Transition Skills: From Oil and Gas to Geothermal (G573)

Tutor(s)

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Overview

This course will offer geoscientists an understanding of how they can use and adapt their expertise gained in the oil and gas industry to the growing geothermal industry. Participants will be introduced to the fundamentals of a variety of geothermal system styles and be guided through the exploration and development of a project, focusing on subsurface workflows based on those used for oil and gas. The course is intended as an introduction to the entire lifecycle of a geothermal resource, covering aspects of geoscience and some engineering.

Duration and Logistics

Classroom version: A 3-day in-person classroom course comprising a mixture of lectures, exercises and discussion with a focus on geothermal project case studies and examples.

Virtual version: Five 3.5-hour interactive online sessions presented over five days. Digital course notes and exercise materials will be distributed to participants before the course.

Level and Audience

Fundamental. This course is designed specifically for geoscientists wanting to transition from the oil and gas industry to the geothermal sector.

Objectives

You will learn to:

1. Describe the fundamentals of geothermal energy and how it is harnessed and used.
2. Understand the key subsurface characteristics of geothermal resources and reservoirs.
3. Understand what exploration tools (seismic, potential fields, geochemistry), exploration data (bottom hole temperatures, gradient surveys) and exploration approaches (basin modelling, play-based exploration) are used in geothermal exploration, which ones are in common with oil and gas, and how their uses differ.
4. Define the subsurface geoscience requirements for a geothermal project, including the key similarities and differences with an oil and gas project.
5. Appreciate the data types and subsurface workflows involved in a geothermal project.
6. Examine the key project risks and uncertainties in developing geothermal resources and how they are mitigated.

Course Content

Course Details

The course will provide participants with an understanding of how geothermal systems work and how their present subsurface geoscience skills can be utilized in geothermal projects. Importantly, the course will also outline what new skills (‘upskilling’) they need to acquire. Some of this upskilling will come from the course, but some must come from deeper-dive, subject-specific courses.

Key themes:

- Fundamentals of geothermal energy (what it is, what are its uses and how we classify geothermal systems)
- Global industry perspective (where does the industry operate, what are the job roles, where is the future growth and what are the challenges)
- The business basics – techno-economic estimation and supply chain
- Geothermal resource characterization – temperature and geologic settings
- Geothermal exploration – the tools, data, software and workflows
- Geothermal production – engineering, drilling, well design and technologies
- Case studies and project examplesLunch each day will constitute an informal networking opportunity. Subject to their availability, there will be guest speakers (remote or in-person) from established firms, startups and/or research organizations, who will discuss what they are doing and what they are looking for from their staff.

Day 1: Fundamentals of geothermal

Lectures

- Thermodynamics and fluid flow
- Geothermal theory and styles
- Geothermal systems and how to find them (geology, geophysics, geochemistry, rock mechanics), including applying an adapted Play Fairway Analysis approach

Exercises

- Using the online Heat-In-Place Estimation Tool, calculate the overall geothermal potential of a given area.

Day 2: Surface and subsurface expressions

Lectures

- Exploration and production tools, including well design and pumping, reservoir properties and modelling, power plants, heat exchangers, scaling and corrosion
- Case studies for several existing geothermal projects (with guest presenters who are experts in the cases)

Exercises

- Using the GEOPHIRES techno-economic modelling tool, explore alternative geothermal scenarios of a particular project area.

Day 3: Commercial and legal considerations

Lectures

- Regulations, power sales, thermal (direct use) sales, holistic and integrated developments, carbon credits and politics
- Environmental and societal impacts / responses (environmental impacts, challenges and motivation for community geo-exchange projects)
- Hurdles and challenges to develop an industry in Texas (unique opportunities, challenges to widespread adoption, storage and hybrid systems)

Exercises

- Using the NREL GEOREPORT and RAPID Toolkit, explore the funding maturity of a prospect.