Introduction to CCS Policy and Regulations

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Overview

• Introduction
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  » OSPAR
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Importance of policy & regulations

• Policy: standpoint, a guiding principle – starting point for legislative process & development of regulations.
• Without regulations (new and amendment of existing) implementation of new technology not possible.
• Safeguard the public, the environment, industry and government.
• Need initial regulatory frameworks for first projects, and amend with international growing experience.
• Both international & national regulations: still learning and emerging.
International Regulations

- London Convention and Protocol
  - Marine treaty – global agreement regulating disposal of wastes & other matter(s) from land-based sources at sea.
  - Main articles:
    » Prohibition of dumping except for wastes etc in Annex I
    » Dumping requires a permit in accordance with Annex II
  - Annex I: Dredged materials, sewage sludge, fish wastes etc, vessels, man-made structures etc, inert & inorganic geological materials, natural organic materials, bulky items (island nations only).
International Regulations

• For CCS – needed amendment.
  o CO₂ specific guidelines.
  o CO₂ streams can be considered if:
    » Disposal is into sub-seabed geological formations.
    » Wastes consist overwhelmingly of CO₂ (may contain incidental associated substances from source material and CCS processes used).
    » No wastes or other matter added for disposal.
International Regulations

- London Protocol – Transboundary transport
  - Article 6 prohibits export, including CO₂
  - Working group (Feb 08, Germany) – covering transport and subsurface migration. Agreed amendment necessary – drafted.
  - Working group annual meeting Oct 08 considered further. Some for, some against. Agreed plenary statement to give message:
    “LP should not create barrier to transboundary transport of CO₂ for CCS”
  - Intersessional Working Group, Jan 09 – questionnaire
  - Will enter force for Parties accepting on 60th day when 2/3 of Contracting Parties accepting it.
International Regulations

• OSPAR
  o Marine Treaty for NE Atlantic: to protect marine env.
  o Prohibited some CCS configurations
  o Considered CCS and CO₂ Impacts on seas.
  o Amendments proposed by Norway, UK, NL, France to Annex II & III – adoption June 2007, need ratification by 7 Parties:
    □ CO₂ streams from CO₂ capture processes for storage provided:
    □ Into a sub-soil geological formation
    □ Consist overwhelmingly of CO₂.
    □ No wastes or other matter are added for the purpose of disposal
    □ They are intended to be retained permanently & will not lead to significant adverse consequences for the marine environment, human health and other users.
International Regulations

- OSPAR
  - Decision – requirement to use guidelines when permitting.
  - Storage in water column prohibited.
International Regulations

- **Principles from London and OSPAR**
  - Site by site assessment
  - Site characterisation in advance
  - \( \text{CO}_2 \) Stream impurities: overwhelmingly \( \text{CO}_2 \) & related to integrity of transport & storage.
  - Requirement for risk assessment and management:
    - Monitoring plan
    - Mitigation & remediation plan
    - Site closure plan
    - Post-closure monitoring
EU Regulations

• EU CCS Directive & ETS Directive

• EU CCS Directive:
  Enables regulatory framework to ensure environmentally sound CCS, until 2011 to transpose
  o Follows IPCC GHG Guidelines & OSPAR
  o Objective: permanent storage
EU Regulations

• EU CCS Directive:
  o Ocean storage prohibited
  o Permits required for exploration & storage: EC has right to review decisions.
  o Storage permit only if ‘no significant risk of leakage’
  o Emphasis on site selection, characterisation, risk assessment & monitoring plan
  o Corrective measures & provisional post-closure plan
  o ‘Overwhelmingly CO₂’
  o Monitoring to include ETS monitoring
  o Reporting & inspections at least once per year
EU Regulations

- EU CCS Directive:
  - Financial security required from operator – from outset to cover liabilities including closure, up to liability transfer.
  - Financial contribution to authority to cover long-term monitoring for 30 years.
  - Liability transfer to authority after closure ‘when evidence indicates completely & permanently contained’ >20 years. EC review. Monitoring continue but reduced to detect irregularities.
  - Access to transport networks & storage, unless technical issue or lack capacity.
  -Removes barriers in other directives e.g. IPPC, Waste, Water, EIA, ELD, LCPD.
EU Regulations

• EU CCS Directive:
  • Carbon Capture Readiness (CCR) – definition based on IEA GHG report (TR2007/04).
  • >300 MW, from date of CCS Directive
    Assessed availability of suitable storage sites
    Assessed transport is technically & economically feasible
    Assessed technical feasibility of retrofitting capture equipment
    If so, set aside space for capture
  • Directive not require CCR on all new combustion plants
  • No potential timescales for CCS retrofit
  • Review Directive in 2015 – perhaps include mandatory Emissions Performance (EPS)?
EU Regulations

EU CCS Directive Guidelines
• Commission documents – not legally binding!
• Released for comment June 2010
• Stakeholder meeting 15th July 2010
• To be adapted & published Oct/Nov 2010

• 4 draft documents:
  1.  CO$_2$ Storage Life Cycle Risk Management Framework
  2.  Site characterisation, CO$_2$ Stream Composition, Monitoring and Corrective Measures
  3.  Criteria for Transfer of Responsibility to the Competent Authority.
  4.  Financial Security and Financial Contribution

• Currently concern over 4th document, especially need for 25% contingency plan
EU Regulations & Financial support mechanisms

- EU Emissions Trading Scheme
  - CCS fully included from 2013.
    » Site and operation need to comply with CCS Directive
    » Needs monitoring & reporting guidelines – underway
  - Emissions allowances need not be surrendered where CCS successful.
  - Separate permitting of capture, transport & storage
  - Any leakage – surrender allowances.
  - If leakage suspected from monitoring under CCS Directive, trigger ETS monitoring.
  - Biomass & CCS can be opted in.
EU Regulations & financial support mechanisms

- EU ETS allowances
  - ETS Directive amendment for EU CCS demonstration projects using 500 million EU Allowances from New Entrants Reserve (fund set aside for new installations & extensions).
  - Agreed 300 million EUAs = 6-9 billion Euro until 2015 for up to 12 CCS demonstration projects.
    - 8 projects; 34 renewable projects
    - Fund 50% of relevant costs
    - Max 3 per member state; at least 1
    - At least 3 saline aquifer, at least 3 hydrocarbon, at least 1 from each capture technology in Annex; no more than 3 per capture technology.
EU Regulations & financial support mechanisms

Cont...
- 24 months for permitting (36 for saline aquifer).
- Store 75% of expected CO₂ for 100% of funding.

- EUAs:
  - Award support by end 2011
  - Operational: 2015
- Have to be in EU economic zone & associated continental shelf.
EU Regulations & Financial support mechanisms

• EU Demonstration projects
  o Dec 09, Commission approved 15 energy projects which will significantly contribute to the economic recovery of EU. 1 billion to 6 CCS projects; 565 million to 9 offshore wind projects.
  o Jaenschwalde, Vattenfall, Germany: Oxyfuel & post-combustion on existing plant site. 2 storage & transport options.
  o Porto-Tolle, Italy – CCS on new 660MW coal power plant, capture on 250MW. Saline aquifer.
  o Rotterdam, Netherlands – CCS chain on 250MW, post-combustion. Depleted gas field.
EU Regulations & financial support mechanisms

- Compostilla, Spain – Oxyfuel & fluidised bed on 30MW pilot to be up-scaled to 320MW. Saline aquifer.
- Hatfield, UK – CCS on new 900MW IGCC, part of Yorkshire Forward Initiative.
- PGE EBSA, Poland – Full CCS chain, corresponding to 250MW, new supercritical unit of largest lignite-fired plant in EU. Exploration of 3 saline aquifer storage sites.
EU Policy Regulations – UK Example

• Climate Change Act 2008 – 80% cut by 2050. Creation of Committee on Climate Change. Carbon budgeting system - caps emissions over five-year periods. 1\textsuperscript{st} country with legally binding long-term framework.

• Energy Act 2008/2009 - Enabling powers to control CCS, transpose the EU CCS directive to the UK
  - Assert UK right to store beneath seabed to 200 nautical miles
  - Assigns ownership to State
  - Requirement for lease
  - Requirement for licence
  - Provision for regulation of site after closure
  - Extend Petroleum Act to cover decommissioning
EU Regulations & Financial support mechanisms

• Government response November 2009
• **No new coal without CCS.**
  - Up to 4 commercial-scale CCS demonstrations, funded by new CCS incentive, & requirement for any new coal power station to demonstrate full CCS chain (capture, transport and storage) at commercial scale.
• **A long term transition to clean coal.**
  - Rolling review process, report in 2018, consider new regulatory and financial measures to further drive move to clean coal.
  - CCS ready for wider deployment from 2020
  - Demonstration plant will retrofit CCS to full capacity by 2025
EU Policy & Regulations – UK Example

• UK Clean Coal Framework:
  • Confirmed commitment to 1st demonstration project(s) – UK Competition (announced 2010).
  • Launch competition for selection of further CCS demonstration projects towards end of 2010, complete 2011.
  • Regulated via planning (S. 36 Electricity Act, Infrastructure Planning Commission) and operation (Environment Agency: secondary legislation for Pollution Prevention Control Act).

Figure 1: Timeline for CCS demonstration and deployment

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<tr>
<th>2010 - 2015</th>
<th>2015 - 2020</th>
<th>2020s</th>
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<tbody>
<tr>
<td>Launch of 2nd competition</td>
<td>1st project awarded</td>
<td>2nd competition completed</td>
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<tr>
<td>Up to 4 projects operational</td>
<td>Expect retrofit by 2025</td>
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<tr>
<td>Legislative framework for CCS incentive established</td>
<td>Rolling review of progress</td>
<td>Government report on CCS (by 2018)</td>
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<tr>
<td>Long term framework (pre-commercial &amp; deployment)</td>
<td>Demonstrations</td>
<td>Establishing CCS regime (finance, planning, regulation e.g. storage for CO₂, selection of demonstration projects)</td>
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EU Policy Regulations – UK Example

• Building Britain's Future, 29th June 2009: Draft Legislative Programme (DLP) for the 5th parliamentary session 2009-2010.

• Proposed energy bill: Moving decisively to a low carbon economy while maintaining the security and diversity of electricity supplies by:

“introducing a financial incentive, funded by electricity suppliers, to support up to four Carbon Capture and Storage (CCS) commercial-scale demonstration projects”. CCS levy.

• Energy Act 2010 as from 8th April 2010.

• New coalition government committed to CCS development
Regulations Elsewhere

- **Australia**
  
    - Access & property rights for waters under Commonwealth jurisdiction
    - Site Plan – characterisation, predictions, operations, monitoring, risk assessment, management & remediation
    - Operators bear costs of post-closure monitoring & verification
    - 20 year limit following project closure on common law liability, afterwards federal government assumes long-term liability

  - **Carbon Pollution Reduction Scheme (CPRS)**
    - Cap and trade scheme
    - Operation 2010
    - $CO_2$ transferred to CCS counts as not emitted
Regulations Elsewhere

- **Australia**
  - Queensland Greenhouse Gas Storage Act 2009
    - Onshore
    - State owns rights to geological reservoir
    - Exploration, injection and monitoring permits
    - Injection & monitoring plan, leakage pathways, impacts, probability
  - **South Australia**: CCS regulated under Petroleum Act 2000
  - **Western Australia**: Project specific legislation
Regulations Elsewhere

• USA
  o Existing underground injection control programme for ground water protection adapted for pilot plants
  o US EPA have developed ‘draft rule’ for CO₂ storage (Jul 08)
  o A number of Bills for demonstration project technical & financial assistance, not yet passed.
  o Various Acts passed at a State level, both technical & financial, e.g. Kansas Carbon Dioxide Reduction Act (07): property & income tax reductions for CCS, regulation of injection wells.

• American States with CCS Framework Legislation
Regulations Elsewhere

- **Canada**
  - **Carbon Capture and Storage Funding Act (June 09)**
    - Funding for CCS development
  - **Review underway on existing & necessary regulations in Alberta: Federal/Alberta Task Force**
    - Acid gas injection & CO2-EOR already permitted in states such as Alberta
    - Alberta CCS Program: 4 demonstration projects – Quest, Swan Hills Synfuels, TransAtla, Enhance
Regulations Elsewhere

- Japan
  - Amended Marine Prevention & Pollution Law
    - No one shall dispose oil, hazardous liquid substances, and wastes under the seabed, except for CO$_2$ stream storage under the seabed with permit from Minister of the Environment (Article 18.7)
    - Need for permit, monitoring
    - Purity set at 99% CO$_2$ or 98% from hydrogen production
    - EIA report requirement for permit
Don’t forget

• Climate Change Policy & Regulations
  • GHG emissions targets, e.g. Kyoto Protocol

• UNFCCC – Clean Development Mechanism
  • CCS in the CDM

• IPCC Special Report & GHG Guidelines
  • Baseline for many regulations
Summary

• Though still in the relatively early stages of development, regulations are in place for CCS demonstration
• Australia and the EU have certainly been leading figures in CCS policy & regulations
• Still further to go, however, difficult to regulate when unknowns remain
• Demonstration projects will improve understanding of whole CCS to allow further development of necessary regulatory frameworks
References

- UCL Legal Programme
  - http://www.ucl.ac.uk/cclp/index.php

- DECC
  - http://www.decc.gov.uk/

- European Commission

- UK Parliament
  - http://www.parliament.uk/about/how/laws/

- Also, to consider – Royal Society MP Pairing Scheme
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• Visit: www.ieaghg.org