Novel Hydraulic Fracture Characterization at Utah FORGE Provides New Insights on Completion and Stimulation Effectiveness

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Christopher N. Fredd is a Founding Partner of Blue Angel Energy and serves as Stimulation Technical Director for RESMAN Energy Technology. The topic is "*Novel Hydraulic Fracture Characterization at Utah FORGE Provides New Insights on Completion and Stimulation Effectiveness*". His seminar will be at 9:00 a.m. Central time on Thursday, July 24, 2025.

Abstract

The Utah FORGE project, sponsored by the U.S. Department of Energy, serves as a demonstration field laboratory for advancing technologies that enable the creation, characterization, and long-term sustainability of renewable Enhanced Geothermal Systems (EGS). The project employs multistage hydraulic fracturing to create flow path connections between injection and production wells and evaluates the impact of various completion and stimulation design parameters on EGS performance.

As part of the system characterization, unique chemical tracers were injected during each of the eight fracturing stages on the injection well, and additional tracer pulses were injected during circulation tests. This field case study presents findings from advanced tracer interpretation, including insights derived from quantitative production logs, estimates

of fracture surface area (reservoir contact), and fracture flow path characterization. These answer products enabled the estimation of economic life for each treatment design along the wellbore.

The analysis demonstrates the significance of fracture flow path connections over time based on the response of quantitative production logs to dynamic well operations. Hydraulic fracture conductivity and effective porosity were identified as key drivers of stage-level performance.

Results were derived from tracer responses and treatment data, and corroborated by independent surveillance techniques, including microseismic monitoring, fiber-optic monitoring, and mechanical production logging. The findings offer new insights into flow path characteristics and inform the optimization of completion and stimulation strategies for EGS applications. The methodology and interpretations are also broadly applicable to tight and unconventional hydraulically fractured reservoirs.

Biography

Christopher N. Fredd is a Founding Partner of Blue Angel Energy and serves as Stimulation Technical Director for RESMAN Energy Technology, bringing over 25 years of experience in stimulation, completions, and technology integration across the oil and gas sector. He currently leads innovative tracer interpretation for multistage fracture characterization; a methodology deployed in unconventional plays and at the Utah FORGE enhanced geothermal systems (EGS) project. Chris also served on the Task Force for completions and stimulation in the GEODE (Geothermal Energy from Oil and Gas Demonstrated Engineering) initiative. Previously, he held various senior technology leadership positions at SLB, including Technology Center Director and Global Business Development Manager. Chris earned a Ph.D. in chemical engineering from the University of Michigan and holds more than 30 granted patents and 40 publications.