



Overview of Regulatory Requirements

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Maria Laach, Germany, 2-4 November 2010

Contexts – Environmental Impacts of Leakage



- ***Risk Assessment processes – permitting***
 - Risk = Probability x Impact
- ***Environmental Impact Assessment***
- ***Monitoring for leakage***
 - Detection
 - Impact assessment (and recovery assessment)
 - Quantification

Environmental Impacts - Scope



- *Short term (during operation)*
- *Long term*

- *Local*
- *Global – climate change*



London Convention and Protocol



- *Marine Treaty - Global agreement regulating disposal of wastes and other matter at sea*
- *Convention 1972 (83 countries), Protocol 1996 – ratified March 2006 (35 countries)*
- *Prohibited some CCS project configurations*

CCS work

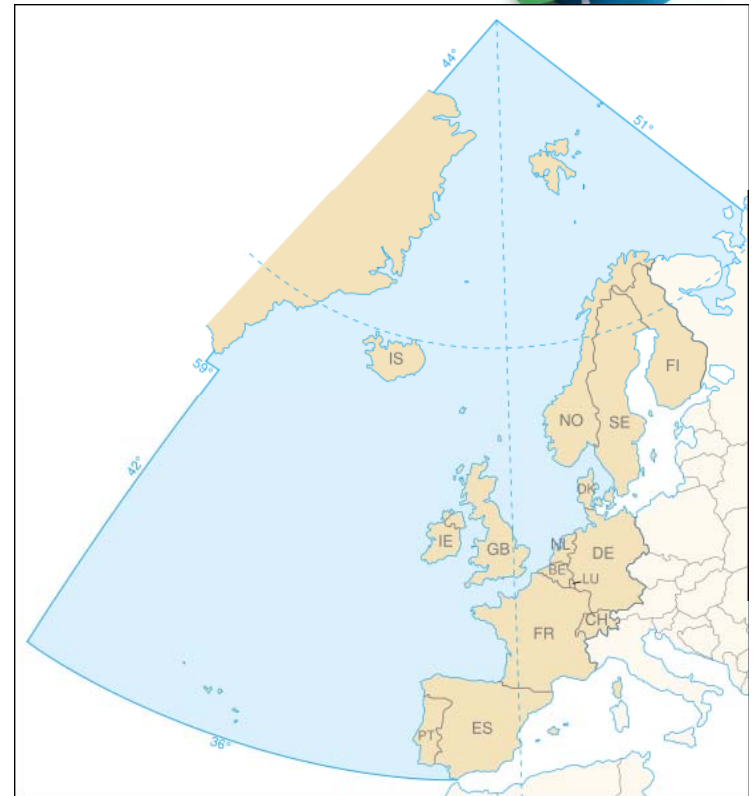
- *Assessed by LC Scientific Group*
- *2006 - Risk Assessment Framework for CO2*
- *To allow prohibited CCS Configurations - amendment adopted at 28th Consultative Meeting, 2 Nov 2006 - came into force 10 Feb 2007 to allow disposal in geological formations*
- **2007 - CO2 Specific Guidelines**
- *CO2 Transboundary amendment adopted Oct 2009*

OSPAR



- *Marine Treaty for NE Atlantic*
- *15 nations and EC*
- *Prohibited some CCS configurations*
- *Considered CCS and CO2 impacts on seas*

- *To allow prohibited CCS configurations - OSPAR amendments (to Annexes II and III) for CO2 storage adopted June 2007 - but need ratification by 7 Parties*



OSPAR Decision – requirement to use Guidelines when permitting.
OSPAR Guidelines for Risk Assessment and Management of Storage of CO2 in Geological Formations – includes the **Framework for Risk Assessment and Management (FRAM)**
Storage in water column prohibited

London and OSPAR Guidelines for Risk Assessment and Management



- **Scope** – scenarios, boundaries
- **Site selection and characterisation** – physical, geological, chemical, biological
- **Exposure assessment** – characterisation CO2 stream, leakage pathways
- **Effects assessment** – sensitivity of species, communities, habitats, other users
- **Risk characterisation** – integrates exposure and effects - environmental impact, likelihood
- **Risk management and permitting requirements** – incl. monitoring, mitigation plans

OSPAR Permit Conditions



- *Permit in accordance with OSPAR Guidelines on Risk Assessment and Management*
- *Only issue permit if full risk assessment and management process completed to satisfaction of Reg Auth.*
- *And if “will not lead to significant adverse consequences for marine environment...”*

EU CCS Directive



Enabling regulatory framework to ensure environmentally sound CCS (23 Jan 2008)

- *Follows IPCC GHG Guidelines and OSPAR*
- *Objective is permanent storage*
- *Ocean storage prohibited*
- *Permits will be required for CCS – exploration and storage*
- *Storage permit only if “no significant risk of leakage, and if no significant negative environmental or health impacts are likely to occur”*
- *Emphasis on site selection, characterisation, risk assessment,*
- ***Monitoring plan – includes to detect leakage; to detect significant adverse effects for the surrounding environment***

EU CCS Directive



- *Corrective measures plan*
- *EC has right to review*
- *CO2 stream acceptance criteria - “overwhelmingly CO2” – impurity levels based on integrity*
- *Reporting and inspections at least once a year*
- *Financial security required from operator*
- *After closure, liability transfer to regulatory authority “when evidence indicates contained for indefinite future”. EC may review. Monitoring may cease.*
- *Access to transport networks and storage, unless technical issue or lack capacity*
- *Removes barriers in other Directives – IPPC, Waste, LCPD, Water, **EIA (adds CCS)**, ELD*
- *Capture-ready in LCPD >300MW – based on IEA GHG report*

EU CCS Directive - Annexes



Annex 1 - Site characterisation

1. Data collection
2. Static Simulation
3. Dynamic simulation - security characterisation (ie performance assessment)
4. Risk assessment
 - Exposure Assessment
 - **Effects Assessment**
 - Risk Characterisation

Annex 2 – Monitoring plan

- For **baseline**, operations, post-closure
- Criteria, coverage, updating
- Non-prescriptive on techniques or timescales

EU CCS Directive



Effects Assessment

- Based on sensitivity of species, communities, habitats to potential leakage events identified
- Effects of exposure to elevated CO₂ levels in biosphere (inc soils, marine sediments, benthic waters)
- Also effects of other substances in CO₂ stream (incidental associated substances and mobilised substances)
- Range of temporal and spatial scales

EC CCS Directive Guidance Document 1 “Risk Assessment” (Draft)



Effects assessment – based on the sensitivity of particular species, communities or habitats linked to potential leakage events associated with identified risks. Where relevant it shall include effects of exposure to elevated CO₂ concentrations in the biosphere (including soils, marine sediments and benthic waters (asphyxiation; hypercapnia) and reduced pH in those environments as a consequence of leaking CO₂). It shall also include an assessment of the effects of other substances that may be present in any leaking CO₂ streams (either impurities present in the injection stream or new substances formed through storage of CO₂). These effects shall be considered at a range of temporal and spatial scales, and linked to a range of different magnitudes of leakage events.
(p39)

ETS Directive



To strengthen, expand and improve the ETS from 2013

CCS

- Can already be included in Phase II (2008-2012) by ‘opt-in’

CCS fully included from 2013

- Site and operation will need to comply with CCS Directive
- Has new monitoring and reporting guidelines

No free allocation to CCS (same as electricity)

Separate permitting of capture, transport and storage

If any leakage – surrendering of allowances

EU Monitoring



CCS Directive's monitoring – to detect leakage and impacts

ETS Directive's monitoring – to quantify leakage





EU Directives: Strategic Environmental Assessment (SEA); Environmental Impacts Assessment (EIA)

- *SEA - a structured and systematic methodology for evaluating environmental impacts of proposed policies, plans and programmes (ie public sector) for a specific location*
- *EIA – for potential environmental impacts of project activities (private sector) for a specific location*
- *Limited to lifetime of project*

What level of detail will be required?



- *Not specified – London and OSPAR may have assumed data available from literature*
- *Definition of ‘significant’ adverse effects*
 - *Uncertainty*
 - *First projects will set precedents*



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