Managing risk and uncertainty of CO₂ storage – and associated liabilities

IEA – GCCSI Joint Liability Workshop

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We classify, certify, verify and test against regulatory requirements, rules, standards and recommended practices
We develop new standards and recommended practices
We qualify new technologies and operational concepts
We give expert advice to enhance sustainable business performance
Our purpose – and ambition for CCS

Be preferred independent party

- Support projects with demonstration (and communication) of compliance with regulations/industry best practice

Contribute to trust and transparency

- Publish standards to support efficient and robust decision making processes
- Guide development of harmonized regulatory frameworks for CCS
- Credible verification of CCS projects and emissions reductions from CCS

Safeguard life, property and the environment
Risk – Effect of uncertainty on project objectives

- Task: Set-up and manage a CCS project to the point of FID.

- Which uncertainties will keep you awake at night?
Key uncertainties for CCS project managers

- Long term CO₂ Price – ETS, Tax, Feed in tariffs, etc.
- Regulations – Clear, transparent and fair game
- Policies (and governments) – Is CCS a priority?
- Long-term liabilities and responsibilities
  – If or ‘how and when’ handover occurs
- Reputation:
  – Not doing anything (CCS)
  – Doing it in my backyard
  – #%&*ing up (and letting it hit the fan)
- Allegations – They did it!
  – Monitoring to detect leakage, seismicity
  – Monitoring and communication protocols to refute allegations
Managing uncertainty through project life

![Graph showing the number of wells drilled vs. Oil Initially in Place (OIIP) during different phases of a project life cycle: Exploration, Appraisal, Early Field Development, and Late Field Development. The graph illustrates the reduction in uncertainty as the project progresses, with Seismic surveys used for data collection. The data are courtesy of Phillip Ringrose, Statoil.]
**Risk management – again, and again, and again ...**

- Managing risk is an iterative process of repeated assessments, analyses and data collection allowing project proponents to react to the expected and the unexpected.
- Risk is never zero, but should be managed within levels acceptable to all stakeholders.
- Residual risk prior to handover of liability (and responsibility), or simply walking away, may need to be close to zero based on a ‘nothing more needs to be done’ attitude.
- Still, some stakeholders may claim: We don’t have enough evidence, what if, what if?
Reflections from Alberta PCSF study

- Post closure risk (5-50 after end of injection) should be informed by project experience – Not by other projects.

- Any liabilities post closure will be tied to potential for leakage (observed or not refuted).

- Quantification of leakage risk, in absence of any prior indications of leakage, is challenging: $P<<<1$.

- Mitigation (to stop leak) and possible remediation cost are the big cost elements.
Concluding points

- There are risks and uncertainties in all projects.
- No two projects are identical – tailored approaches are needed.
- Unexpected circumstances are to be expected!
  - We will never know ‘exactly’ what the subsurface looks like, but managing subsurface uncertainties is part of the core business of O&G companies. It is how they earn their bucks.
- The level of risk we should be willing to accept (of doing CCS) should be weighed against the risk of not giving CCS a fair game.
- Burdenous requirements to long term post-injection monitoring, and the lack of an effective CO2 price are the two biggest obstacles to creating a stronger momentum for CCS deployment.