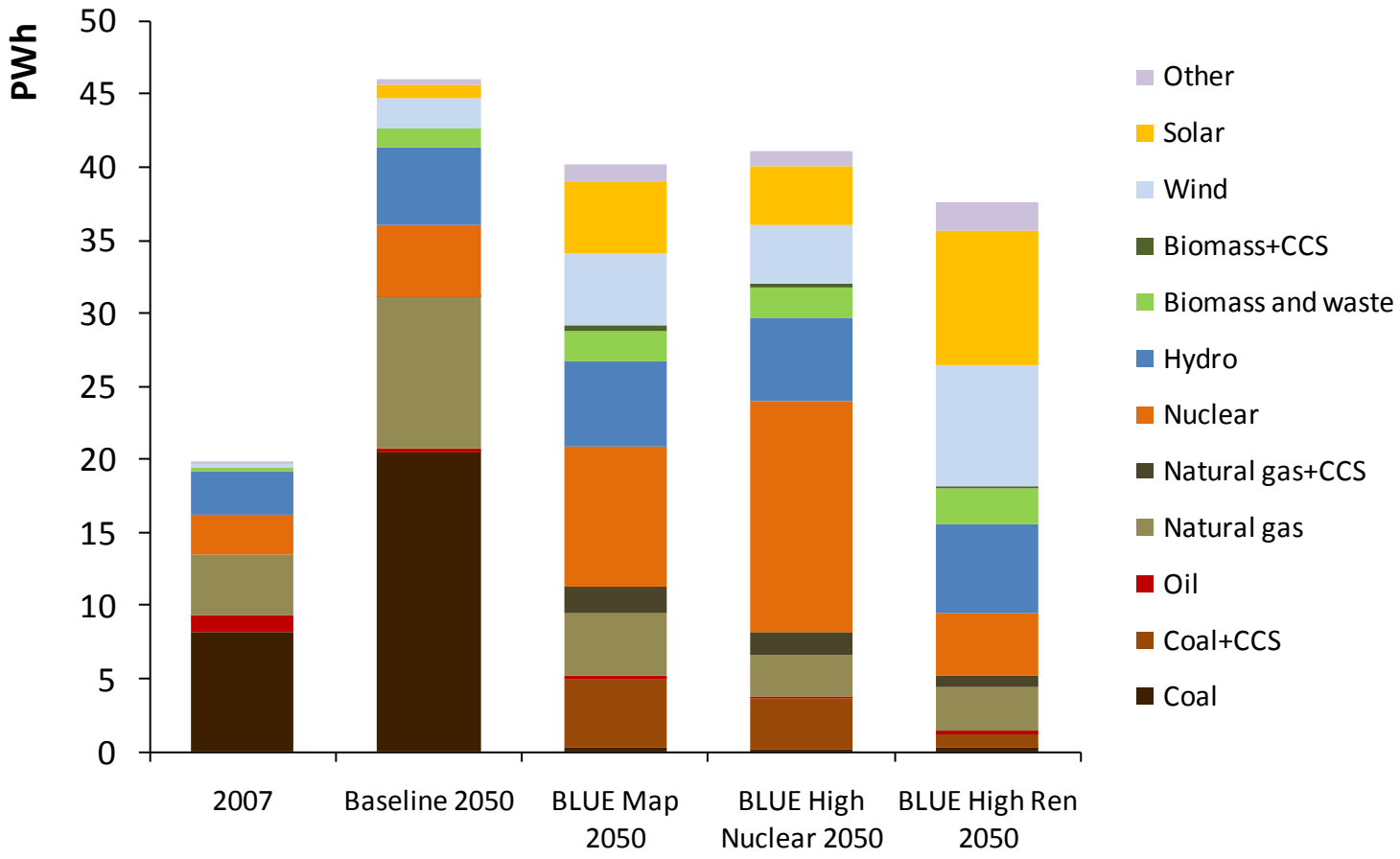
Decarbonising the power sector – a new age of electrification?



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

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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.

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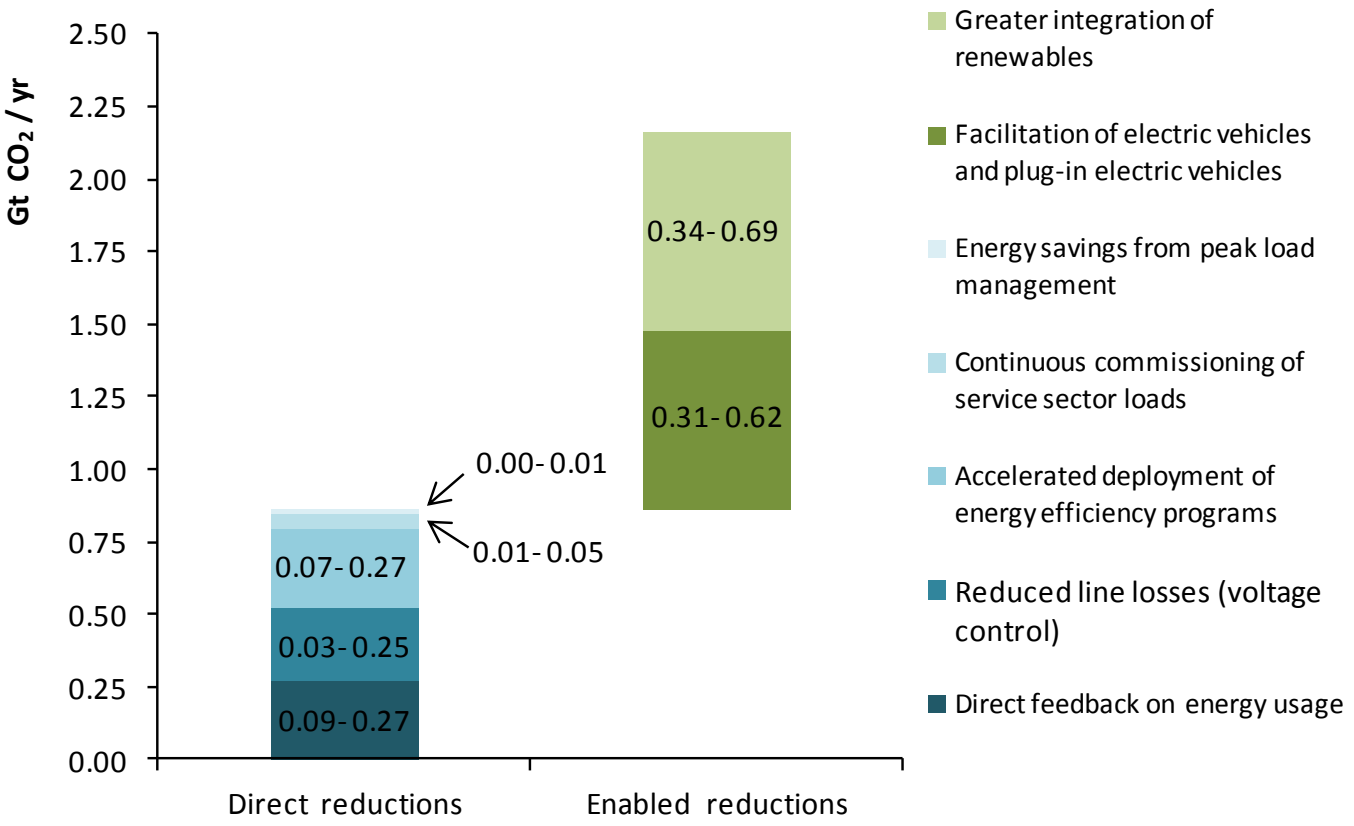
Smart grid CO_2 reductions in 2050



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

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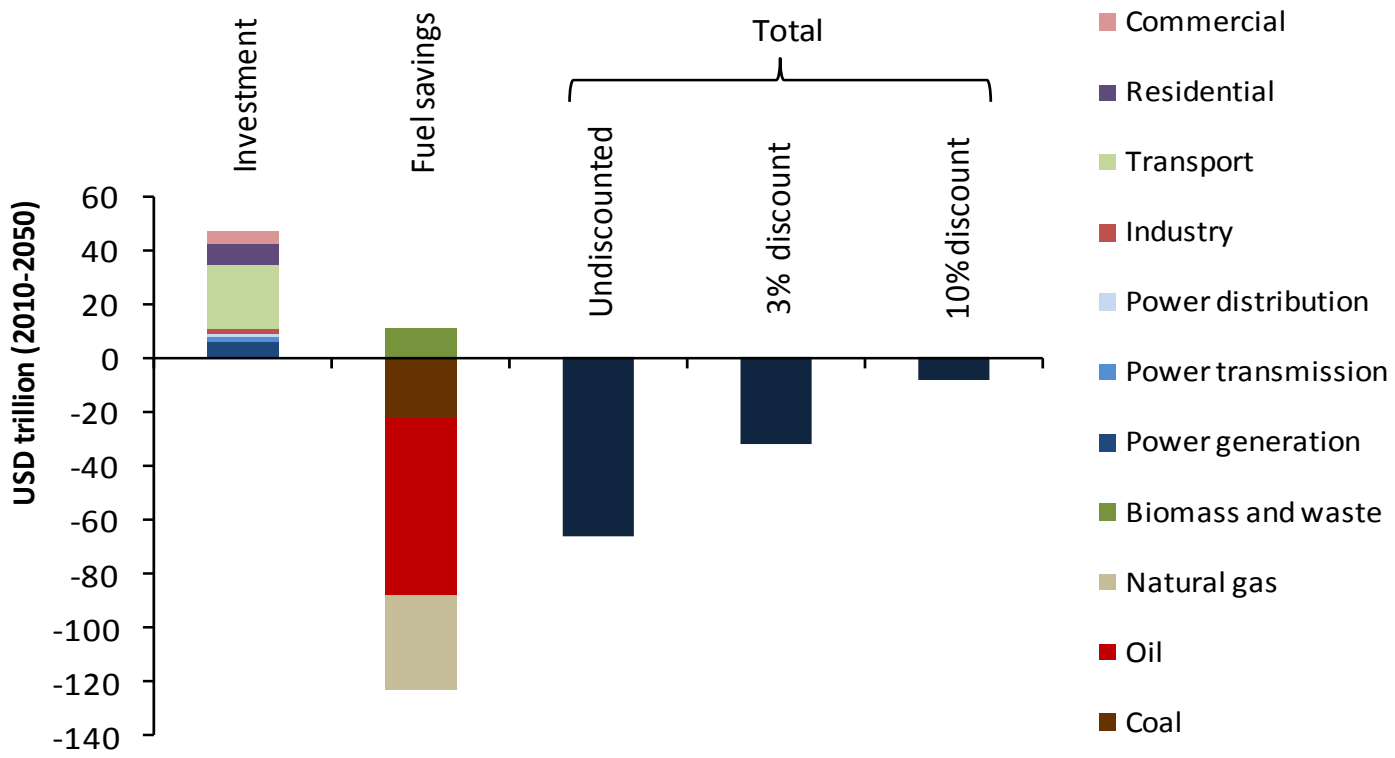
Additional investment and fuel savings, 2010-2050



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

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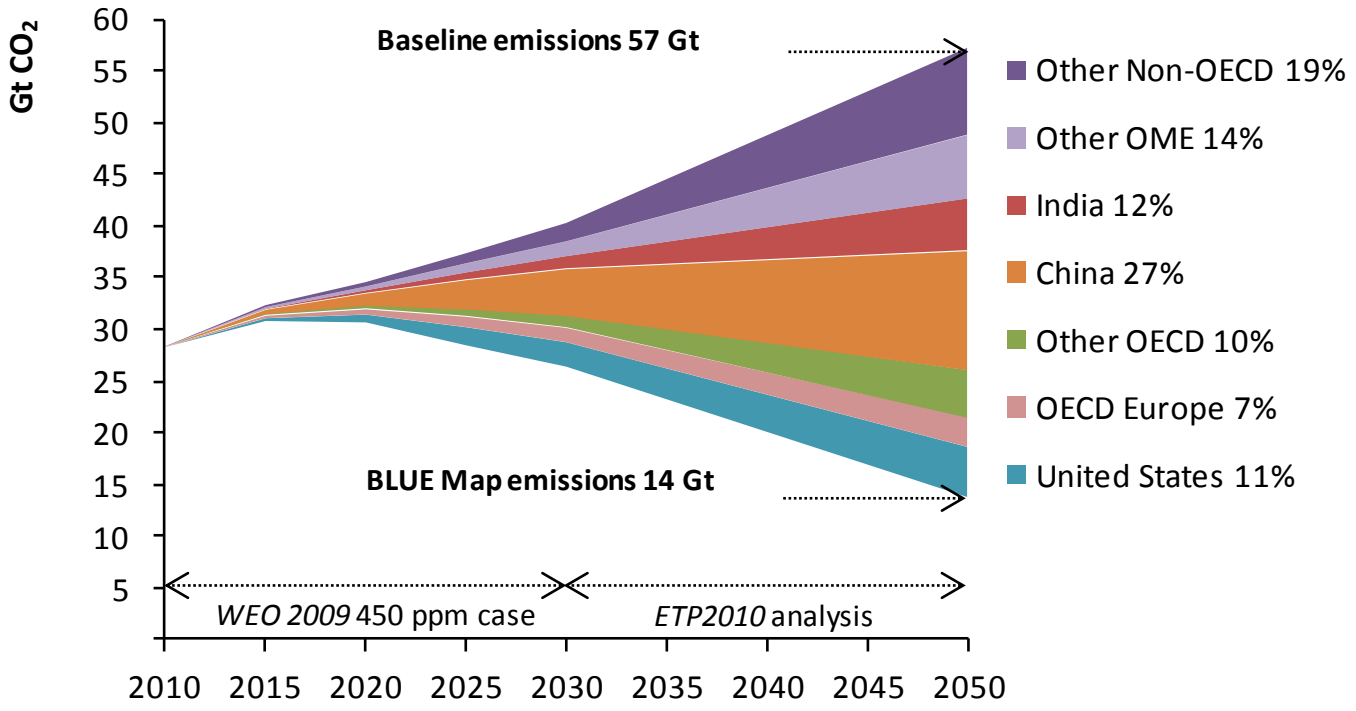
World energy-related CO_2 emissions abatement by region



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

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UNITED STATES

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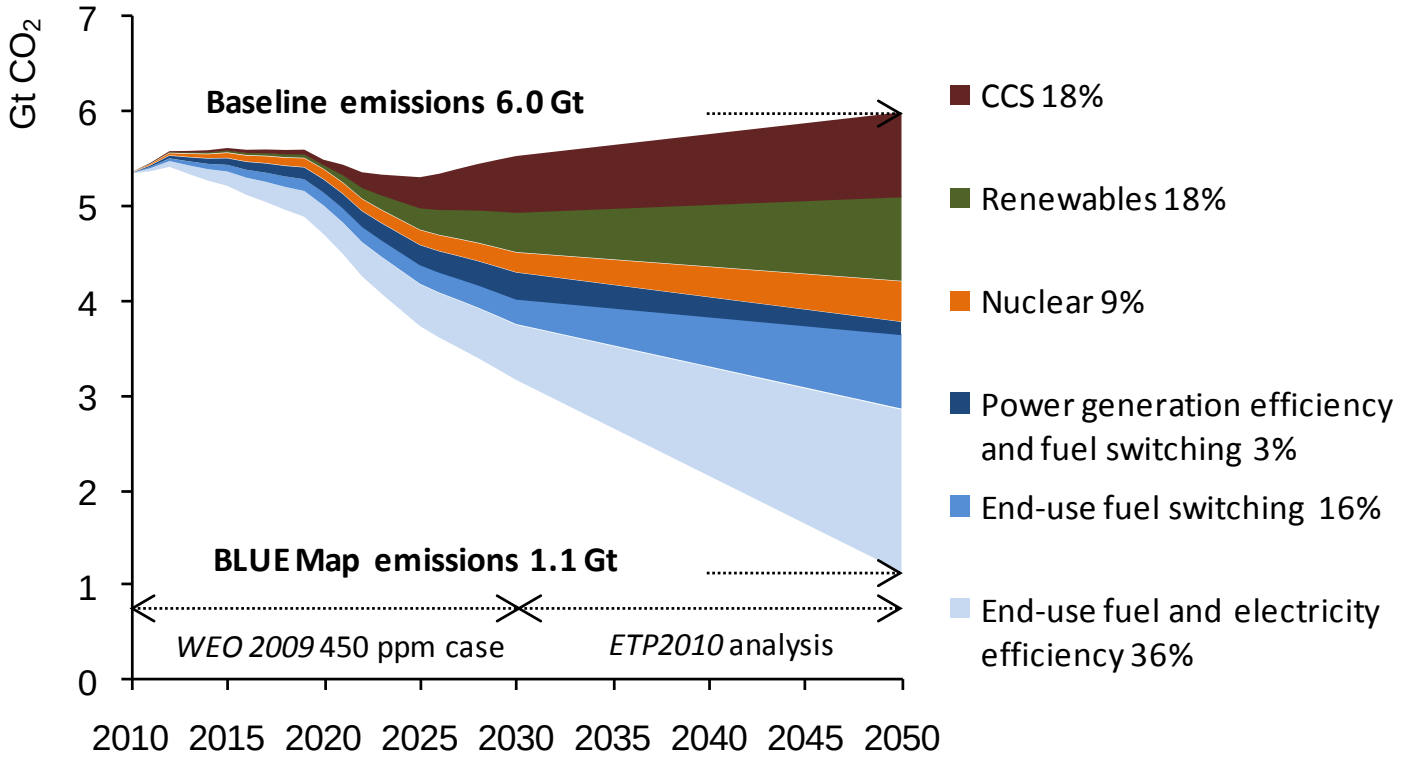
Contributions to CO_2 emissions reductions in the United States



Efficiency improvements, fuel switching, renewables and CCS are all needed to reduce CO_2 emissions.

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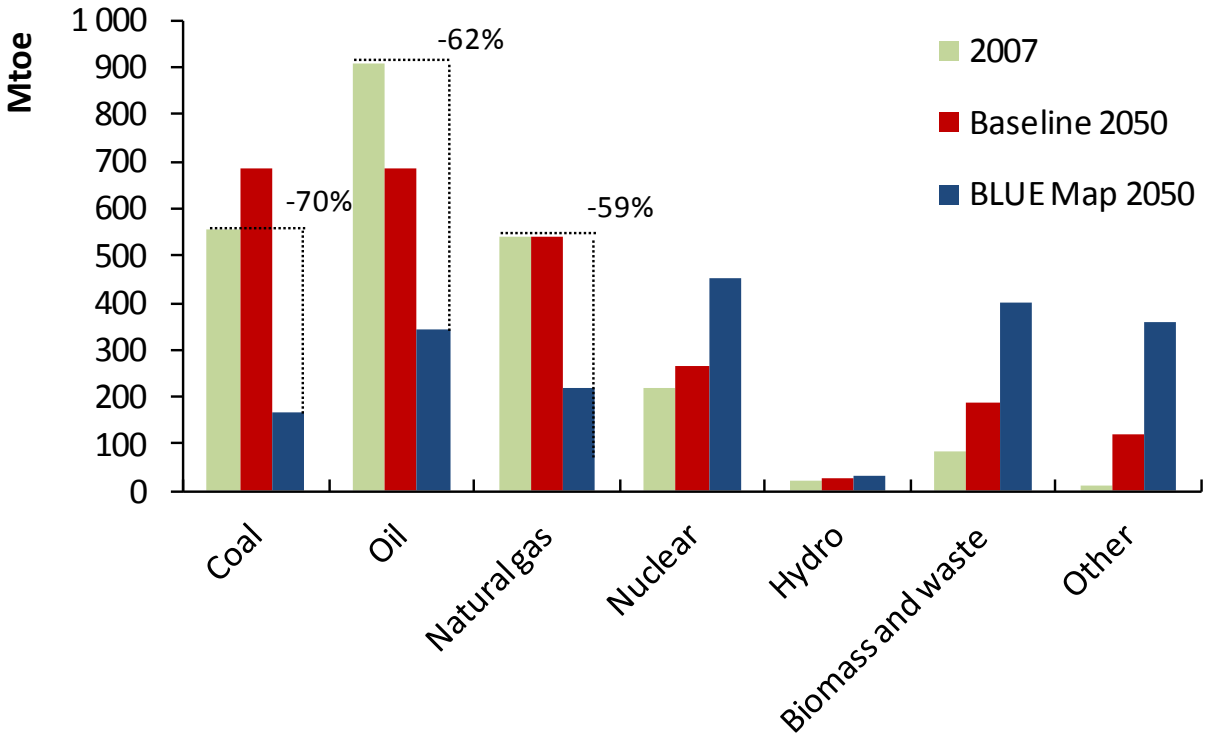
Primary energy demand by fuel and by scenario in the United States



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

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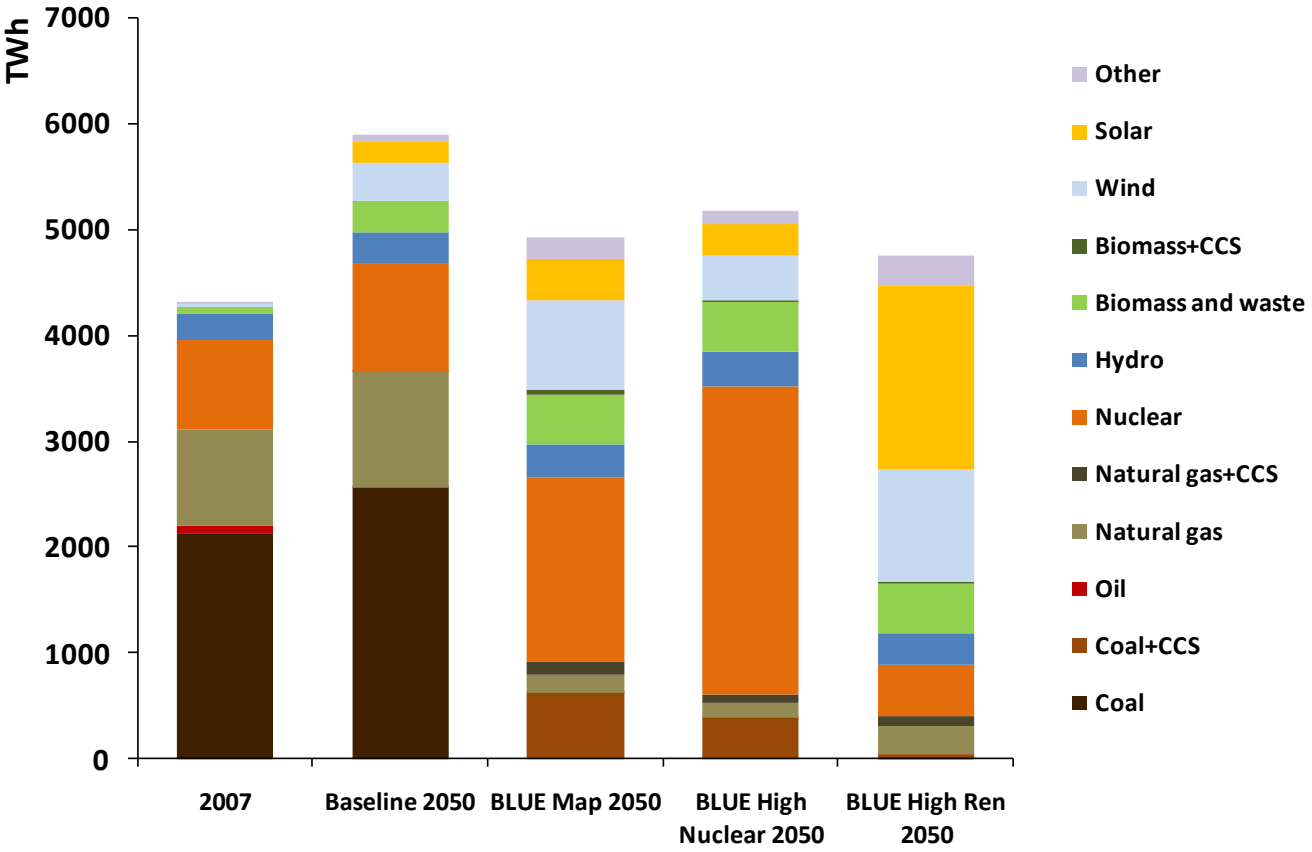
Decarbonisation of power generation in the United States



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

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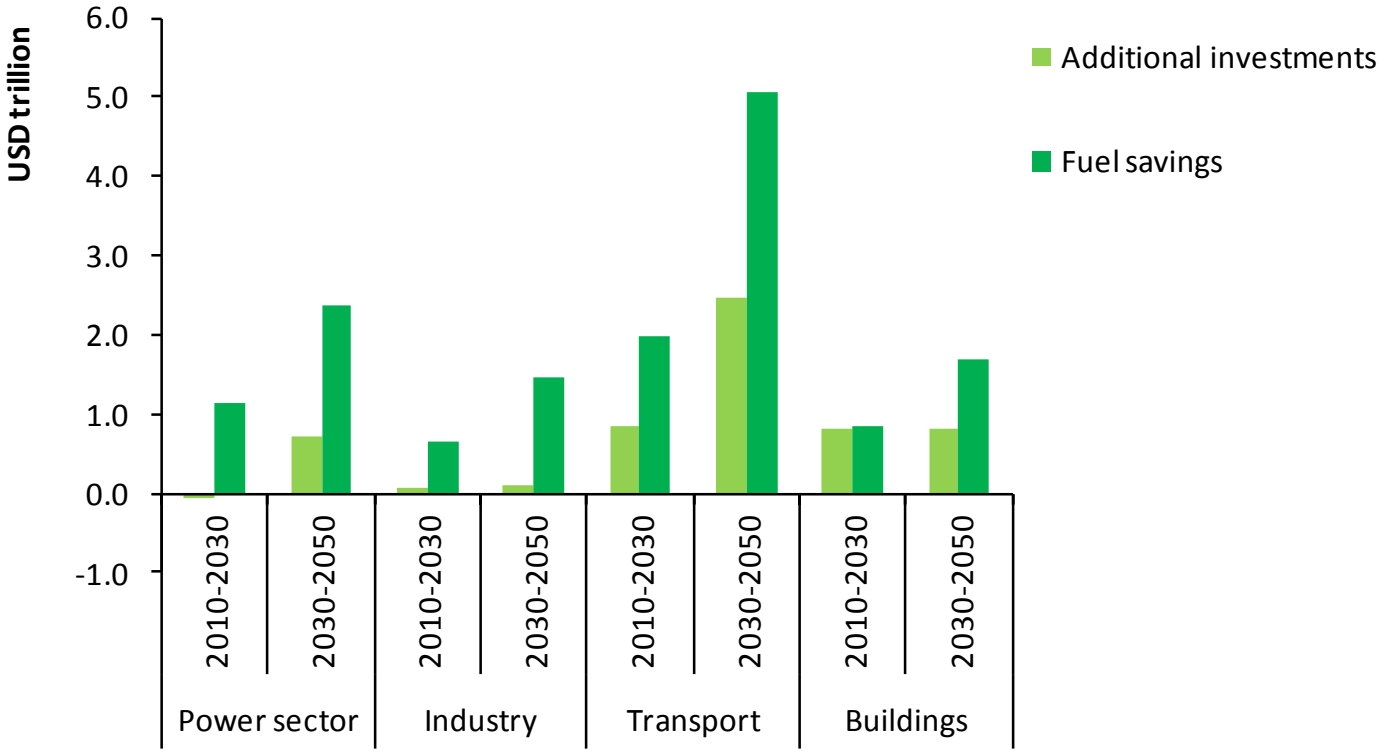
Additional investment needs and fuel cost savings for the United States



Most additional investments will be needed in the transport and buildings sectors.

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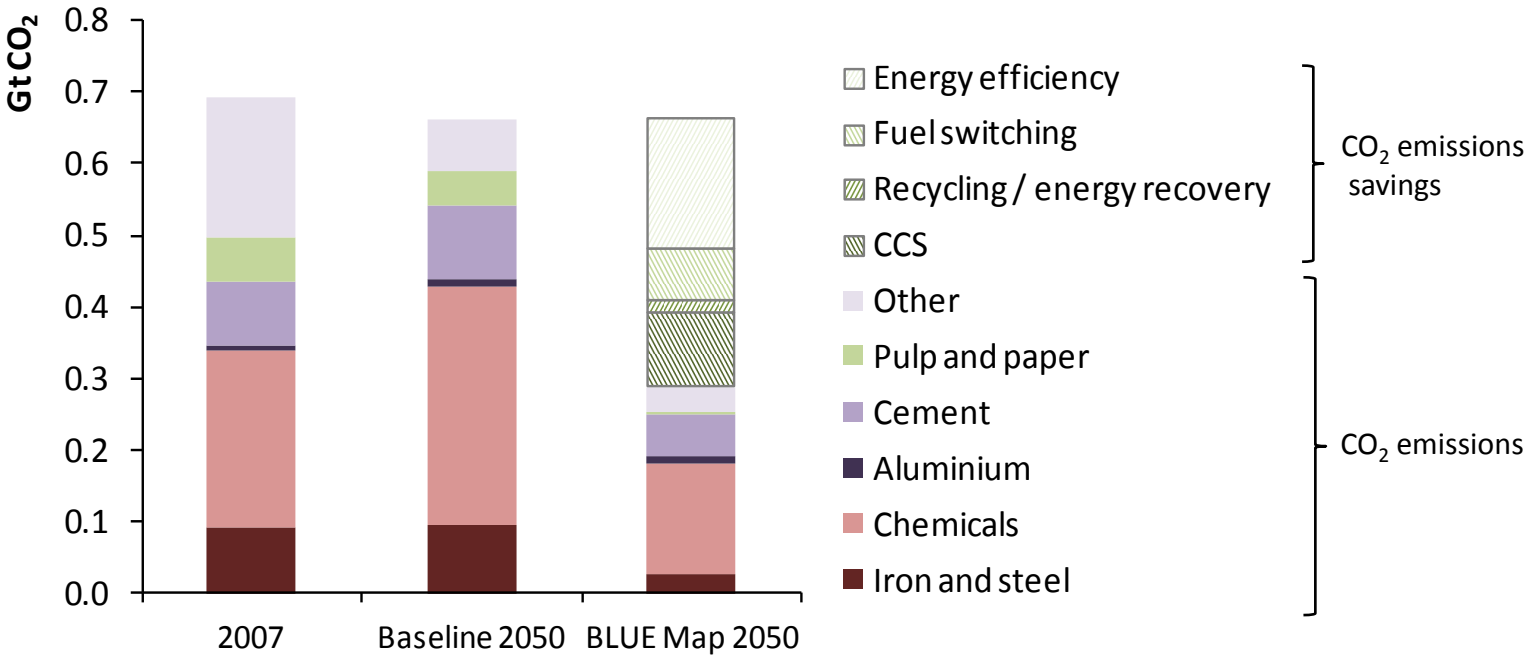
Direct energy and process CO_2 emissions in industry by sector in the United States



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

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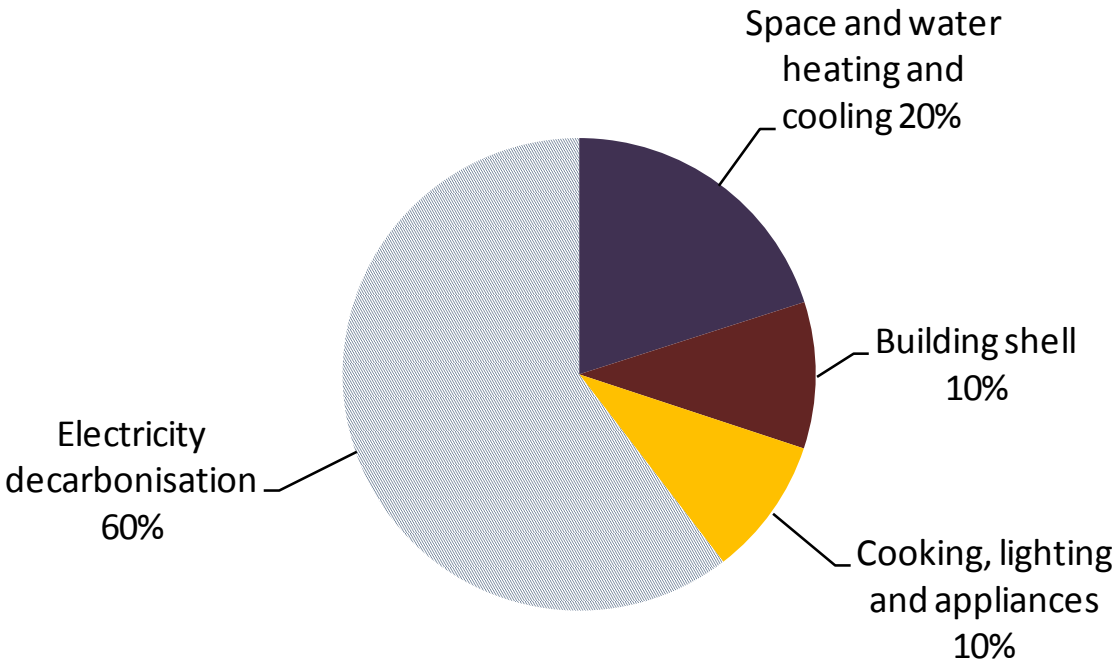
CO_2 emissions in the buildings sector in the United States



Decarbonisation of the electricity sector contributes 60% of emissions reduction in the buildings sector.

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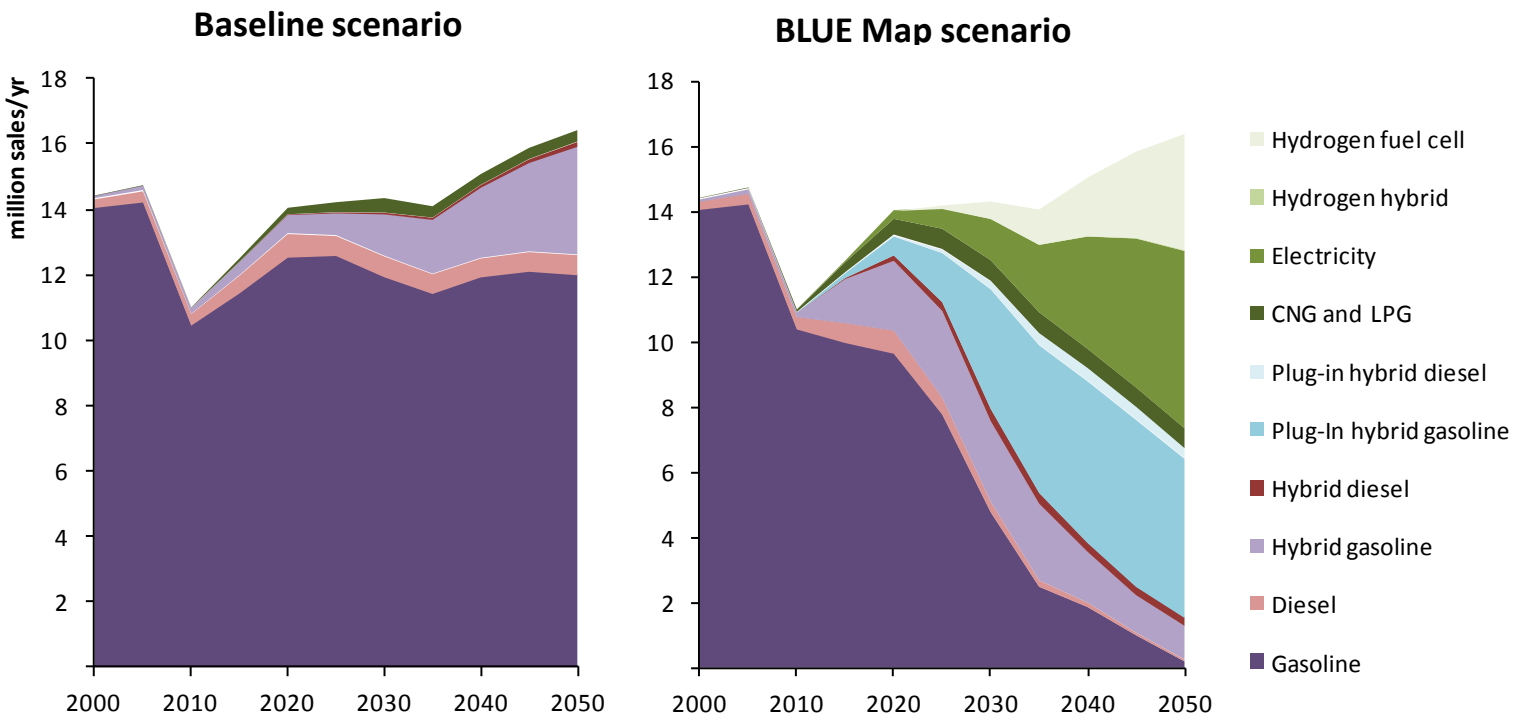
Passenger light-duty vehicles sales by technology in the United States in the Baseline and BLUE Map scenarios



In the BLUE Map scenario, US LDV sales become dominated by EVs, PHEVs and FCVs by 2050.

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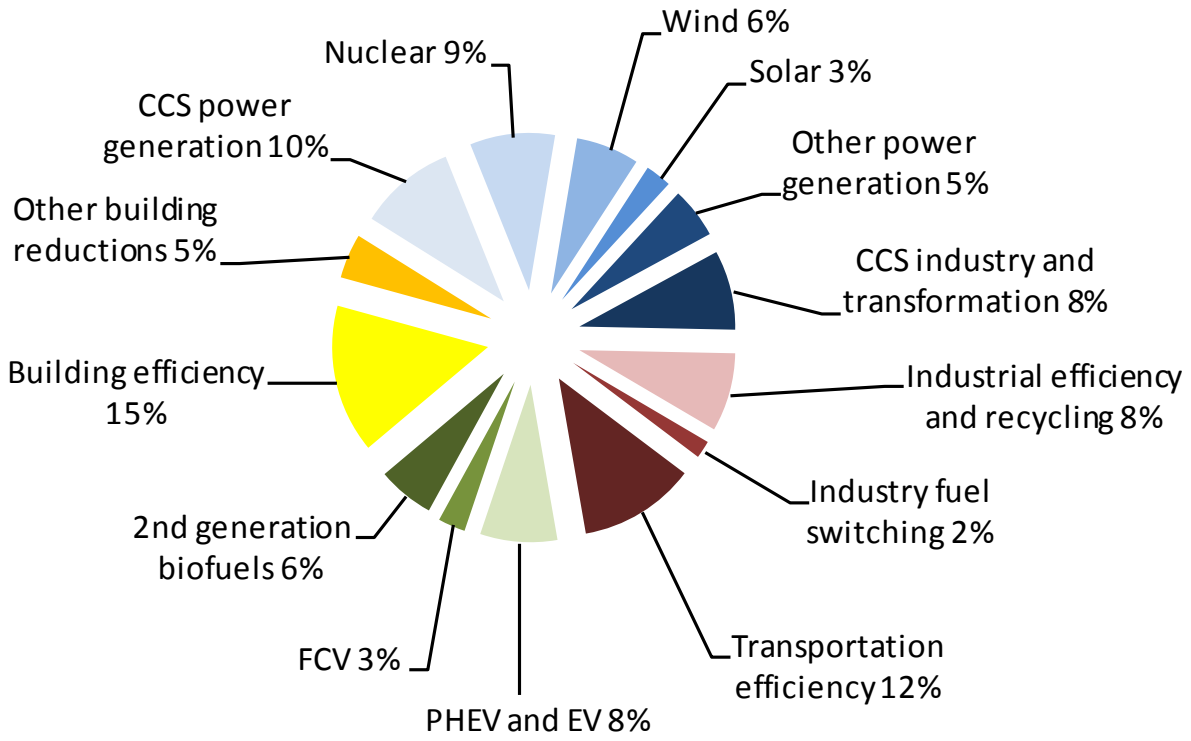
Contributions to CO_2 emissions reductions in the United States in 2050



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

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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

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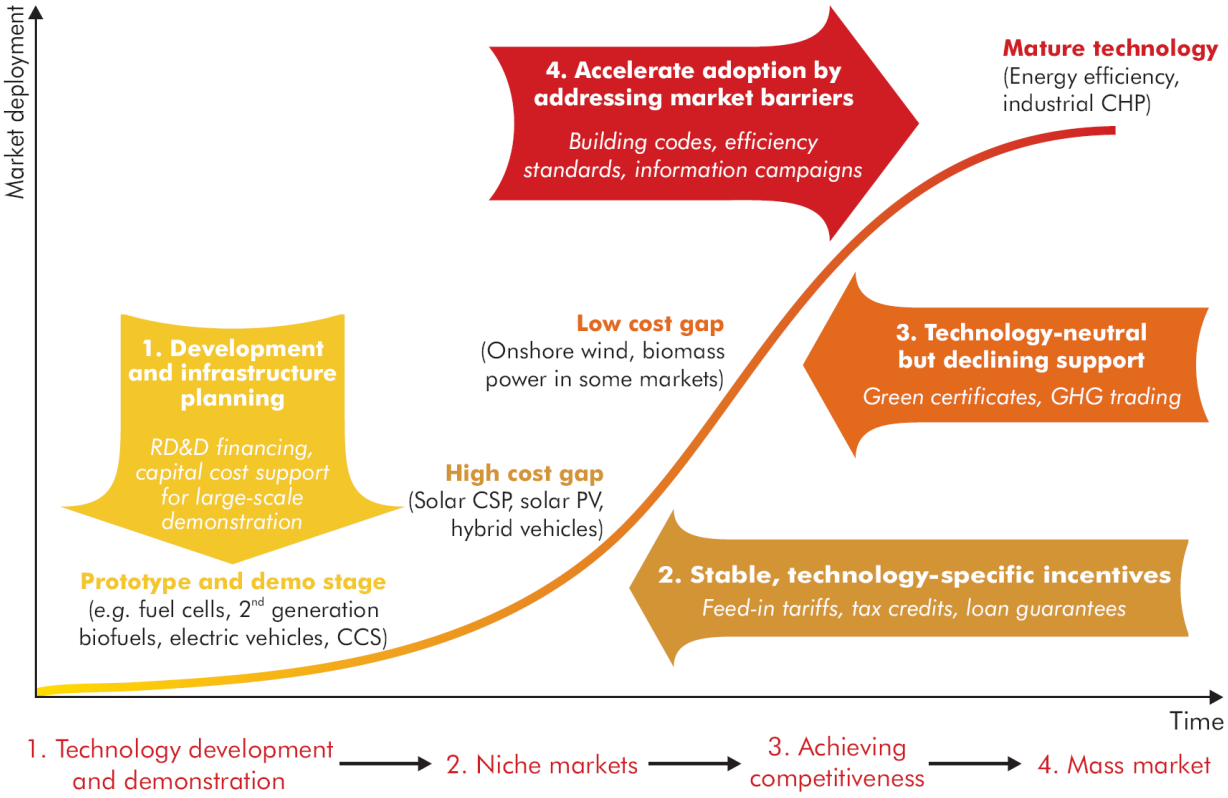
Policies for supporting low-carbon technologies



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

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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

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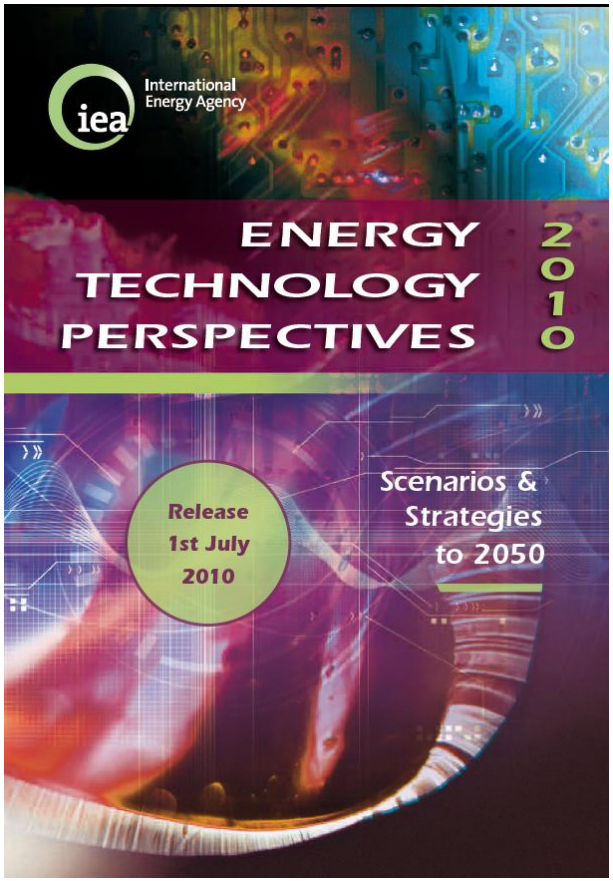

Thank You

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