CARBON CAPTURE AND STORAGE

International Energy Agency

Carbon Capture and Storage: Outlook and Challenges

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CCS: SIGNIFICANT POTENTIAL

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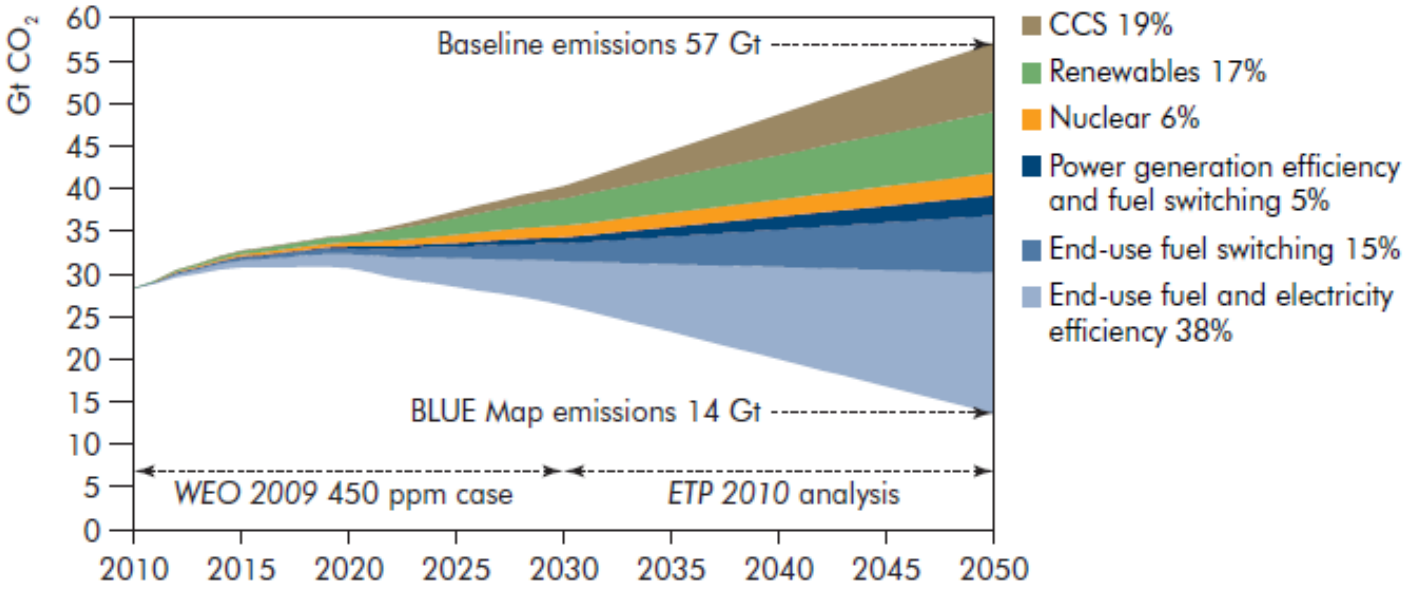

- 2nd largest share (19%) of CO_2 reductions in 2050
- 31% of CO_2 reductions in power sector in 2050
- Scenario without CCS-power: + USD 4,7 trillion additional investment cost 2010-2050

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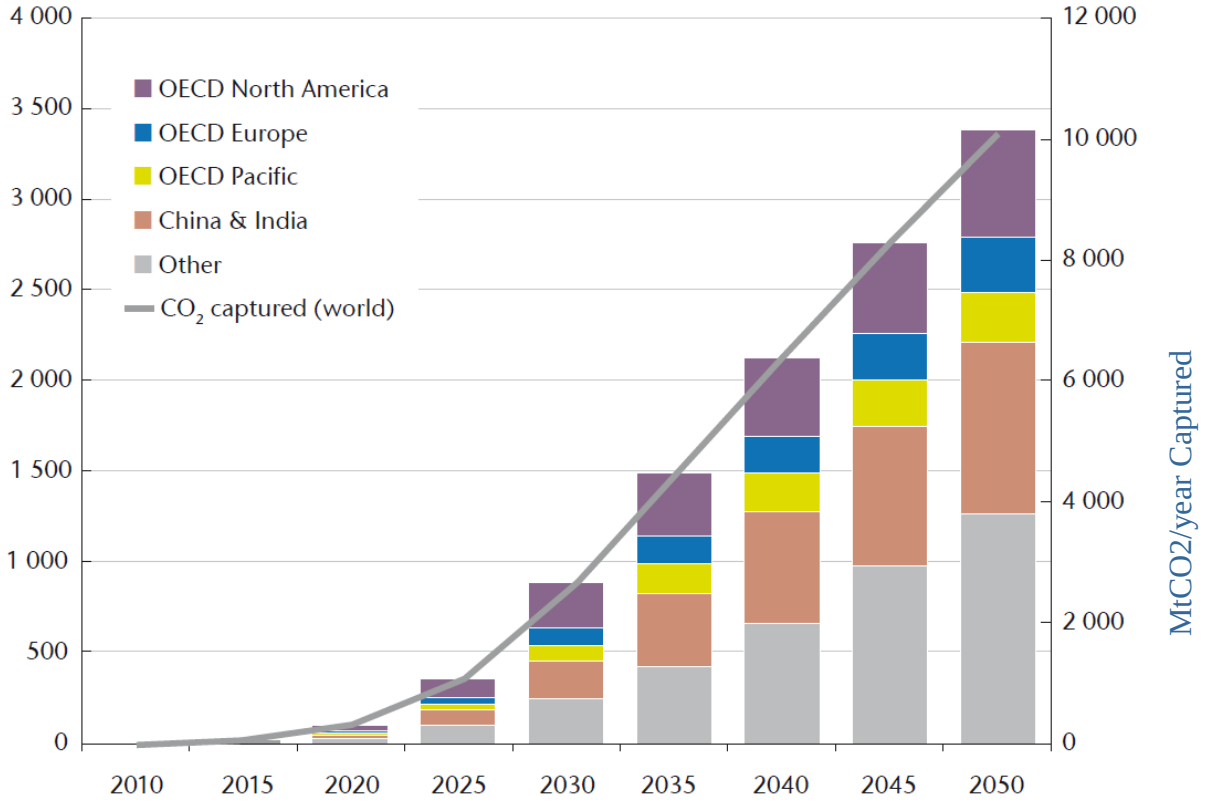
CCS: CHALLENGING DEPLOYMENT



3400 projects operational in 2050
2/3 of projects outside OECD countries in 2050

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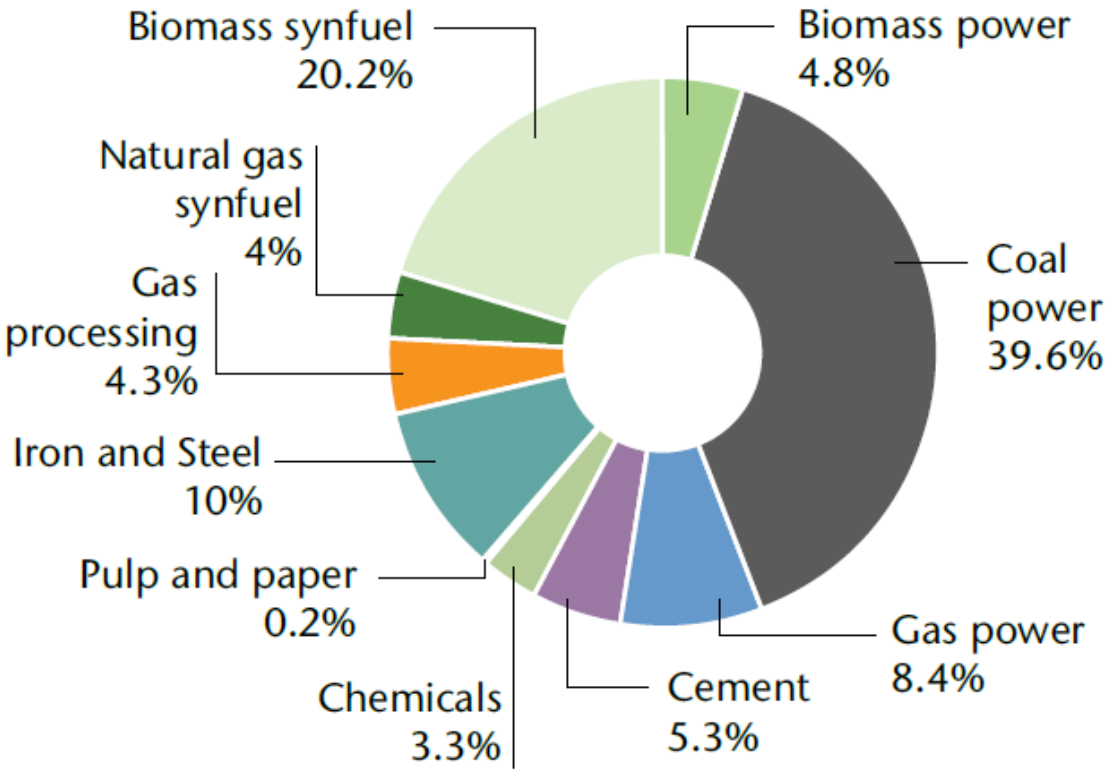
CCS NOT ONLY ABOUT "CLEAN COAL"



Coal power only makes up around 40% of stored emissions in 2050

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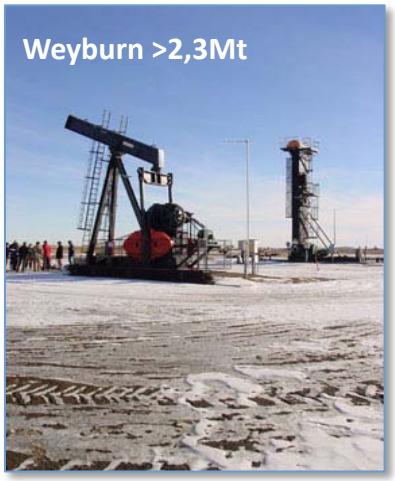
CO_2 IS CAPTURED AND STORED AS WE SPEAK…



Five large-scale projects in operation

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… AND MORE IS PLANNED

80+ integrated large-scale projects in various stages of development

Storage Type
- Geological
- Beneficial reuse
- Geological and/or beneficial reuse
- To be determined (TBD) or undisclosed

Capture Facility
- Power generation
- Natural gas processing
- Coal to liquids
- Coal gasification
- Oil refining
- Fertiliser production
- Aluminium, steel, cement or paper
- Various

Source: GLOBAL CCS INSTITUTE

GLOBAL CCS DEMONSTRATION: PLANS

Significant new project development activity

- especially for CCS in **coal-fired** power generation
- Other large stationary emissions sources such as **steel and cement** production significantly **under-represented**
- Clusters of projects in **North-America, Europe and Australia**
- In terms of a "balanced portfolio"- significant **under-representation** in **developing countries**

Source:

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UNCLEAR STRATEGIC DIRECTION

- Only modest commitments to cut global CO_2 emissions
- Limited public and government **understanding of CCS**
- Limited attention to **industrial CCS** applications

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INCOMPLETE REGULATION

- Lack of **legal and regulatory frameworks** especially in key non-OECD countries
- **Outstanding issues** in domestic legal and regulatory frameworks e.g. long-term liability
- Outstanding **international legal issues** e.g. ratification of the London Protocol and OSPAR amendments

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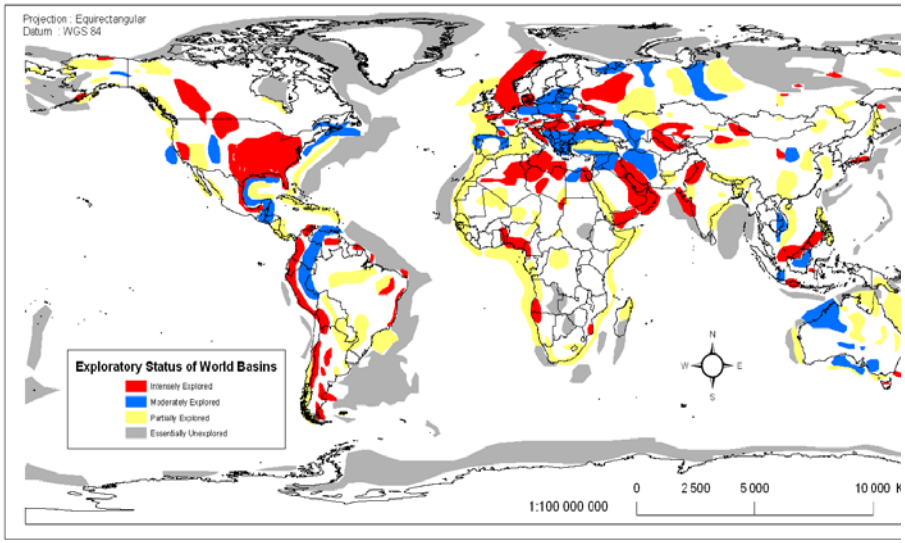
STORAGE SPACE

- No common **methodology** to estimate storage capacity
- Uneven data on global/regional/national storage **capacities**
- Limited appreciation of the **time** and **money** required to select and characterise a CO_2 storage facility



IEA GHG, GCCSI

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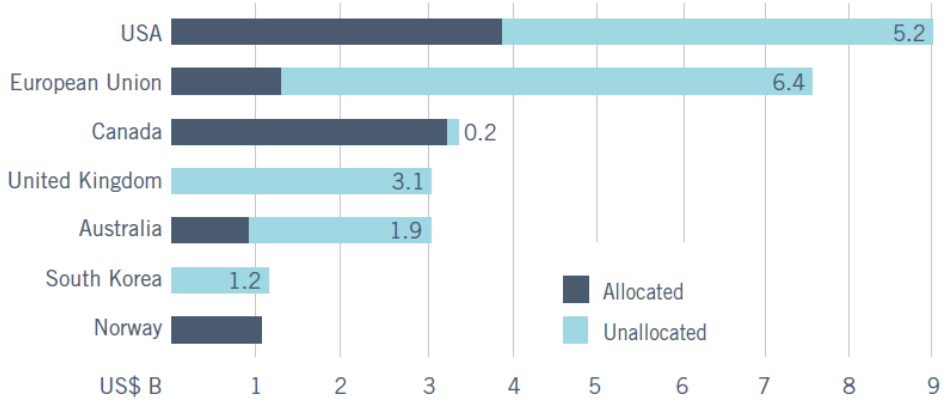
FUNDING

- **Insufficient** or **slowly emerging** financing by industry and governments for CCS demonstration
- Limited incentives for commercial-scale **deployment**
- No broad mechanism for financing CCS in **non-OECD countries**

FIGURE 2: Funding announcements and allocations by country



GCCSI

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WHAT ARE WE DOING?

- Model Regulatory Framework just published
- Supporting UNIDO: Global Roadmap for CCS in industry
- Economic instruments to support CCS demonstration and deployment (in planning)
- Roadmap for global methodology on storage capacity estimation (in planning)

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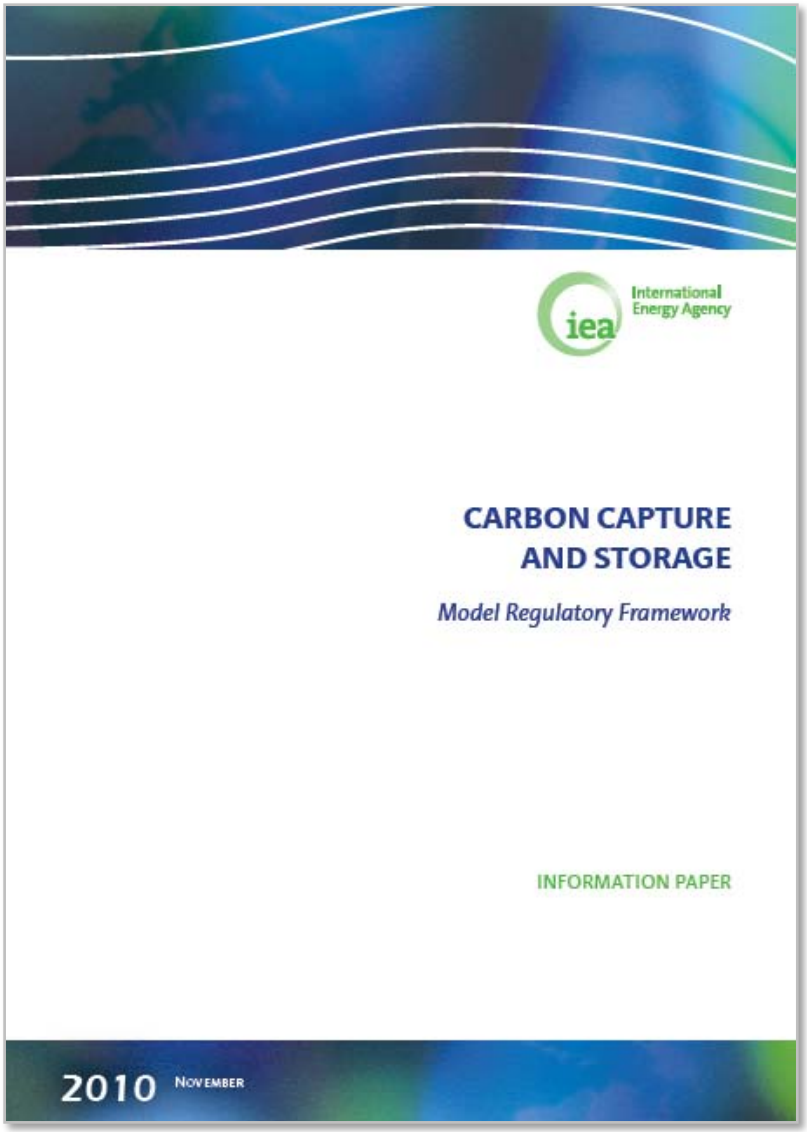
IEA CCS MODEL REGULATORY FRAMEWORK



AIMS

- To assist governments in the development of national legal and regulatory frameworks
- Proposes key principles for handling regulatory issues associated with CCS

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KEY ISSUES

Classification of CO_2	Engaging the public in decision-making	Corrective measures and remediation measures
Property rights	CO_2 capture	Liability during the project period
Competition with other users and preferential rights issue	CO_2 transportation	Authorisation for storage site closure
Transboundary movement of CO_2	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 CO_2 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 CO_2 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	Monitoring, reporting and verification requirements	

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Sample text

6.4 Regulating site selection and characterisation activities

1. *A site characterisation process as required by the relevant authority must be undertaken in respect of a proposed storage site.*
2. *The results of the site characterisation process must be submitted as part of a storage authorisation application.*
3. *To be a suitable storage site, the site characterisation process must indicate that a proposed storage site:*
    a. *has sufficient storage capacity for the intended quantity of CO_2 to be stored;*
    b. *has sufficient injectivity for the intended rate of CO_2 injection; and*
    c. *is free of faults, fractures, wells or other features that are likely to allow unintended migration.*
4. *A proposed storage site is not suitable where the site characterisation process indicates that it poses significant:*
    a. *risk of unintended migration;*
    b. *risk of leakage;*
    c. *environmental risks;*
    d. *health risks; or*
    e. *risk to other resources.*
5. *Where the location of a proposed storage site would result in the existence of more than one storage site in the same primary storage formation, the potential interaction of the sites (including but not limited to interaction of CO_2 plumes and pressure interactions) must be such that both sites will meet, or continue to meet, the requirements of this section 6.4.*

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ECONOMIC INSTRUMENTS

- To evaluate and propose policy instruments that could support CCS deployment in OECD and non-OECD countries
- Useful to national and international policy makers
- Builds upon IEA technology road map
- Scope
  - Power generation and industry
  - Demonstration and large-scale projects
  - International funding and finance options
  - Interaction with (renewable) energy policies
  - Biomass

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Thank you!

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www.iea.org/ccs