BERR | Department for Business Enterprise & Regulatory Reform

Introduction

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UK Progress Regulating the Storage of Carbon Dioxide

David Rutland, BERR

- Energy Bill
- Integration with Directive
- Where to next?

Energy Bill

- Asserts UK's rights to store carbon dioxide offshore (to 200 nautical miles).
- Vests those rights in the Crown.
- Provides a comprehensive legal basis for licensing the storage of carbon dioxide.
- Sets out the sanctions for breaches of licences.
- Sets out public information obligations.
- Provides for transfer of long-term stewardship to the state.
- Extends a number of offshore provisions to carbon dioxide storage:
  - Decommissioning of facilities
  - Safety zones
- Can be extended to include EOR.

Bill and Directive

- Bill and Directive have different scope, but both permit offshore storage (Directive also permits onshore storage).
- Bill does not contradict Directive.
- Bill is more comprehensive/specific in some areas (eg. penalties, decommissioning), but less specific in others (eg. conditions to be met for long-term transfer).
- Directive will be incorporated into UK legislation once agreed.

Where to next: homing in on the detail

- Lifetime
- Boundaries
- Other uses of the seabed
- Liability and legacy
- Licence

Where to next: lifetime

	Preliminary Exploration	Exploration	Dormant	Operational		Delicensed
				Injection	Post-Injection	
Lease	No	Yes (Time Limited)	Yes (Time Limited)	Yes		No
Licence	No	Exploration Licence (Time Limited)	No	Operational Licence		No

Where to next: liability and legacy

- Arrangements will have to ensure:
  - polluter pays principle
  - operator has regard to long-term safety and stability of store
  - public purse protected against main risks
- Transfer criteria:
  - coincident with the termination of licence
  - long-term containment (Directive)
- How to protect the taxpayer:
  - type of security to cover obligations
  - security to cover contingent liabilities

Where to next: licence (1)

- Retain carbon dioxide within defined geological boundaries.
- Avoid interference with other uses of the sea and seabed.
- Provide for the regulator to step-in, withdraw, suspend or vary a licence.
- Key operating parameters specified.
- Control drilling and plugging of boreholes, including notification and information requirements.
- Modelling, monitoring, reporting, inspection, notification and record-keeping requirements.

Where to next: licence (2)

- Financial guarantee arrangements.
- Conditions to be met for termination of licence.
- Maintain a closure plan that demonstrates how and when the facilities will be decommissioned and the store secured.
- Maintain a post-closure plan detailing management prior to termination.
- High management standards.
- Preparation and maintenance of a Risk Management Plan.

Climate Action
Energy for a Changing World

Climate action and renewable energy package

Enabling legal framework for carbon capture and storage

BERR event on CCS
25 February 2008

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Climate Action
Energy for a Changing World

EU climate objective: stabilisation of GHG at 450 ppmv

IEA World Energy Outlook 2007: Based on current policies emissions from energy use will continue to grow by 55% until 2030

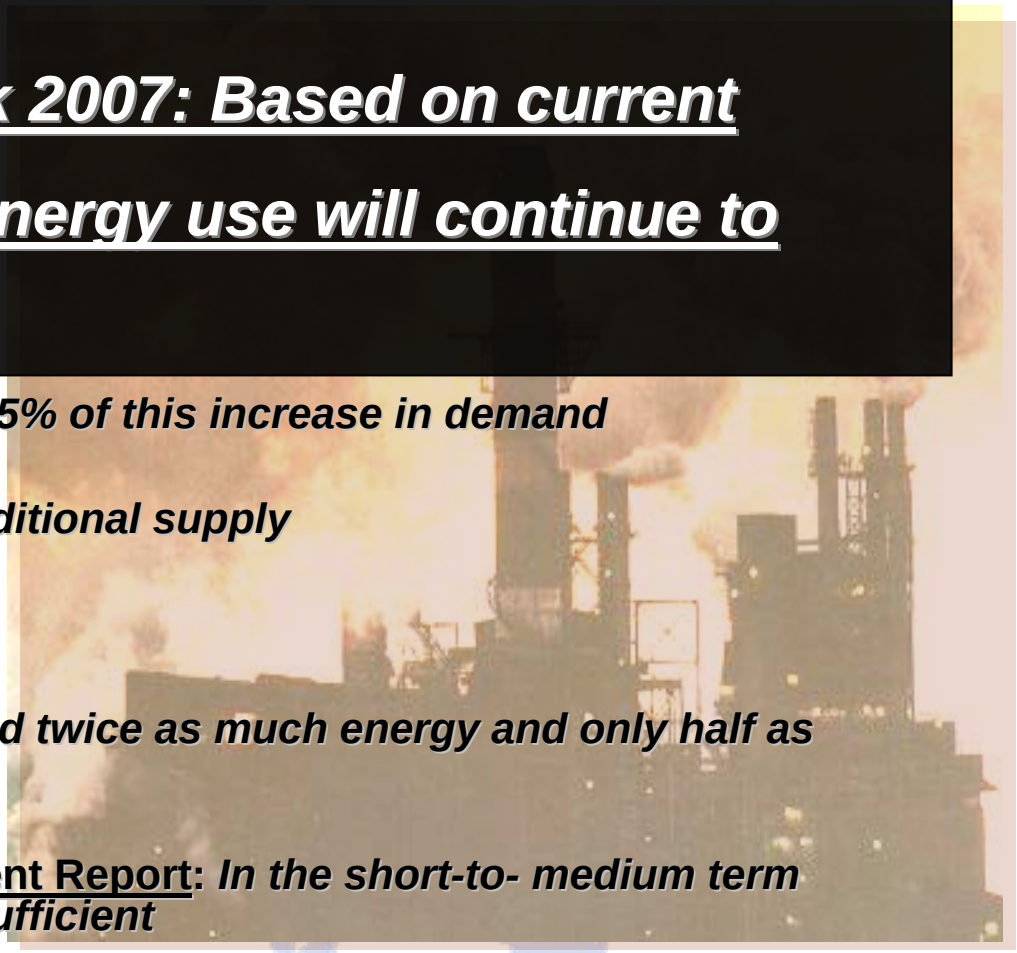
China and India together account for 45% of this increase in demand

Fossil fuel use provides 84% of the additional supply

Coal use increases by 73%

IEA & IPCC: ***By 2050 the world will need twice as much energy and only half as much CO2***

Stern Review, IEA, IPCC 4th Assessment Report: ***In the short-to- medium term Energy Efficiency & RES alone are insufficient***



Risk management framework

Capture

- Regulated and permitted under IPPC, included explicitly in Annex I of 96/61 (Article 30)
- Update of BAT Reference Documents (BREFs) to specify requirements
  - Possible horizontal BREF on CO2 capture technologies

Transport

- Currently regulated at MS level (for natural gas); relevant European and international standards apply
- Large pipelines require Environmental Impact Assessment (Article 29(1)(a))
- TREN Working Group on safety of oil and gas pipelines
- Conservative approach: no risk differences CO2/NG justifying a different approach
- Similar approach to transport by ship

Environmental security of storage sites

- Focus is geological storage
  - Storage in water column prohibited (Article 2)
- Site location
  - Member States have sole right to decide which areas in their territory to make available (Article 4.1)
  - Where exploration allowed, standard non-discrimination provisions apply (Article 5)
- Site selection
  - Integrity of project depends crucially on the initial choice
  - Criteria are established for prior assessment of the site (Annex I)
  - Condition of use is that the assessment shows that under the proposed conditions of use, there is no significant risk of leakage or impacts on human health or the environment (Article 4.2)
  - Storage site subject to EIA (Article 29)

Composition of the CO2 stream

Acceptance criteria based on the agreements in London Convention and OSPAR (Article 12):

- **CO2 stream shall consist overwhelmingly of carbon dioxide**
- **No wastes or other matter added for the purpose of disposal**
- **Streams may contain incidental associated substances from the source or capture process, but concentrations shall be below levels that would:**
  - Adversely affect the integrity of the storage site and transport infrastructure
  - Pose a significant risk to the environment
  - Or breach the requirements of applicable EC legislation.

The operator must:

- **Show that the CO2 to be accepted for injection fulfils the criteria in question**
- **Keep records of the origin, quantity and characteristics of the CO2 accepted.**

Monitoring and permit review

- **Monitoring plan (Article 13 and Annex II) designed to:**
  - Compare actual and modelled behaviour of CO2
  - Detect migration and leakage
  - Detect significant adverse effects resulting from leakage
  - Assess effects of corrective measures
  - Assess long-term containment prospects for the stored CO2
- **Commission may review the permits but final decision on permitting remains with competent authority (Article 10)**
- **Competent authority reviews permits at least every five years, and updates or withdraws as necessary (Article 11)**

Liability and long-term stewardship

- **Liability measures in case sites do leak**
  - Competent authority immediately notified and corrective measures taken (Article 16)
  - Environmental Liability Directive applies for any local damage (Article 33)
  - ETS allowances must be surrendered for any leakage (proposed ETS Directive)
  - Financial security for future liabilities (Article 19)

- **Closure and transfer of responsibility to the state under clear conditions to avoid distortion of competition (Articles 17 and 18)**
  - The site must be safely closed and sealed
  - While site represents a significant risk it remains the operator's responsibility
  - Transfers to the state when all available evidence indicates complete containment of CO2 for the indefinite future

Removal of barriers to CCS deployment

- Water Framework Directive amended to allow CO2 storage in saline aquifers (Article 31)
  - Same environmental conditions as for natural gas
- Waste legislation adapted to remove from scope CO2 transported and stored in accordance with this framework (Articles 34 and 35)

Incentivisation and market measures

- Under the ETS:
  - CO2 captured, transported and safely stored considered as not emitted
  - No allocation to capture, transport and storage
  - ETS allowances must be surrendered for any leakage
  - Monitoring and reporting guidelines under preparation.
- ETS auctioning revenues major potential source of funding for CCS demonstration
- Measures to ensure a fair market in transport and storage (Articles 20 and 21)
  - Principle is fair and open access to transport and storage
  - Embryonic market so light touch appropriate
  - Member States to determine modalities, and can limit access in certain cases

Enabling versus mandating CCS

- Enabling
  - Member States determine whether and where CCS will happen
  - Companies decide whether to use CCS on the basis of conditions in the carbon market
- Capture-ready assessment required to avoid lock-in of high-emissions technology (Article 32)
  - By amendment of the Large Combustion Plants Directive
- No mandatory CCS at this stage:
  - Let the market work: The revised ETS will ensure a robust carbon price and action on demonstration will bring CCS costs down

Climate Action
Energy for a Changing World

Early demonstration

- Early demonstration of technical viability of CCS in power generation important step towards widespread deployment
- Commission intends to stimulate construction and operation of up to 12 CCS demonstration plants by 2015
- Communication on early demonstration
  - Creation of a European Industry Initiative as basis for the co-ordination of the demonstration projects 2008
  - Facilitation of State aid clearance through revision of Environmental State aid guidelines
  - Inclusion of CO2 infrastructure in revision of TEN-E guidelines 2008
  - Discussion on provision of further financing

Summary

- Clear enabling legal framework that can serve as an international model on risk management, liability, long-term stewardship and other management issues
- Market-driven deployment
- Impact assessment evidence shows that CCS can make a substantial contribution towards reducing the cost of major CO2 reductions.
- Substantial finance available from ETS auctioning revenues, including for CCS demonstration

CCS in EU Climate Change and Energy Package: initial UK views

Ruth Hampton, BERR

Overview: CCS elements of "package"

1. DG Environment Proposal for a Directive on the geological storage of carbon dioxide
2. DG Transport and Energy Communication on "Supporting Early Demonstration of Sustainable Power Generation from Fossil Fuels"
3. DG Environment Proposal for the third phase of the EU Emissions Trading Scheme, which includes CCS
4. DG Research Strategic Energy Technology (SET) Plan, which covers CCS technologies
5. DG Competition guidelines on state aid for environmental protection, which state how CCS will be assessed.

Directive on geological storage [1]

- **Context:** 2007 SEC tasked to "develop the necessary technical, economic and **regulatory** framework to bring environmentally safe CCS to deployment"
- **Content:** aims to cover the whole CCS chain (capture, transport and storage) through:
  - Adjustments to existing legislation
  - New framework to regulate environmental risks of carbon dioxide storage

Directive on geological storage [2]

- **Key provisions:** Creates enabling framework for capture, transport, onshore and offshore storage of CO_2, in particular introducing:
  - Detailed criteria for site selection and risk assessment and monitoring
  - Permits for CO_2 storage with operation, closure and post-closure obligations
  - Arrangements for transfer of long-term liabilities to the State
  - Third party access and transboundary cooperation
  - A requirement for carbon capture readiness (CCR) on new plants

Directive on geological storage [3]

Initial UK analysis:

- Broadly aligns with progress made on the treatment of CCS in existing international agreements on marine protection:
  - The OSPAR Convention, amended in June 2007 to permit all types of sub-seabed storage
  - The Protocol to the London Convention, amended in 2006 to permit CO_2 storage
- Broadly aligns with proposed UK regime for CO_2 storage in draft Energy Bill

Directive on geological storage [4]

Initial UK reaction:

- Strongly support and seek swift agreement
- Must align with international marine protection law and better regulation and subsidiarity principles.
- Several areas for further clarification, including:
  - Commission review of national regulators' decisions
  - Limited period for exploration permits
  - Relationship with MRV in the EU ETS
  - Financial security obligation
  - Intention of carbon capture readiness requirement

Relationship to CCS in the EU ETS

- Monitoring in CCS Directive for **environmental impact purposes** i.e. detection and location of leakage (provided in Annex II)
  - Reporting to national competent authority at least annually
- Monitoring in ETS Directive for **GHG performance** – ie quantification of leakage and other emissions (provided in MRG)
  - Reporting to Environment Agency (Defra) annually
- Areas of interface identified in **Monitoring Plans**
  - MRG process will wait to see if any changes to monitoring and reporting in the CCS Directive before finalising CCS MRG, so as to ensure no conflicts or gaps

Communication on early demonstration [1]

Key Elements:

- Creates a European Industrial initiative on CCS under the SET plan to aid knowledge transfer and coordinate demonstration, R&D and policy
- Projects in network receive EU kitemark, knowledge sharing, and beneficial State Aid treatment

Initial UK Analysis:

- State Aid for large CCS projects will undergo individual assessment but will be viewed favourably and judged by their merits under the Treaty, rather than under the environmental state aid guidelines.

Communication on early demonstration [2]

Initial UK Reaction:

- Support and welcome plans to share learning across the EU and with developing countries. Hope UK demonstration can be part of this network.
- Need other Member States and industry to commit to demonstrations.
- Welcome positive wording on state aid and clarification on use of structural funds for CCS projects. Commission must find further non-financial ways to incentivise CCS demonstrations

Environmental state aid guidelines

- Welcome new guidelines stating Commission support in principle for large scale CCS demonstration projects:
  - scope allow MS to fund up to 100% of the additional costs incurred by businesses in environmental protection, where subsidies are allocated by means of open competitions
  - support in principle for funding of large carbon capture storage projects either as part of fossil fuel power plants or at other stages, although proposals will still need to be scrutinised and cleared individually.

Key milestones: Jan – Jul 2008

- 26 February: European Parliament lead Rapporteurs selected
- 28 February: Energy Council
- 3-4 March: Environment Council
- 13-14 March: Spring European Council
- 26 June: Environment Council
- 5-6 July: Joint Informal Energy and Environment Ministerial Council

Health and Safety Executive

The Health & Safety implications of Carbon Capture and Storage

Gwyneth Deakins

Head of Major Hazards Policy Unit

Health and Safety Executive

HSE's view

- Consideration of the safety risks of CCS deployment should in no way prohibit its introduction.
- An appropriate safety regulatory regime will underpin public confidence in CCS technologies.
- We need to recognise the limitations of current knowledge and address the specific challenges associated with CCS.

Major accident hazard potential of CCS

- Exposure to high concentrations of CO_2 is known to be fatal
- A major pressure loss of dense phase CO_2 could result in:
  - Cryogenic burns/embrittlement of neighbouring plant
  - Toxic contamination
  - Dry ice ‘grit blasting’ effects

Global CCS experience

- Comparatively limited experience in managing the risks associated with CO_2 compared with oil and gas.
- Important differences between US projects and UK proposals relating to industry drivers, geological/population characteristics etc. require different technical and regulatory outcomes.

Areas of uncertainty

- Defining the characteristics of a large-scale high pressure CO_2 release.
- Estimating the consequences of a loss of containment event.
- Best practice for containment and integrity.

Recent and ongoing work

- Toxicity quantified in form of DTL values http://www.hse.gov.uk/hid/haztox.htm
- HSL modelling of pipeline releases
- CCS Working Group Wilton project – release experiments
- Exploring joint research possibilities with the Norwegians

Determining an appropriate regulatory framework

- Health and Safety at Work etc. Act 1974 - new technology will be subject to general duties of the Act.
- No desire to impact on existing CO2 industries.
- Need to consider the need to extend the major hazard regulatory framework to the capture, transport and injection of CO_2 both on and offshore.

Current Model for Regulating Major Hazard Industries

- Operators take all measures necessary to prevent major accidents – compliance demonstration required
- Mitigation of residual risk (i.e. that which remains when the operator has taken all reasonable measures) through
  - Emergency planning and
  - Land use planning controls (onshore)

Extending the Major Hazard Regulatory Framework

- Fixed installations (onshore)
  - Control of Major Accident Hazards Regulations 1999
- Pipelines
  - Pipelines Safety Regulations 1996 (Part III Major Accident Hazard Pipelines)
- Fixed installations (offshore)
  - Offshore Installations (Safety Case) Regulations 2005

Conclusions

- HSE is working with OGD's to enable the safe introduction of CCS technologies
- An appropriate regulatory regime will support societal acceptance of CCS technologies
- Ongoing research is required to fill knowledge gaps