International Energy Agency

Energy Technology Perspectives 2010

Policies to accelerate a low carbon technology transition

Transforming Innovation into Realistic Market implementation Programmes
Paris, 27-28 April 2010

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Energy Technology Perspectives

- **IEA flagship publication on energy technology, complementing the WEO**
- **Provides impartial advice to decision makers on energy technology policy for:**
  - delivering affordable energy supply and use
  - enhancing energy security
  - protecting the environment
- **The main output is the Energy Technology Perspectives (ETP) publication - released every two years**
- **Used as input to high-level inter-governmental discussions on energy technology policy**

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Scenarios & Strategies to 2050

New features of ETP2010

- **Updated scenarios**
  - Baseline consistent with WEO reference
  - Higher fossil fuel prices
- **Regional detail**
  - China, India, OECD Europe, United States
- **Sectoral deep dives**
  - Including smart grids
- **Cross-cutting themes**
  - Roadmaps and technology policy
  - Financing
  - Technology diffusion and transfer
  - Co-benefits of low carbon technologies

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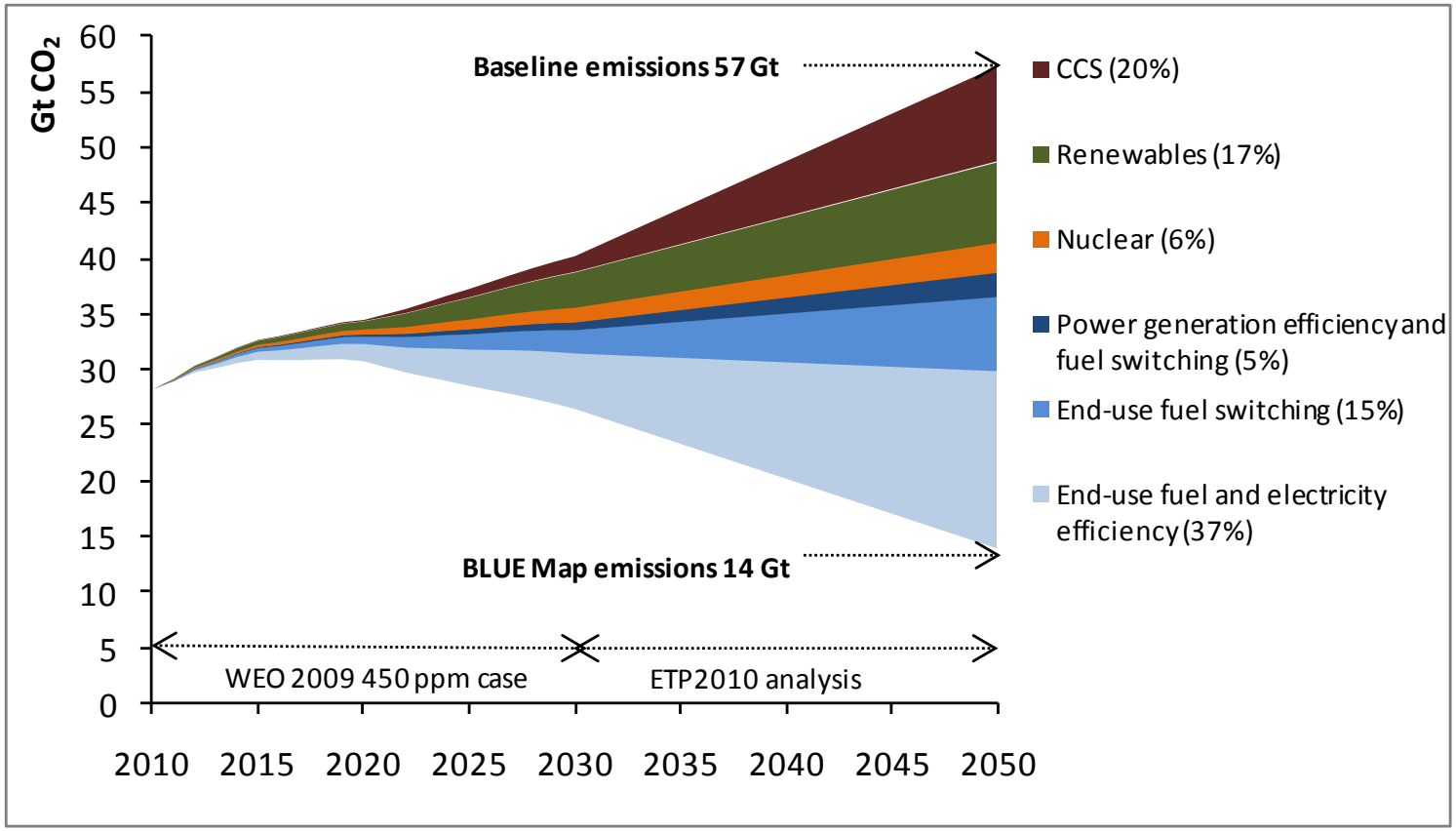
Scenarios & Strategies to 2050

Key Technology Options to halve global CO_2 emissions



- *Energy efficiency and renewables account for more than half of the total reduction*
- *Power generation is the sector with the largest reductions*

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Draft Key Messages from ETP2010 Scenarios (1)

- **The Baseline scenario is unsustainable**
  - **Global CO_2 emissions double by 2050, oil and gas prices are high, and energy security concerns increase as imports rise.**
- **The widespread deployment of a range of low carbon technologies with abatement costs of up to USD 175/tCO_2 can lead to a more secure and sustainable energy future**
  - **Under BLUE MAP emissions are reduced by 50% in 2050**
  - **Oil demand in 2050 is 27% lower than in 2007 and gas demand is 12% lower. Oil prices are significantly lower than Baseline**
- **The electricity sector will need to be substantially decarbonised through the use of renewable energy, nuclear power and fossil-fuels with CCS**

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Draft Key Messages from ETP2010 Scenarios (2)

- Rate of energy efficiency improvement will need to double across all end-use sectors
- New low-carbon technologies will be required in transport and industry
- Fuel switching to low or zero carbon fuels will be a significant source of carbon reductions.
  - In BLUE Map, biomass use doubles and low-carbon electricity is increasingly used in buildings, transport and industry. Hydrogen also plays a role later on
- Urgent action is needed
  - Emissions must peak around 2020 and thereafter show a steady decline
- Non-OECD countries will need to make absolute cuts in CO_2 emissions to reach the 50% reduction target

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The Role of Roadmaps

- **Low carbon technologies are at the heart of efforts to improve energy security and address climate change**
- **International community recognises value of roadmaps in accelerating technology development, transfer and deployment**
- **Technology roadmaps can support policy goals by:**
  - **Identifying and addressing technology-specific barriers**
  - **Highlighting necessary deployment policies and incentives**
  - **Directing increased RD&D funding for new technologies**
  - **Supporting technology diffusion, knowledge sharing among countries**

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Overview of IEA Roadmap Process

- Engage cross-section of stakeholders
- Identify a baseline – where is technology today?
- Use model results to set a vision for the technology's long-term contribution (e.g. in 2050)
- Identify barriers – technical, regulatory, policy, financial, public acceptance
- Develop implementation action items for stakeholders

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IEA Roadmap Status

2009 releases

- Wind
- Electric / plug-in hybrid vehicles
- Carbon capture & storage
- Cement

2010 releases

- Solar photovoltaic
- Nuclear power
- Concentrating solar power
- Biofuels
- Efficient heating and cooling in buildings
- Smart grids
- Vehicle efficiency

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A carbon price is not enough

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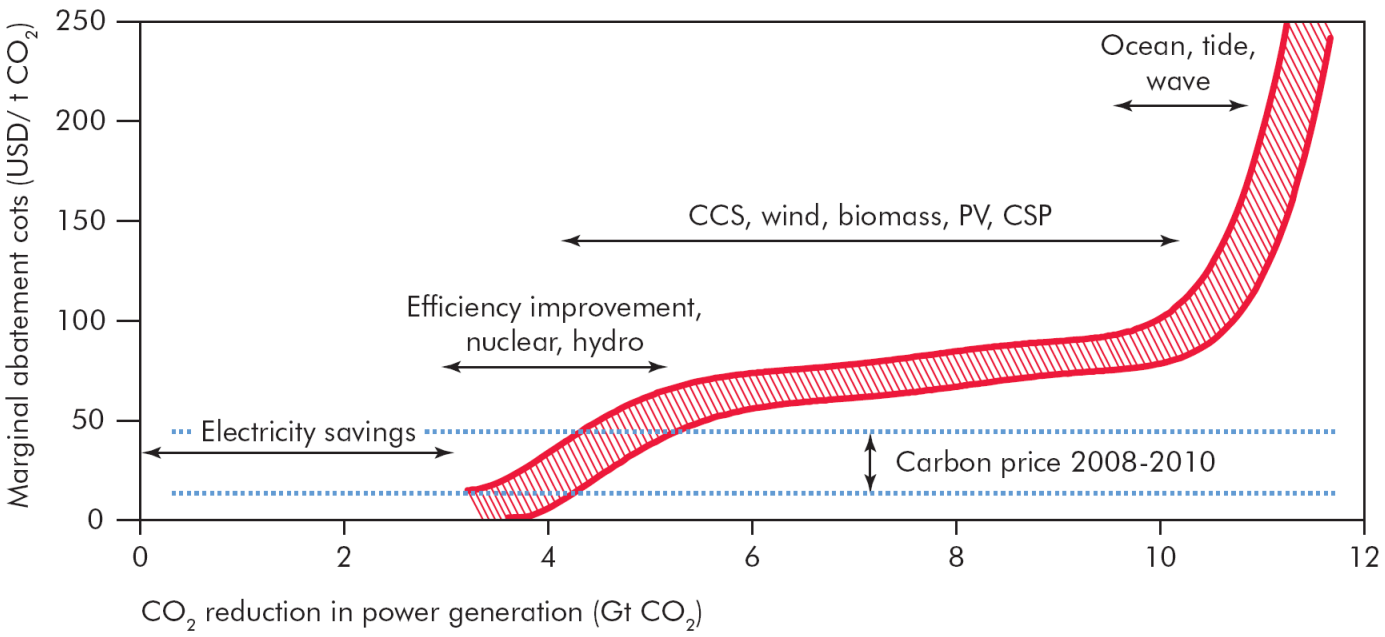

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Tailored technology policies are needed

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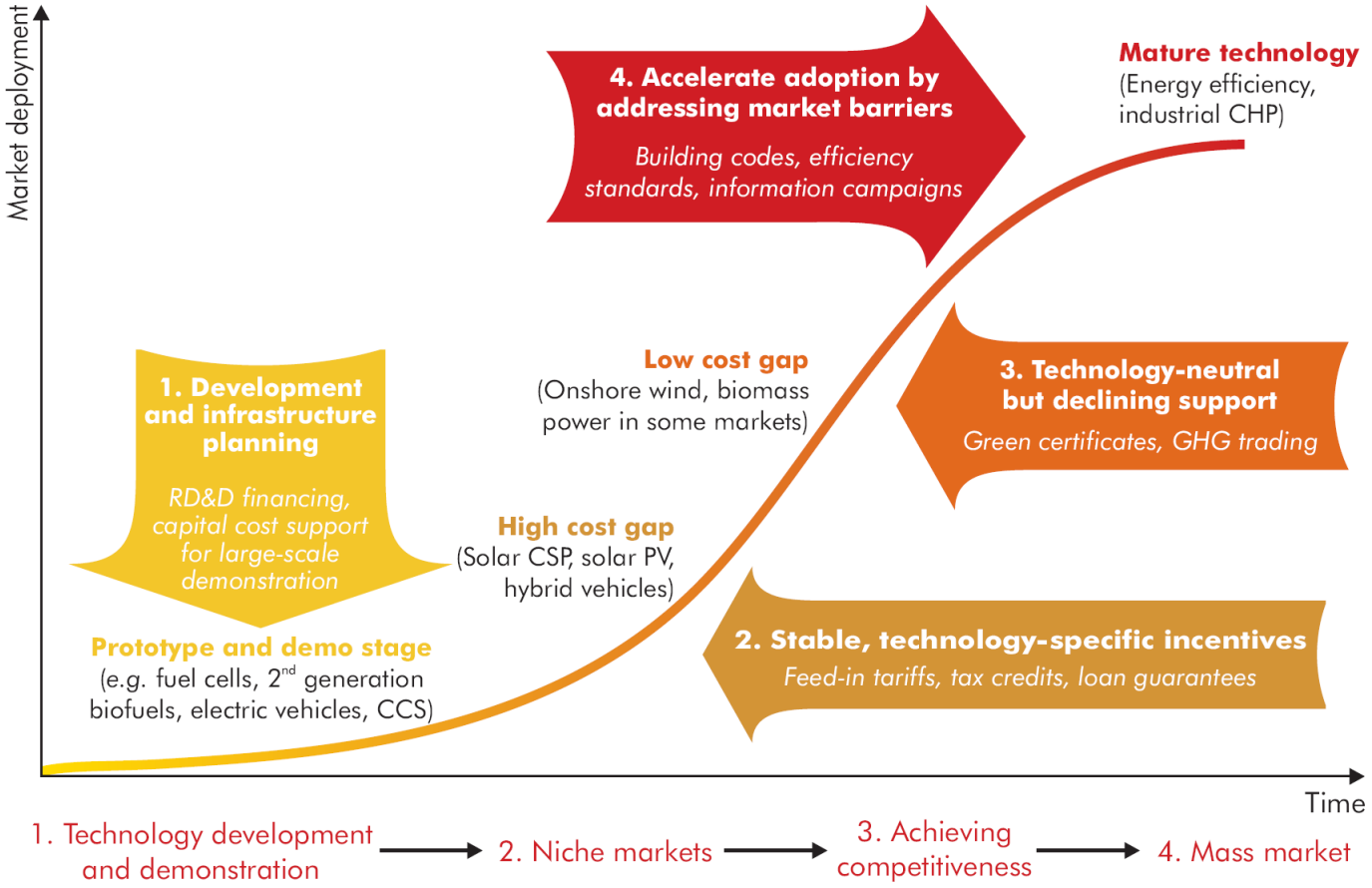

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Enabling support also needed from other stakeholders

- **Industry: develop new business models, implement sector roadmaps and expand investment in RD&D**
- **Academia: develop workforce with skills relevant to low-carbon technologies**
- **NGOs: support government efforts to communicate needs for low-carbon infrastructure**
- **International community: design new more effective models of energy technology collaboration**

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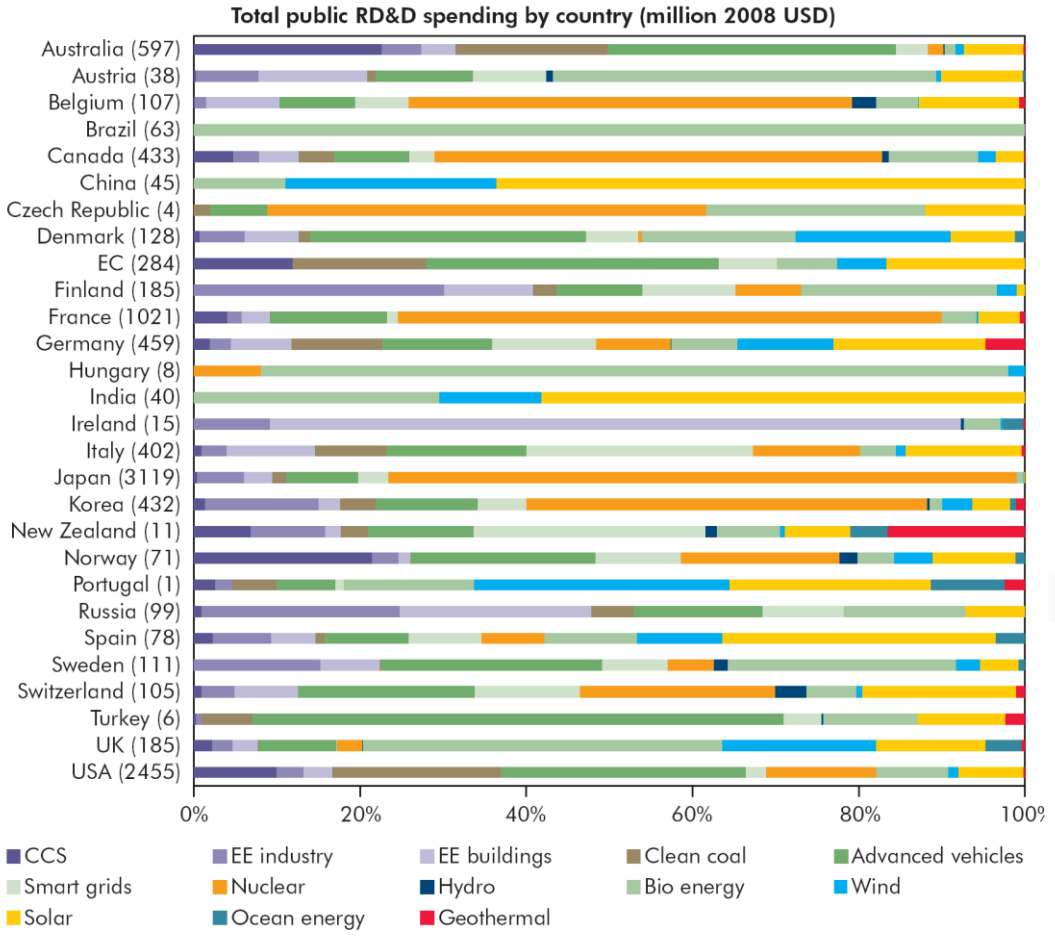
Scenarios & Strategies to 2050

Public sector 2008 energy technology RD&D expenditures



Spending is increasing, but not to 1980 highs; 2008-09 financial rescue spending not likely to be sustained

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Estimated gap in public low-carbon energy RD&D

	Annual investment in RD&D needed to achieve the BLUE Map scenario outcomes in 2050	Current annual public RD&D spending	Estimated annual RD&D spending gap
	(USD million)[1]	(USD million)[2]	(USD million)
Advanced vehicles (includes EVs, PHEVs + FCVs; energy efficiency in transport)	20 000 – 40 000	1860	18 140 – 38 140
Bioenergy (biomass combustion and biofuels)	1400 – 2800	740	660 – 2 060
CCS (power generation, industry, fuel transformation)	8 000 – 16 000	540	7 460 – 15 460
Energy efficiency (industry)[3]	4 400 – 8 800	530	3 870 – 8 270
Higher-efficiency coal (IGCC + USCSC)[4]	2 200 – 4 400	850	1 350 – 3 550
Nuclear fission	2 600 – 5 200	4 030	0[5] – 1 170
Smart grids	5 400 - 10 800	530	4 870 – 10 270
Solar energy (PV + CSP + solar heating)	2 200 – 4 400	680	1 520 – 3 720
Wind energy	1 800 – 3 600	240	1 560 – 3 360
Total across technologies	**48 000 – 96 000**	**10 000**	**38 000 – 86 000**

[1] RD&D investment needs derived using 10% to 20% of average RDD&D value for BLUE Map scenario.

[2] IEA 2007 data with the following exceptions: Australia (2009-2010 estimated); Canada (2009 estimated); France (2007 revised via direct submission; Germany (2009 estimated); USA (2009 estimated). The non-member country data were taken from IEA (2009f). When necessary, spending calculated using 2008 exchange rates.

[3] Estimates for buildings energy efficiency RD&D needs were not available.

[4] Integrated gasification combined cycle and ultra-supercritical steam cycle.

[5] The lower range of the gap for nuclear fission is assumed to be zero. Therefore the sum of the lower estimates for the gap by technology do not sum to the total.

More work needed to capture non-IEA countries' spending, private sector spending, improve data quality & transparency

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Key Findings

- Carbon pricing alone will not be sufficient; range of energy technology policies are needed
- Policies must be tailored to the technology's stage of development
- 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
- Public RD&D spending for low-carbon energy technologies is lacking; more than doubling needed
- Governments need to accelerate technology innovation via best practices in energy RD&D

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Thank You

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