

IEA CCS Activities update

CSLF Policy Group
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CONTINUOUS IEA ANALYSIS OF GLOBAL ENERGY TRENDS AND FUTURES

- Energy demand continues to grow: +35% by 2035
- Despite policy action CO₂ emissions continue to grow: 35Gt by 2035
- Current pathway is towards 650ppm
- Role of CCS is very limited under our best known policies...
- ...but is absolutely critical under any ambitious climate scenario

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Technology Roadmap

Carbon Capture and Storage in Industrial Applications

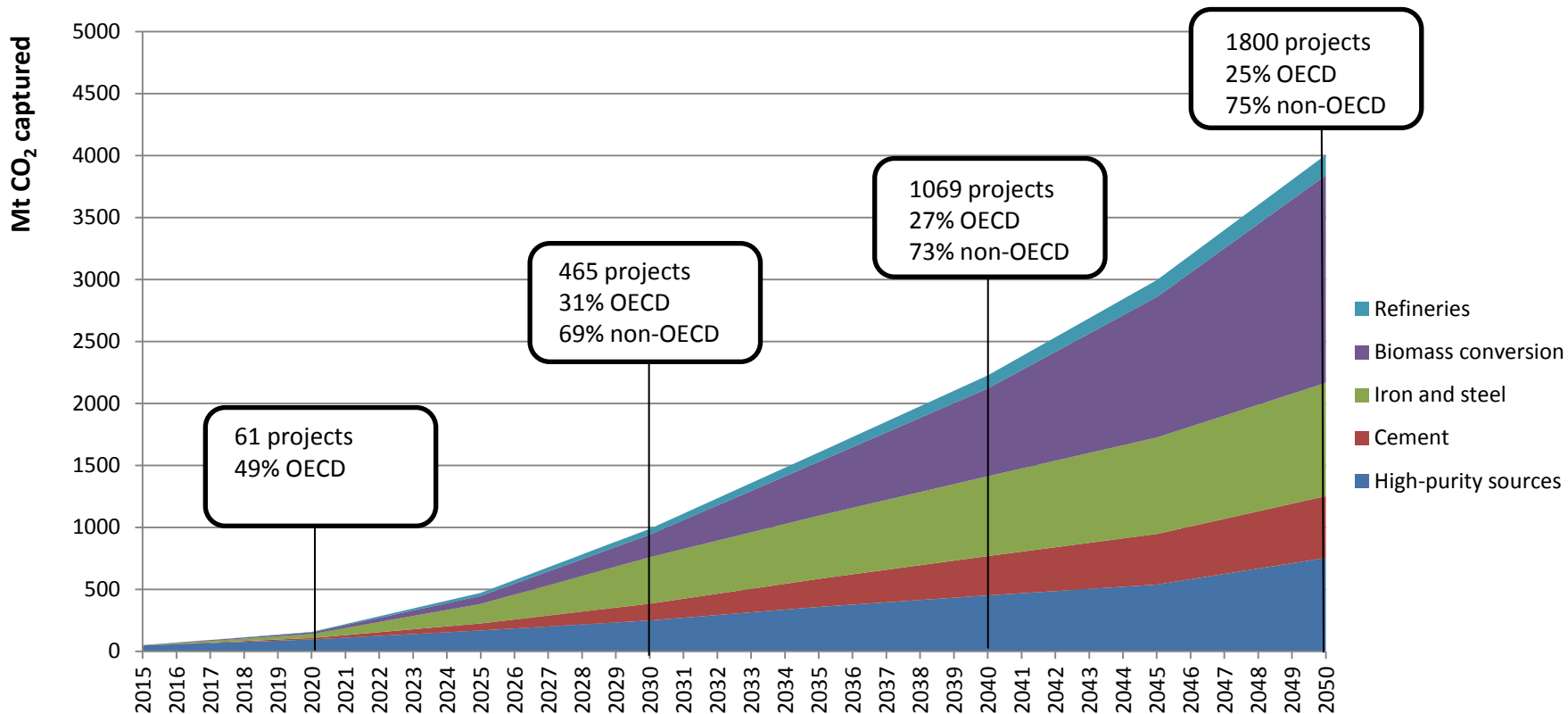


UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

ROLE OF CCS IN THE FIVE COVERED SECTORS CAN BE VERY SIGNIFICANT:

→ CCS could cut emissions by 4Gt in 2050

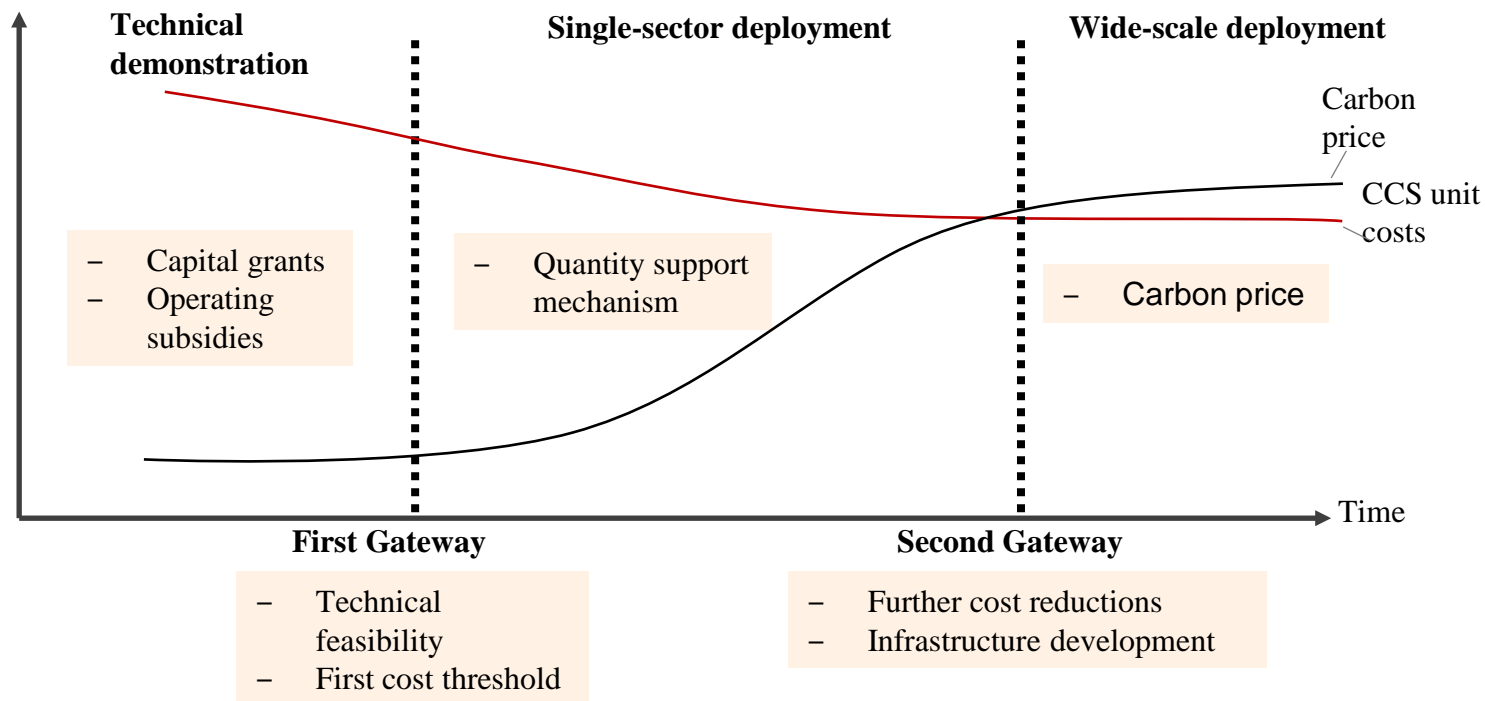
→ 9% of the global required emission reductions in 2050



NEW REPORT: INCENTIVES FOR CCS

- Policy objectives will evolve over time
- Incentive policy to match policy objectives and suit level of technical maturity
- Interactions between incentive mechanisms
- Long-term strategy and “policy gateways”

CCS Cost/
carbon price



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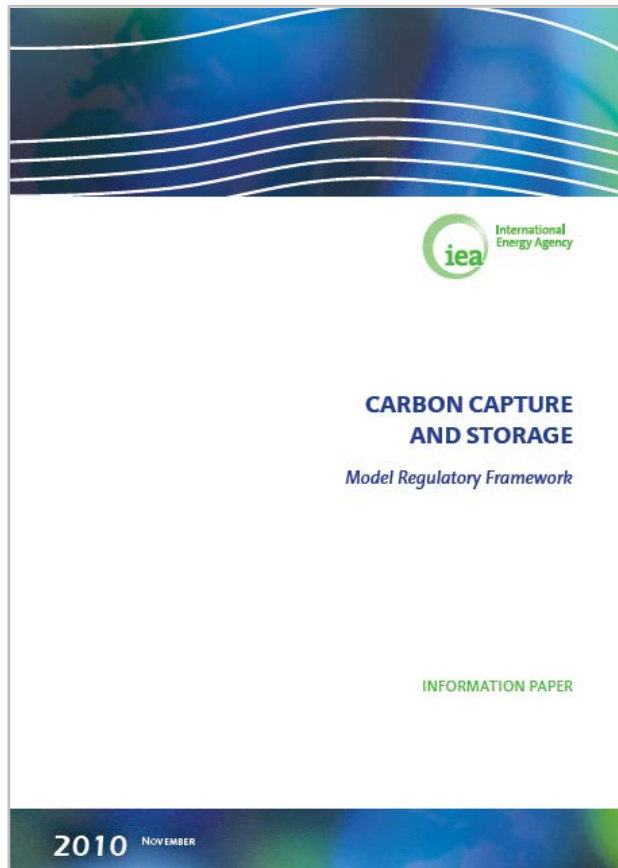
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IEA Model CCS Regulatory Framework 2010



- Regulatory development process
- Capture, transport and **storage**
- 29 key issues
- 4 categories
 - A. Broad regulatory issues
 - B. Existing regulatory issues
 - C. CCS-specific regulatory issues
 - D. Emerging CCS regulatory issues

Key issues for CCS a regulatory framework

Classification of CO₂	Engaging the public in decision-making	Corrective measures and remediation measures
Property rights	CO₂ capture	Liability during the project period
Competition with other users and preferential rights issue	CO₂ transportation	Authorisation for storage site closure
Transboundary movement of CO₂	Scope of framework and prohibitions	Liability during the post-closure period
International laws on protection of the marine environment	Definitions and terminology applicable to regulating CO₂ storage	Financial contributions to post-closure stewardship
Incentivising CCS as part of climate change mitigation strategies	Authorisation of storage site exploration activities	Sharing knowledge and experience through the demonstration phase
Protecting human health	Regulating site selection and characterisation activities	CCS Ready
Composition of the CO₂ stream	Authorisation of storage activities	Using CCS for biomass-based sources
The role of environmental impact assessment	Project inspections	Understanding enhanced hydrocarbon recovery with CCS
Third-party access to storage site and transportation infrastructure	Monitoring, reporting and verification requirements	

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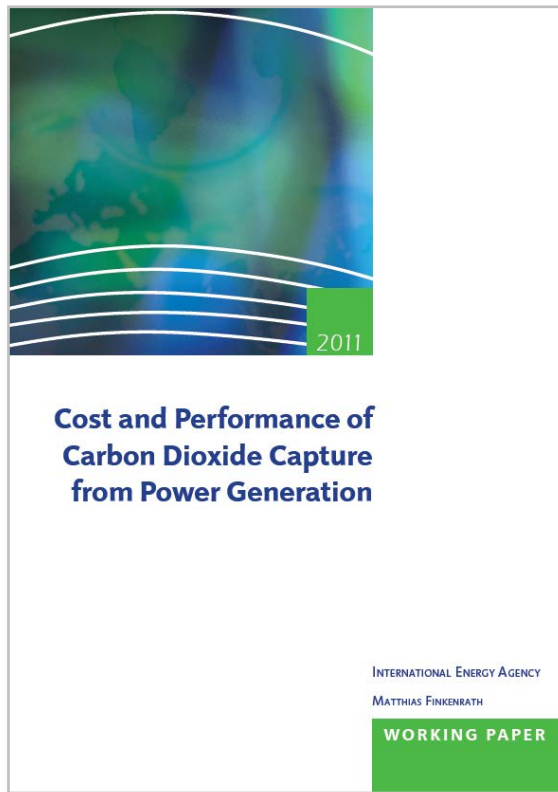
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Cost of CCS in power generation



Re-evaluated engineering study data of various institutions

- *Carnegie Mellon University*
- *China-UK Near Zero Emissions Coal Initiative*
- *CO₂ Capture Project*
- *Electric Power Research Institute*
- *Global CCS Institute*
- *Greenhouse Gas Implementing Agreement*
- *National Energy Technology Laboratory*
- *Massachusetts Institute of Technology*

→ **Cost and performance estimates for more than 50 capture installations across all capture routes**

EARLY COMMERCIAL PLANTS

Summary of results (OECD countries)

Fuel	Coal <i>(similar for all capture routes; relative to a pulverized coal baseline)</i>	Natural gas <i>(post-combustion)</i>
Efficiency penalty	10 %-points	8 %-points
Capital costs	3 800 USD/kW (74% increase)	1 700 USD/kW (82% increase)
Cost of CO ₂ avoided	55 USD/tCO ₂	80 USD/tCO ₂

Notes: Averages figures for OECD countries shown (costs in China estimated to be about half), capital costs are overnight costs

Not yet included (since site-specific):

CO₂ transport & storage cost and performance impact

CONCLUSIONS FROM REPORT

- **No single technology outperforms** alternative routes for coal-fired power generation
- **Variability** between and **uncertainty** of costs remains **significant**
- **Harmonisation** of costing methodologies and formats of reporting data is desirable in order to increase transparency
- **Suggested additional analysis**
 - Quantifying differences between generic cost estimates and project- and site-specific costs of CO₂ capture projects
 - bioenergy with CCS (BECCS)
 - applications in non-OECD countries

*Free download of study on IEA and OECD homepages
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**CARBON CAPTURE
AND STORAGE**

OUTREACH ACTIVITIES

Roundtable meetings

- Malaysia (March 2011)
- Mexico (March 2011)
- Russia (March 2011)
- Ukraine (May 2011)

Legal and regulatory workshops

- Indonesia (April 2011)
- South-Africa (June 2011)

IEA Energy Training Week (April 2011)

IEA – WPF – China MOST workshop on CCS
(Beijing 18-19 September 2011)

WORK IN PROGRESS / TO COME

- WEO-2011 (9 November 2011)
- ETP-2012 (June 2012)
- Publication on CCS in China (2011)
- CCS in power systems (2012)
- Global potential for retrofitting CCS (2012)
- CCS & biomass policy study (jointly with IEA RES division, 2011-2012)
- Regulatory review 3rd edition, regulatory network (2011-2012)
- Clean Energy Ministerial (April 2012)
- Revision of CCS roadmap (2012)
- Input to UNFCCC process (December 2011)