Carbon Capture and Storage Readiness: Experiences in implementing CCS readiness in the EU and beyond

Part of workshop on CCS Post-Paris: Realising Global Ambitions

June 2016

Climate Action

Agenda

- ✓ Introduction
- ✓ Objectives
- ✓ Approach
- ✓ Progress across Europe
- ✓ International best practice
- ✓ Next steps

Introduction

- ✓ 2009 EU CCS Directive: a legal framework for the environmentally safe geological storage of (CO_2)
- ✓ 2015 Review of the CCS Directive
- ✓ Article 33: new investments are made in such a way as to facilitate substantial reductions in emissions
  - ✓ **Requires that Member States grant operating licences to combustion plants with a rated electrical output of 300MW or more only after assessment of availability of suitable storage sites, technical and economic feasibility of transport facilities and retrofit for CO_2 capture**
  - ✓ **If such assessment is positive, the competent authority has to ensure that suitable space on the installation site for the equipment necessary to capture and compress CO_2 is set aside**

Objectives of the study

- ✓ **TASK 1:** Gather and analyse information on the practical application of Article 33 of the CCS Directive in the 28 Member States since its entry into force
- ✓ **TASK 2:** Collect best practice within and outside the EU in consenting power plants and carbon intensive installations in view of a future retrofit for CCS
- ✓ **TASK 3:** Provide recommendations, which will assist:
  - ➢ **Project operators to assess the availability of storage sites and the technical and economic feasibility for CO_2 retrofit and of transport infrastructure**
  - ➢ **The competent authorities to evaluate the assessments**
  - ➢ **Project operators to prepare for future retrofitting**

The most relevant Member States

		Germany	United Kingdom	Italy	Poland	Spain	Netherlands	Czech Republic	France
Consumption of coal and gas in electricity generation	Electricity Generation (TWh)	369.38	229.69	172.85	146.79	113.3	84.76	46.05	44.48
	Consumption of Coal and Gas in electricity generation	High	High	High	Medium	Medium	Medium	Low	Low
CO_2 storage capacity	CO_2 storage capacity (Mt)	17,080	14,400	6,550	2,940	14,179	2,340	853	8,692
	CO_2 storage capacity	High	High	Medium	Low	High	Low	High	Medium
CCS projects development	Large-scale CCS projects (number)	0	3	0	0	0	1	0	0
	CCS notable projects (number)	3	4	1	0	2	2	0	2
	CCS projects development	High	High	Low	Low	Medium	High	Low	Medium
CO_2 storage feasibility due to regulation		Low	High	Medium	Low	High	High	Low	High
CCS public awareness		Medium	Medium	Low	Low	Low	High	Low	Low
CCS public acceptance		Low	Medium	Medium	Medium	Medium	Low	Medium	Low

Licenses / permits issued by MSs

Member State	Number of operating licences/permits issued for combustion power plants covered by Article 33 of the CCS Directive
Czech Republic	One operating permit has been issued by the CA and considered in this analysis.
Belgium	One operating license has been granted to a combustion plant of 920MWe in the Flemish region.
Estonia	Estonia has issued one operating license to a combustion plant of up to 300 MWe.
Poland	10 power plants have applied for permits. Only three have been granted building permits.
Romania	Five power plants have been granted consent. For one plant the authorisation is pending.
United Kingdom	12 power plants have been granted consent (licenses). Out of these, two have been granted varied consent (need to fulfil specific requirements before full consent is given).

Current practice for Competent Authorities

- Across the EU, the UK has the most practical experience of applying of Article 33 of the CCS Directive. Examples from other MSs (including Poland and Czech Republic) are included where appropriate.
- Relevant lessons:
  - Detailed Carbon Capture Readiness (CCR) guidance material
  - Regular monitoring reports
  - Sharing information on storage options
  - Criteria for consent with changing circumstances
  - Discounted cash flow approach for economic assessment

Challenges for Competent Authorities

- The main challenges for Competent Authorities identified include:
  - Restricted availability of information on the practical application of the CCS technology due to limited practical experience
  - Lack of capacity by the CA to effectively evaluate applications
  - Outdated sources for guidance material and the basis for assumptions
  - Exclusion of key financial aspects that can improve the cost-effectiveness of CCS projects
  - Failure to consider hubs and clusters for CO_2 transport

Current practice and challenges for project developers

- Information was gathered from confidential interviews and questionnaires with three power plant developers:
  - Limited experience and confidence in applying CCS technology
  - Difficulty with demonstrating economic feasibility
  - Issue with intellectual property
  - Unintended adverse consequences

International best practice: Identification of relevant countries

Country	CCS project development			National storage readiness	Inherent CCS interest	CCS policy, legal and regulatory development		Total score
	Large-scale CCS projects (number)	Notable CCS projects (number)	CCS project development			Constituent Policy Index	Legal and regulatory indicator	
USA	12	17	High	High	High	High	High	10
Canada	6	4	High	High	High	High	High	10
Australia	3	5	High	Medium	Medium	Medium	High	7
China	9	9	High	Medium	High	Medium	Low	6
Norway	2	0	High	High	Low	Medium	Medium	6
South Korea	2	2	High	Low	Medium	Medium	Medium	5
Japan	0	7	Medium	Low	Medium	Medium	Medium	4
Brazil	1	1	Medium	High	Medium	Low	Low	4
Mexico	0	0	Low	Low	Medium	Low	Medium	2
India	0	1	Low	Low	High	Low	Low	2
Indonesia	0	0	Low	Low	High	Low	Low	2
Russia	0	0	Low	Low	High	Low	Low	2
Saudi Arabia	1	0	Medium	Medium	Low	Low	Low	2
UAE	1	0	Medium	Medium	Low	Low	Low	2
New Zealand	0	0	Low	Low	Low	Low	Medium	1
South Africa	0	0	Low	Low	Medium	Low	Low	1

Relevant legislation outside the EU

Country	Relevant legislation
Canada	Temporary exemptions included in 2012 Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations; Alberta's Regulatory Framework Assessment (RFA); and regulatory policy framework for CCS in British Columbia
United States	Environmental Protection Agency – Final Carbon Pollution Standards for New, Modified and Reconstructed Power Plants; Clean Power Plan
Australia	CCS readiness standard proposed in 2010; Queensland's CCSR Policy since; and the Bluewaters Power Plant in Western Australia
China	Asian Development Bank Roadmap For Carbon Capture And Storage Demonstration And Deployment In The People's Republic Of China
Norway	Pollution and Waste Act; Petroleum Act; and the Continental Shelf Act; and progress on "storage readiness"

Key conclusions

- Increasing storage readiness in the EU
- Identifying locations of potential CO_2 capture and storage clusters and feasible CO_2 pipeline routes within the EU
- Requiring increasing levels of CCS readiness, in the context of Article 33
- Requiring regular progress reports as part of Article 33 compliance
- Periodically reviewing the commercial viability of CCS in the EU
- Extending CCS readiness requirements to emissions intensive industry
- Examining CO_2 utilisation opportunities and government incentives

European Commission

Thanks for listening

Climate Action

elementenergy

Maria Velkova
European Commission
Maria.VELKOVA@ec.europa.eu

Neal Mehta
ICF International
Neal.Mehta@icfi.com

Emrah Durusut
Element Energy
Emrah.Durusut@element-energy.co.uk

Climate Action

The study is being prepared for the European Commission under SPECIFIC CONTRACT No 340201/2015/720381/SER/CLIMA.C.1, implementing Framework Contract CLIMA.A4/FRA/2011/0027.

Once finalised, it will be published on the website of the EU Bookshop

For further information on the CCS Directive

http://ec.europa.eu/clima/policies/lowcarbon/ccs/directive/index_en.htm

CLIMA-CCS-DIRECTIVE@ec.europa.eu

Climate Action