Adaptive Management for CCS

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Overview

- International Risk Governance Council on CCS
- Full-scale project deployment for learning
- Moving to a commercial scale
- Creating an adaptive management structure
- Long term care
- Conclusions and outputs

International Risk Governance Council CCS Project

- Commissioned 11 essays on regulation from CCS
  - BP
  - Bellona/Statoil
  - RFF/IVL/CICERO
  - UK Energy Research
  - Australia GHG Office
  - Swiss-Re
  - CMU
  - MIT
  - Stanford
  - NRDC
  - PIK
- Workshop with authors and invited participants to discuss a regulatory framework for CCS

What we all agreed upon…

- CCS can play an important role
  - Benefits > Liabilities
- Programmatic goals
  - Large volumes, stored long time, 1000's of years
  - "Maximize CO2 avoided, minimize CO2 sequestered"
- Siting is crucial
- Some credit for sequestered CO2
  - Within a trading scheme or otherwise
  - Fungible credits
- Long term care… all agree public assumption of liability is necessary in the long term
  - When? (1 year to 30)
  - Based upon what? (performance, time limit, $$$)

Regulation must provide

- Clarity
- Framework for
  - Investment
  - Operation
  - Responsibility
- Stability
- Flexibility and adaptability to incorporate new scientific information

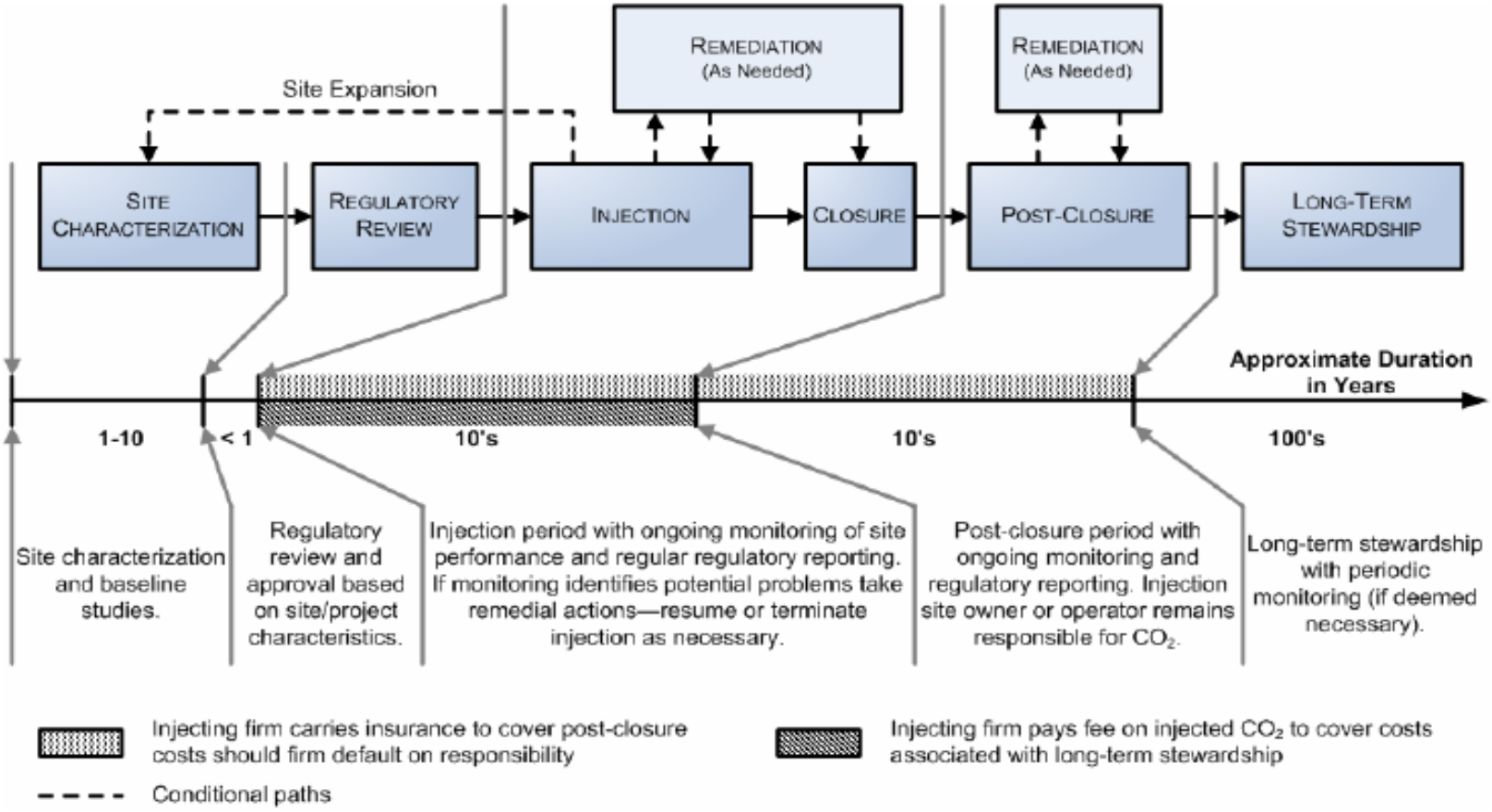

Figure 3. Life-cycle phases of a GS project with an approximate timeline and description of the regulatory processes and activities involved at each stage

Rubin et al. 2007

The good news

- Most risks are manageable… and have already been managed in other contexts
- Insurance industry comfort with potential health, safety and environmental risks
- Just climate risk is unfamiliar

Early Deployment Now

- Limited number of large early projects now under existing regulations to learn
  - Capture reliability
  - Geologic site performance
  - Adequacy of models to predict reservoir performance at scale
  - MMV methodology, detection limits
  - Long-term liability
  - Industrial organization

Transition to Commercial Deployment

- Boutique regulations are fine for first projects, but more stability and predictability is needed for
  - Operators, financial interests, insurance, regulators, and public
- Regulations must provide predictability, accountability, and be adaptable
- Debate on whether this should be a formal two-stage process or more gradual transition

Adaptive Management of Commercial CCS

- Goal:
  - Clear expectations for all parties
  - Incorporate emerging site information and evolving risk management strategy
- Challenge:
  - Develop a regulatory framework that is both predictable, yet able to incorporate new information

Adaptive management for long-term care

- Operational period with regular, scheduled ‘true up’ performance reviews
  - Performance-based decision nodes would govern management for next period
  - Operator has control as to how to manage project
  - Regulatory procedures established beforehand
  - Financial community able to judge risk and performance
  - Public assurance that project is being actively managed
- At point of transfer to public, high level of confidence in site performance and funds for long-term care established (no unfunded public mandate…)

Adaptive management, long-term care and climate hedging

- Example:
  - Operator: Payment into a fund that covers both site closure and long-term care
  - Initial amount is set by site risk profile and past performance
  - Periodic ‘true up’ would raise or lower payments into fund and be based upon operational data and site performance
- Advantages
  - Predictable, manageable by operator and financial community
  - “Moral hazard” of bonding avoided
  - Good site selection and responsible management encouraged

Public Trust, Public Acceptance, Public Confidence

- Asymmetric information
  - Public access to information
  - Data storage
  - Transparency
  - High levels of performance…leakage and public performance
- Regulation and trust in regulator key
  - Risk contagion

Public Assumption of Responsibility (and public perception risk…)

- Concern: Requiring public assumption of liability too early may undermine public confidence
  - General sentiment: “if it is as safe as you say, why do you want the government to take responsibility?”

Conclusions

- Data from full-scale operations necessary to demonstrate CCS performance to public, insurance and financial industries and regulators
- Adaptive management approach necessary for managing geologic uncertainties and ensuring long-term care
- Industrial organization will shape regulatory needs

Fin

- Project Outputs
  - Workshop report end of summer
  - General article
  - Essays available on IRGC website www.irgc.org

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