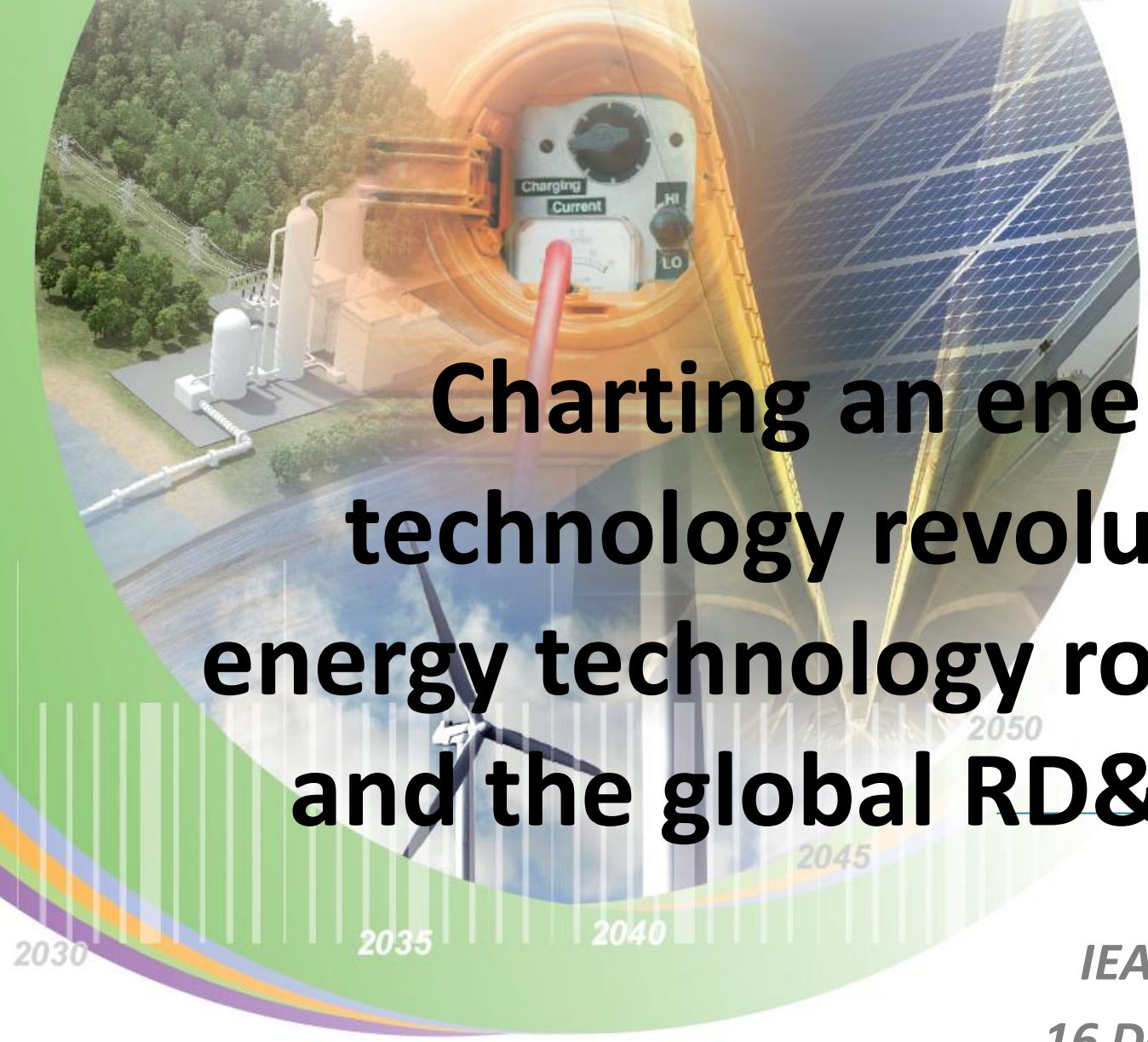


Charting an energy technology revolution: energy technology roadmaps and the global RD&D gap

IEA Event - COP

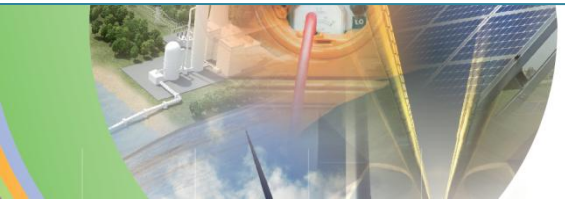
16 December 2009

Low-carbon energy technology roadmaps

International Energy Agency

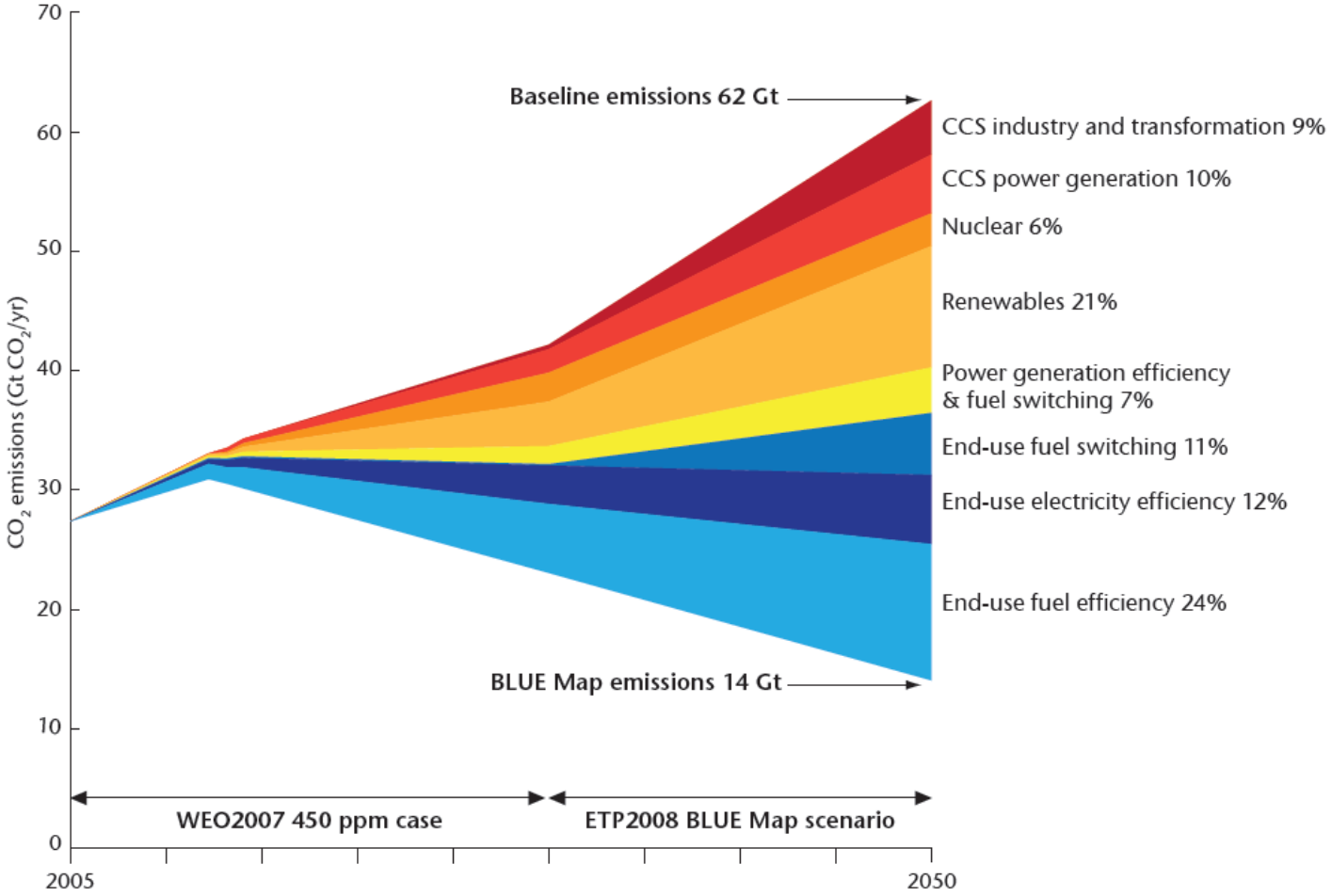
Overview

- An energy technology revolution is needed
- What is the gap?
- The role of roadmaps
- Results from CCS roadmap
- Next steps



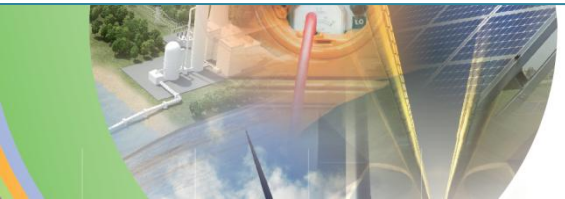
An energy technology revolution is needed

Technology contributions to 50% CO_2 reduction scenario, 2005-2050

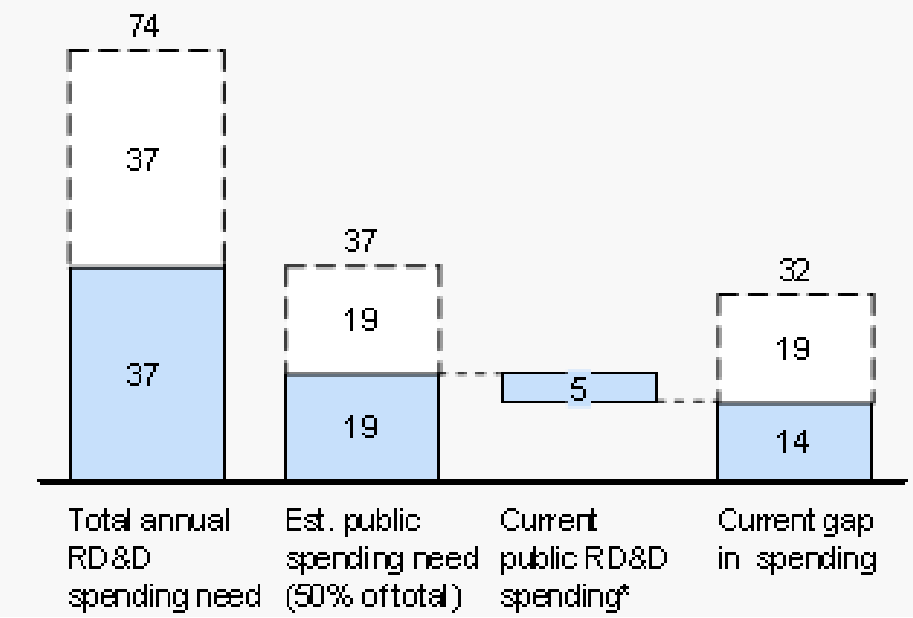


Where are we today?
IEA global RD&D mapping exercise

- Assess current RD&D spending across 9 technology areas for Major Economies Forum (MEF) countries
  - IEA data, other sources for non-IEA countries
- Define RD&D priorities
  - IEA roadmaps, other studies
- Identify the gap between current levels of activity and IEA BLUE Map 2050 technology targets
- Collect one-time stimulus spending data separately
- Compare results against other studies



RD&D mapping results



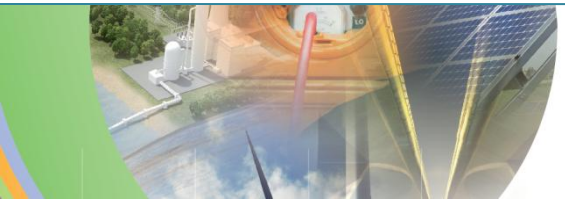
- Roughly 3-6x increase from current public RD&D levels needed to meet innovation needs identified by IEA
- Other analyses suggest an increase of 3-10x current spending levels, with the consensus around 3-4x
- Strong technology policy would also spur private innovation investment

Spending needs to increase 3-6 times current levels

Secretariat for the MEF Global Partnership

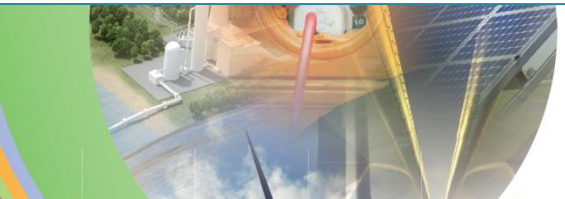
Next steps

- Increase public sector spending
- Improve data quality, availability
  - Improve IEA member country data
  - Expand collection with non-member countries
  - Analysis does not include private RD&D investment; will work with key sectors to develop data
- Many policy approaches to stimulate energy technology innovation; spending is just one means
  - Document other energy innovation policies
- Increase international collaboration on energy technology RD&D

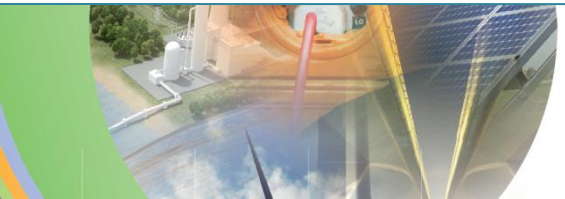


The IEA roadmap approach

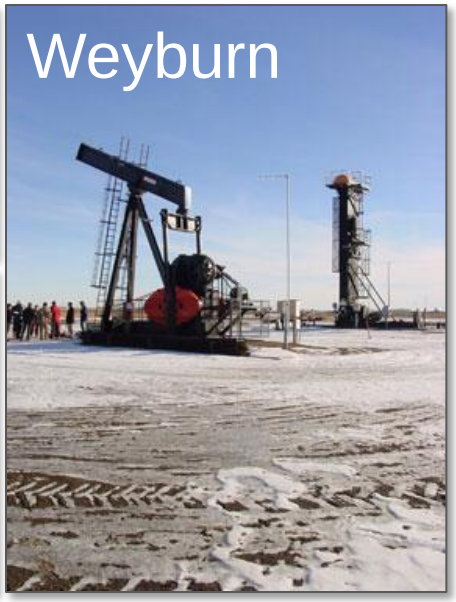
- Engage cross-section of stakeholders
- Identify a baseline – where is technology today?
- Use *ETP* BLUE Map results for deployment pathway to 2050
- Identify milestones – technical, regulatory, policy, financial, consumer adoption/public acceptance
- Develop implementation action items for stakeholders



CCS ROADMAP RESULTS



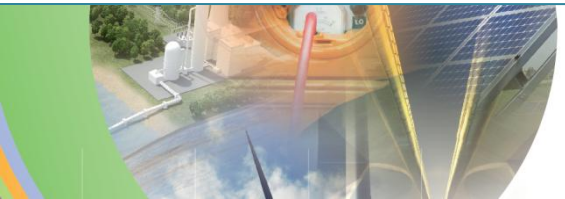
CCS is operating today



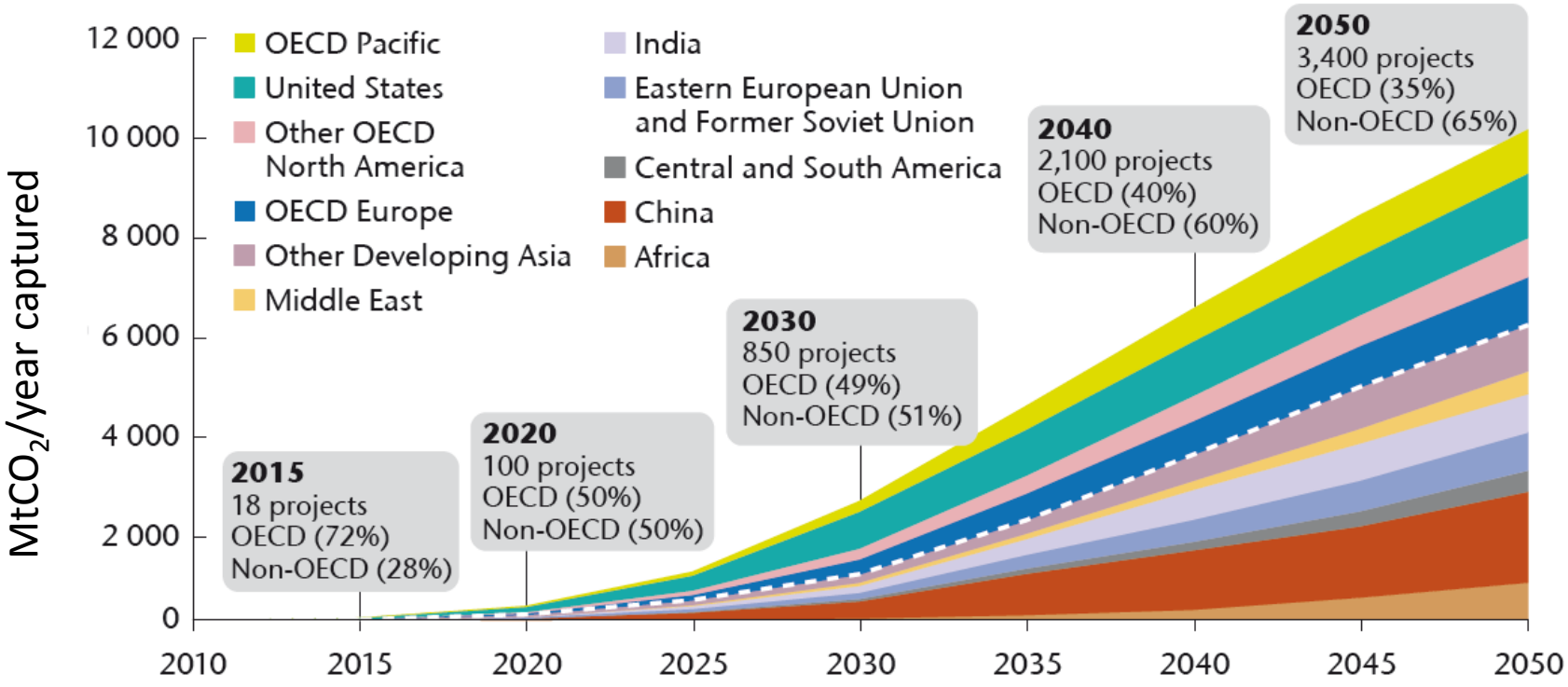
…but needs to rapidly expand;
need to turn announcements into projects

CCS financing today

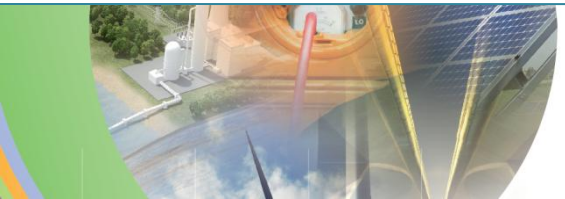
- Australia: Aus$2bn; Aus$300 for GCCSI
- Canada: Can$1.3bn; Can$2bn from Alberta
- EU: €1.05bn from Economic Recovery Energy Programme and 300m allowances in the EU ETS
- Japan: JPY10.8bn
- Norway: ~US$40/tonne CO_2 tax on offshore oil and gas operations; NOK1.2bn government investment
- UK: GBP 7.2-9.5 billion to cover additional costs for 1-4 CCS plants raised thru levy on electricity suppliers
- US: US$3.4bn from Economic Recovery Act; US$3.3bn in other federal government RD&D support



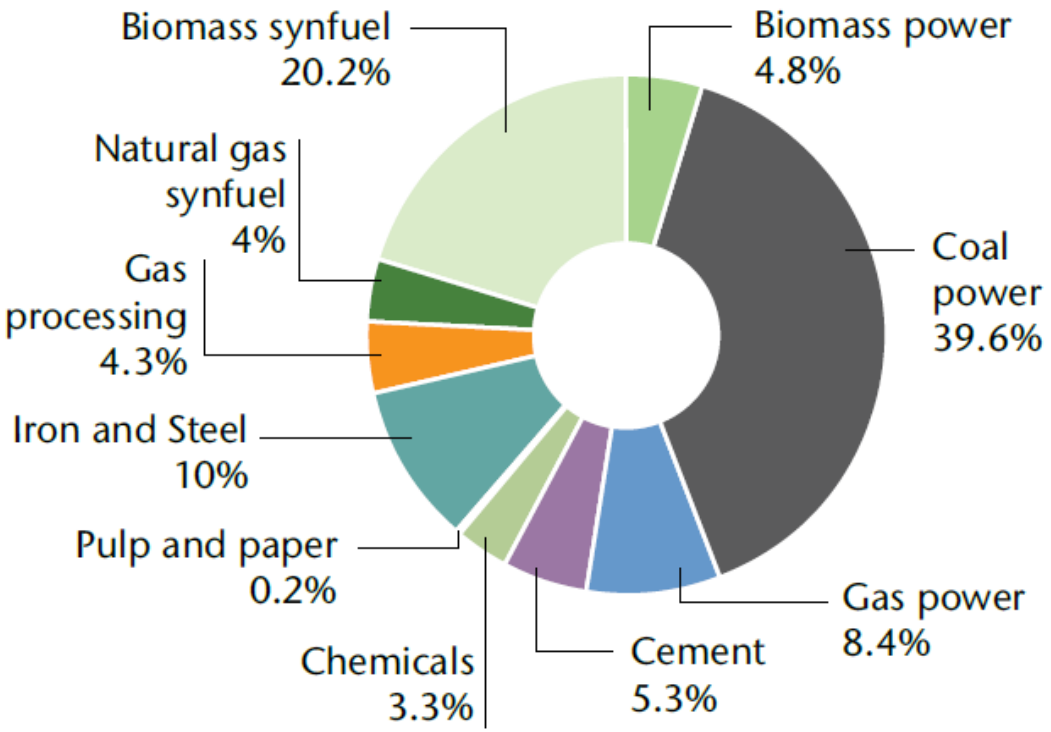
An ambitious growth pathway



OECD regions must lead in demonstrating CCS,
but the technology must quickly spread to the rest of the world



CCS is not just about “clean coal”



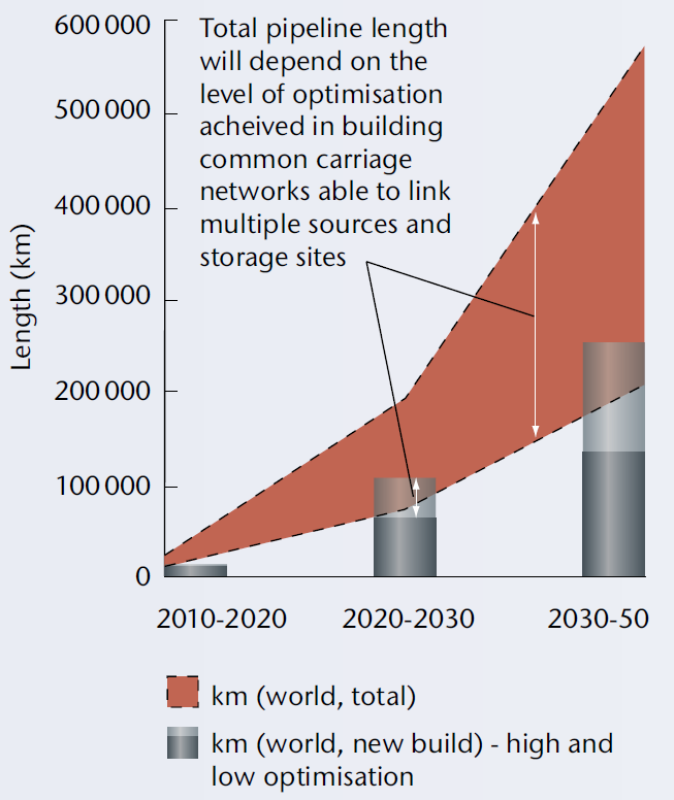
Coal power makes up just 40% of stored emissions in 2050

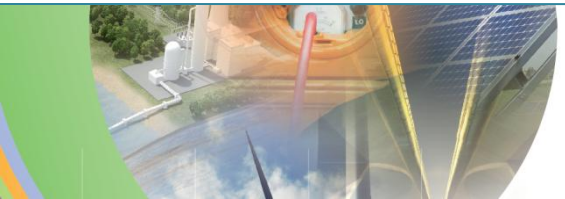
Technology actions and milestones: CO_2 transport

Priority actions

- Analyze and incentivize optimized source and/or sink transport hubs
- Analyze and incentivize optimized country/region-wide pipeline network
- Use tanker transport of CO_2 in near term
- Improve understanding of CO_2 transport leakage scenarios and effects of impurities

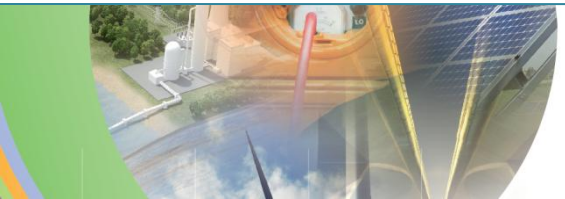
Global CO_2 pipeline needs





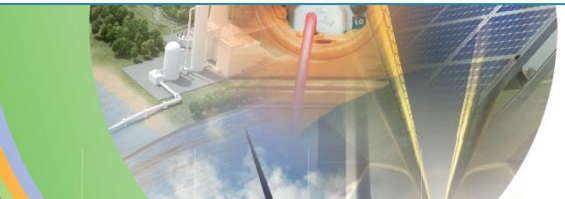
Technology actions and milestones: CO_2 storage

- 144.7 Gt CO_2 stored in 2050 will use less than 1% of total global theoretical capacity
- Priority actions
  - Agree on a common CO_2 storage capacity methodology by 2010; assess global capacity by 2012
  - Develop best-practice guidelines for site selection, operation risk assessment, safety, monitoring, remediation and closure by 2012
  - Develop and improve tools for predicting spatial reservoir and caprock properties between 2010-2020



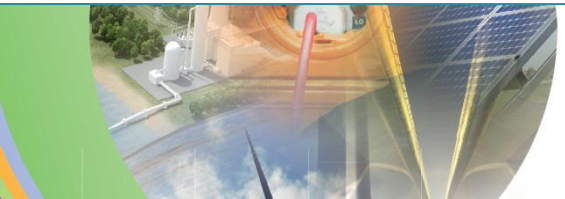
The next ten years: a critical period for CCS

- **Demonstration milestones**
  - Meet G8 goal of 20 project announcements by 2010
  - Achieve commercialisation with 100 projects by 2020
- **Financial milestones**
  - Provide USD42 bn for near-term demonstrations; also need to fund longer-term R&D
  - Incentivise CCS via bonus allowances in cap-and-trade schemes, emissions performance standards or carbon taxes



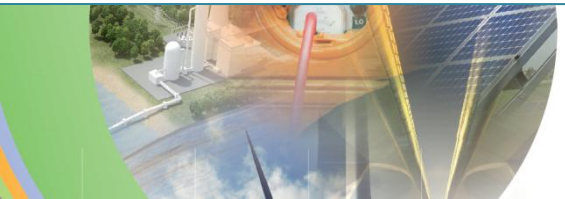
The next ten years: a critical period for CCS

- **Legal/regulatory milestones**
  - Provide recognition of CCS in CDM or alternate mechanism
  - By 2015, all countries with CCS potential should have comprehensive frameworks
- **Public engagement milestones**
  - Increase government investment in outreach in 2010-2012
  - Provide greater (and earlier) information on planned projects

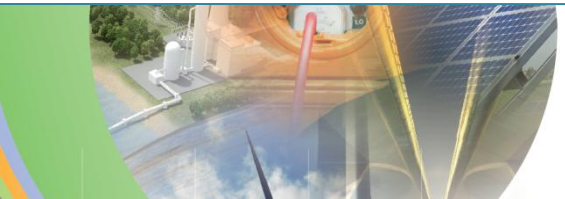


The next ten years: a critical period for CCS

- **International development milestones**
  - By 2050, non-OECD regions will account for 64% of captured CO_2
    - China and India alone account for 26%
  - Expand capacity building efforts in emerging fossil-based economies
  - Provide an average annual investment of USD 1.5-2.5bn between 2010-20 in non-OECD regions



NEXT STEPS



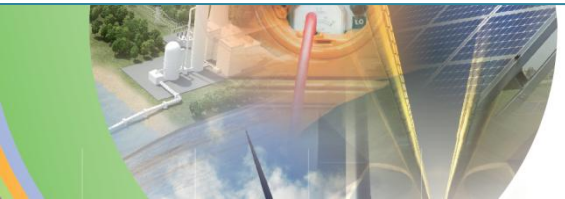
Roadmap status

2009 releases

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

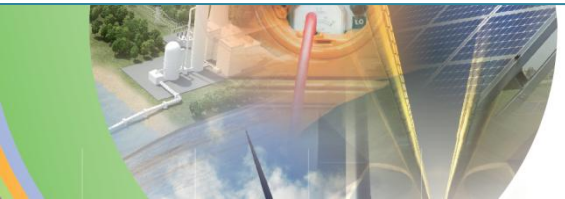
2010 releases

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



Help IEA to implement the roadmaps

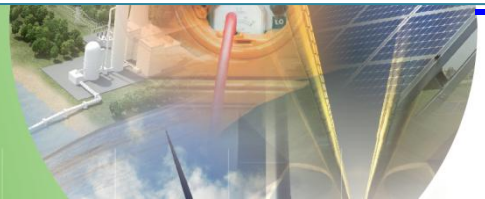
- Seeking industry, NGO partners to endorse roadmap and help track/implement
- Looking to set timeline/format/process for reporting on progress
- Developing roadmaps in emerging economies
- Expanding the IEA Implementing Agreements on RD&D



Thank you

tom.kerr@iea.org

www.iea.org/roadmaps



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