D538: Repurposing Subsurface Petroleum Skills for CCUS

Instructor(s): Alex Bump / Seyyed Hossieni / Katherine Romanak

3 Days	Competence Level: Skilled
Virtual Course	
Computer Usage	

Summary

Business Impact: Carbon Capture and Storage (CCS) is a **key means of mitigating climate change** and is the **only option currently available to decarbonize industries** such as cement, steel, petrochemicals and LNG. As opportunities in oil and gas decline, they are growing in CCS. Human activities now generate about 35Gt of CO2 (1 gigatonne=1 billion tonnes) per year. At ~$50/ton for sequestration, the **potential opportunity is enormous, both in new business revenue and in repurposing old assets and delaying decommissioning costs. Mitigation of the worst effects of climate change will require storing billions of tons per year, with an industry to match.** In the US alone, the National Petroleum Council estimates that CCS could employ ~230,000 people, similar to the current oil industry.

This course empowers attendees to develop and apply their skills to the growing industry of Carbon Capture Utilization and Storage (CCUS). Attendees will be guided through the lifecycle of a CCUS project with an emphasis on key concepts, processes, and workflows of the CCUS industry. Focus will be on developing the geoscience and engineering skills needed to progress a project.

Learning Outcomes

Participants will learn to:

1. Describe what CCUS is, what it does, and why it is important.
2. Outline the regulatory, policy, and financial drivers and constraints for CCUS.
3. Define the subsurface requirements for a successful storage project, including similarities and differences with oil and gas exploration.
4. Design a workflow and perform the key tasks for defining, developing and permitting a CCUS project, including site selection, characterization, risk assessment, and monitoring for operational and post-operational phases.
5. Estimate CO2 storage capacity in saline aquifers at reservoir and basin-scales through Dr. Hosseini's *EASiTool*, an enhanced analytical simulation tool.

Duration and Training Method

A virtual interactive classroom course divided into five 4-hour sessions. Course delivery will include presentations by the instructors, discussions, quizzes and interactive exercises.

Who Should Attend

This course is aimed at subsurface oil and gas professionals and first-level leaders who would like to develop their skills for the emerging industry of carbon capture and geologic storage (CCUS). It is recommended specifically for:

- Geologists, geophysicists, reservoir engineers and other technical subsurface O&G professionals interested in CCUS
- First-level leaders and others tasked with developing and/or assuring geologic storage for CCUS

D538: Repurposing Subsurface Petroleum Skills for CCUS

Instructor(s): Alex Bump / Seyyed Hossieni / Katherine Romanak

3 Days	Competence Level: Skilled
Virtual Course	
Computer Usage	

projects
- Recent graduates in petroleum geoscience and reservoir engineering who want to develop skills in CCUS

Prerequisites and Linking Courses

None but course assumes competence in petroleum geology and engineering.

Course Content

Overview of CCUS

- Climate change and the role of CCUS
- What is CCUS?
  - Basics of capture, transport, and storage.
  - Where are we now and where are we going? – history of CCUS, current global projects, public perception
  - Basic concepts of permanence, migration pathways, and project monitoring
- Regulation and policy overview
- Project lifecycle - Characterization and baselines, risk assessment, injection and post-injection
- Business drivers
  - Tax incentives, clean fuel standards, penalties/carbon take-back obligation
  - Costs
- Permitting overview—key considerations

Subsurface Characterization

- Comparison with petroleum geoscience
- Pressure
  - CO2 density and storage window
  - Area of Review (AoR) and pressure propagation
- Trapping mechanisms
- Play elements
  - Reservoir: injectivity, capacity, depositional systems
  - Confining systems: seals, baffles and faults
- Risks: faults, legacy wells and other key risks
- Site screening
- Applied geophysics
  - Seismic characterization and monitoring
  - Legacy data and new acquisition
- Well design and location

Capacity Estimation and Modeling

- Capacity estimation (static and dynamic)

- Geomechanics
  - Pressure propagation
  - Frac strength
  - Fault reactivation
- Dynamic simulations (visualizations, considerations, software available)
  - Case study: Cranfield experience—plume breakthrough and fundamentals of fluid flow
  - EasiTool (input and outputs) (All attendees must download and install EasiTool prior to the course)
- Area of Review (AoR) calculation

Risk, Safety and Shallow Monitoring

- The Importance of environmental monitoring
- Safety and risk
- Environmental impact and underground sources of drinking water, soil, and the biosphere
- Public perception
- Permitting
- Shallow-focused monitoring
- Plume monitoring
- Regulations versus technology

Project Development, Permitting and Public Acceptance

- Successes and failures to date, look ahead
  - Key considerations
- Designing and permitting a project