TETRA TECH RPS ENERGY | TRAINING

N585: CO2 Containment and Storage Monitoring

Instructor(s): Jim Lorsong

Format and Duration

Classroom - 2 Days
Virtual - 3 Sessions

Summary

The course considers physical mechanisms of stabilisation of injected CO2, as well as potential geological migration pathways within or outside of the storage complex. Identification and systematic assessment of the relative likelihood of CO2 migration along various pathways is discussed, including seal capacity, spill points, fault seal and conductivity, induced fault slip or fracturing, displacement of reservoir fluids and pressure interference. Implications for review of potential impacts (e.g., the "area of review") are discussed. The second part considers design of an integrated, cost-effective monitoring programme to address site-specific subsurface and well CO2 containment risks, including surveillance of reservoir performance, well integrity, potential subsurface CO2 migration and pooling in secondary reservoirs, as well as surface releases. Technologies for monitoring in wells and remotely via surface surveys are discussed, with examples of performance in existing CO2 storage projects. The course concludes with technology selection and strategies for cost-effective storage monitoring.

Learning Outcomes

Participants will learn to:

1. Identify and systematically assess of the relative likelihood of CO2 migration along various pathways.
2. Consider seal capacity, spill points, fault seal and conductivity, induced fault slip or fracturing, displacement of reservoir fluids and pressure interference.
3. Consider factors in the design of an integrated, cost-effective monitoring programme.
4. Be cognisant of containment risks including reservoir performance, migration and well integrity.
5. Consider the technologies for monitoring CO2 storage sites.

Training Method

This is a virtual interactive classroom course comprising presentations, discussions and case studies.

Who Should Attend

This course is aimed at subsurface oil and gas professionals who are familiar with CCS and would like to develop their skills for projects in CO2 storage and monitoring.

Course Content

Risk assessment of subsurface CO2 containment

- CO2 storage mechanisms – residual trapping, dissolution, mineralisation, buoyant (capillary) trapping
- Storage complex and CO2 migration pathways
- Seal capacity
- Spill points
- Fault seal analysis

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- Fault conductivity and transmissibility
- Induced fault slip
- Induced fractures
- Secondary reservoirs
- Surface leakage
- Subsurface pressure interference and contamination
- Reservoir pressure and “area of review”
- Integrated risk management

Monitoring CO2 storage

- Monitoring philosophy
- CO2 containment risks – natural and engineered structures
- Forecasting and iterative history-matching storage performance – CO2 plume and reservoir pressure
- Monitoring reservoir performance – plume and pressure detection
- Monitoring reservoir performance – injectivity, chemistry, seismicity
- Monitoring active & legacy well integrity
- Detection of subsurface CO2 migration and contamination – secondary reservoirs, shallow aquifers
- Surface CO2 detection overview
- Technologies - well monitoring – overview (CO2 detection and integrity), temperature/pressure, cased-hole logging, fluid sampling, well testing, flow profiling, optical fibres (DTS & DAS), gravity, EM
- Technologies - subsurface remote monitoring – overview (direct & indirect detection), time-lapse seismic, VSP, EM, gravity, surface and well microseismic
- Technologies – surface monitoring – overview (direct & indirect detection), time-lapse surveys of ground water, soil gas, ecological indicators, shallow resistivity (AEM), INSAR, high-concentration leak detection
- New technologies
- Monitoring strategy – areal and stratigraphic coverage, redundancy for key containment risks, technology selection & synergy, baselines, survey frequency, tiered and adaptive strategies
- Technology selection and cost-effectiveness
- Post-injection monitoring