IEAGHG Information Paper 2017-IP64; CSLF Report on Practical Regulations and Permitting Process for Geological CO_2 Storage

The Carbon Sequestration Leadership Forum (CSLF) is a Ministerial-level international climate change initiative with the aim of developing cost-effective carbon capture and storage (CCS) technologies. It also promotes awareness and champions legal, regulatory, financial, and institutional frameworks conducive to CCS technologies. CSLF meets regularly to discuss and agree initiatives that meets these aims. It has also instigated a series of Task Force initiatives to investigate and report on specific issues. The latest Ministerial meeting took place in Abu Dhabi, United Arab Emirates between December 3rd – 7th, 2017. The Policy Group within the CSLF met at this latest meeting and reported on a recently produced Task Force paper on CO_2 storage regulation.

CCS pilot and demonstration projects have been instigated around the world, providing valuable experience in the implementation of the technology. Regulatory authorities in different jurisdictions as well as developers have also been on a learning curve. Consequently CSLF decided to prepare a report for their Policy Group on the practicality of regulations on planning procedures, development and the operation of CCS projects. The report is comprised of the regulatory process from seven project case studies and the lessons that can be drawn from them. Its aim is to provide a guide for regulatory authorities who will be responsible for new CCS projects or reviews of existing operations. The content builds from initiatives by other organisations to establish a CCS regulatory framework.

The seven case studies have been selected to represent different jurisdictions, regions, storage type, scale and project status. The table below summaries the diversity of these case studies. They include: Sleipner; ROAD and P18-4; and the former Peterhead CCS project from the North Sea. The latter two are depleted gas fields that have yet to progress to development, although detailed planning and environmental impact assessments were prepared and submitted. Sleipner has benefited from over 20 years' of operation. Two operational deep saline formation demonstration projects, Quest and the Illinois Basin Decatur Project (IBDP), were selected. These sites represent two different jurisdictions from North America. In contrast two much smaller active pilot projects, Tomakomai and Otway, were selected from the Asia Pacific region.

(Continues overleaf)

Region	Project	Storage Type		Scale	Status
		Outline of Case Study			
Europe	Sleipner CCS Project	Saline Formation	Offshore	Large	Operational
		Sleipner was required to re-apply for a CO_2 storage permit due to the replacement of storage regulations. A number of challenges in the re-permitting and new regulations, such as financial security, were resolved.			
	ROAD and P18-4 CO_2 Storage	Depleted Gas Field	Offshore	Large	Cancelled
		ROAD began its planning before the CO_2 storage regulation was finalized. They resolved a number of challenges such as financial security in permitting through close communication with the regulatory authority. Their application was found to be in compliance with the London Protocol requirements in general.			
	Former Peterhead CCS project	Depleted Gas Field	Offshore	Large	Cancelled
		Peterhead commenced communications with the regulatory authority at a time of its precedent project. The successful outcomes include a reasonably flexible way of determining the length of the closure period. They found a need to actively reach out to different teams within the regulatory authority and noted the benefits of independent external review on their permit application.			
North America	Quest CCS Facility	Saline Formation	Onshore	Large	Operational
		The Quest operator was involved in the establishment of the regulatory framework and also a comprehensive review of the framework afterward. The monitoring plan for the project is being optimized and streamlined as the project progresses thanks to its high adaptability.			
	Illinois Basin – Decatur Project	Saline Formation	Onshore	Medium	Site Closure
		Decatur was planned while the new CO_2 storage regulation was evolving. The developer needed to re-apply for a CO_2 storage permit. This resulted in prolonged permitting process, changes in its monitoring plan, and cost increase for monitoring.			

Region	Project	Storage Type		Scale	Status
		Outline of Case Study			
Asia Pacific	Tomakomai CCS Demonstration Project	Saline Formation	Offshore	Medium	Operational
		Tomakomai had to suspend CO_2 injection in its offshore site due to natural fluctuation in seawater parameters larger than conservative threshold. Injection was resumed after the revision of its monitoring plan to allow for more comprehensive judgement when irregularity is detected.			
	CO2CRC Otway Research Facility	Depleted Gas Field / Saline Formation	Onshore	Small	Operational
		Otway pilot has had three phases and has gone through different CCS regulatory environments. CO_2 storage regulation came into force during the second phase. Since then, the project has worked under exemption as an R&D project, but is currently explore how R&D injection fits into the regulation.			

In total 40 lessons have been compiled from these seven case studies which has enabled the authors to draw out three key areas for making storage regulations and permit applications practical.

The first of these *Findings for Making CO_2 Storage Regulations Practical* include*:*

1. CO_2 storage regulations should be established under the principle of promotion of safe CCS. In the establishment of the regulations, the timely involvement of industry is important.

2. Existing CO_2 storage regulations can be improved through a review by diversified stakeholders.

3. CO_2 storage regulations should be flexible enough for various CCS projects with different characteristics to move forward.

4. New or amended CO_2 storage regulations should be flexible with transitional provisions where necessary for continuation of existing valid projects if any.

5. The definitions of key terms should be made with consideration of technical constraints and should have consistency with those in other related laws and regulations.

The second area covers *Findings for Effective CO_2 Storage Permitting Process* which proposes:

6. CO_2 storage regulations should ideally be in place before a planning of the first CO_2 storage project starts in order to promote the deployment of CCS projects in a country.

7. A permitting process should have adequate time and resources allocated and be appropriate to the scale and the likely impact from the project.

8. For efficient permit award, close communication is essential between a permit applicant and a regulatory authority and should be initiated at an early stage. Such communications can be expedited by diversified members and fixed contact points.

9. A regulatory authority and a permit applicant should identify other regulatory authorities who should be involved in a permitting process and commence communicate with them early.

10. It would be helpful if a regulatory authority can recognize that key permit application documents and plans will mature and should be resubmitted when appropriate.

11. A regulatory authority and a permit applicant in a national jurisdiction that is a contacting party to the 1996 London Protocol should make sure that permit application documents for offshore CO_2 storage are in compliance with the Protocol Requirements

The third category *Findings for Making Permit Application Documents and Plans Pragmatic* proposes:

12. An independent external review may be useful to make permit application documents better and streamlined.

13. Negotiations between a permit applicant and a regulatory authority to address critical issues in permitting should be initiated as early as possible. These issues may include financial responsibilities of an operator and monitoring plans.

14. Financial responsibilities of an operator should be reasonable and pragmatic. Issues to be addressed may include the length of the closure period[1]; financial contribution from an operator for a regulatory authority's responsibility during the post-closure period[2]; and responsibility to compensate unintended CO_2 leakage by purchasing emission credits.

15. Monitoring plans for CO_2 storage should be risk-based and adaptive; be pragmatic when responding to an irregularity or a potential irregularity; and use monitoring parameters that are well understood and have sufficient baseline data for critical judgements.

These findings should provide useful information for regulatory authorities to develop or review existing regulations for geological CO_2 storage and amend them if necessary. A good example of this approach is illustrated from the recent experience of the Tomakomai project. A routine survey revealed that CO_2 levels had exceeded pre-determined threshold limits and the CO_2 injection was temporarily suspended. However, re-evaulation revealed that the threshold limits did not accurately reflect the natural seasonal range in CO_2 levels. Now that there is a better understanding of the natural fluctuation in CO_2, and no evidence of subsurface leakage, the authorities have allowed the injection programme to resume.

The background and recommendations should help regulatory authorities and future CCS project proponents to apply for a geological CO_2 storage permit. Moreover, experience from the next generation of CCS projects should be examined in the light of the projects highlighted in this report from initial inception to full-scale operation. Many of the issues, including operator's finance responsibilities, may be specific to a first wave of CCS projects which has limited or no precedent in future CCS projects.

The CSLF Regulation Task Force team which prepared the report was led by Japan (Ryozo Tanaka of RITE). IEAGHG was a member of the Task Force team, and contributed work such as the review of the ROAD project's permits (IEAGHG 2016/TR4), updates on the London Protocol, and monitoring discussions from IEAGHG Monitoring Network meetings.

For further detail the full CSLF report can be found at:
https://www.cslforum.org/cslf/sites/default/files/documents/7thMinUAE2017/7thMinAbuDhabi17-PG-RegulationTaskForceReport.pdf

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