Contribution ID: **87** Type: **Oral**

The Value of Underground Field Laboratories for Advancing Geothermal Energy

Thursday, May 16, 2024 9:00 AM (30 minutes)

As we seek to meet global decarbonization goals there is an urgent need to reduce greenhouse gas emissions by transitioning to clean sources of energy and increasing total energy efficiency. The crystalline rocks that make up the primary constituents of the earth's continental crust have a high specific heat, making them efficient reservoirs for storing thermal energy. Where these rocks are naturally heated by the earth's deep subsurface these rock formations form a vast and mostly untapped source of heat that can be harnessed in enhanced geothermal systems (EGS) for low-emission, always-on energy. It is estimated that through improvements in technology geothermal energy could supply 60 gigawatts of electricity to the US grid, which amounts to 8.5% of all electricity generation and emissions reductions equivalent to removal of 6 million cars per year. Lower temperature resources could supply heating and cooling to 28 million households over this same time frame. Where these rocks are not naturally heated, they have the potential to store large quantities of thermal energy seasonally. This holds the potential to significantly reduce and decarbonize roughly half of global energy consumption that is used for heating and cooling. The easily accessible highly stressed crystalline rocks and the supporting experimental infrastructure at the Sanford Underground Research Facility make it a particularly attractive location to test and advance the technology to help realize the full potential of geothermal energy. The Development, Monitoring, and Control of Fracture Thermal Energy Storage in Crystalline Rock Formations (DEMO-FTES) project is an international collaboration seeking to demonstrate the ability to efficiently store and retrieve thermal energy seasonally. The Center for Understanding Subsurface Signals and Permeability (CUSSP) is a DOE Energy Earthshot Research Center seeking to advance the scientific understanding of the mechanisms controlling fracture network permeability for EGS and detecting changes by remote geophysical imaging. Both projects have sought out the Yates amphibolite formation on the 4100 level of SURF to conduct experiments to advance geothermal technology. Tests at underground facilities in sedimentary formations were a crucial part of the technological developments that enabled the unlocking of US unconventional petroleum reserves. It is envisioned that the experiments conducted by the DEMO-FTES and CUSSP projects can have a similar catalyzing role in unlocking the vast potential of geothermal energy.

Primary authors: Dr BURGHARDT, Jeffrey (Pacific Northwest National Laboratory); Dr ROSSO, Kevin (Pacific Northwest National Laboratory)

Presenter: Dr BURGHARDT, Jeffrey (Pacific Northwest National Laboratory)

Session Classification: Plenary: Advanced Materials, Geology, Advanced Data Analysis

Track Classification: Geology