

4.1.5 Demonstration of an Enhanced Geothermal System at the Northwest Geysers Geothermal Field, California

Presentation Number: 010

Investigator: Walters, Mark (Geysers Power Company, LLC)

Objectives: Create an Enhanced Geothermal System (EGS) by directly and systematically injecting low volumes of cold water into Northwest Geysers high-temperature zone (HTZ); investigate how cold-water injection mechanically and chemically affects fractured high-temperature rock systems; demonstrate the technology to monitor and validate stimulation and sustainability of such an EGS; develop an EGS research field laboratory that can be used for testing EGS stimulation and monitoring technologies including new high-temperature tools developed by others.

Average Overall Score: 3.3/4.0

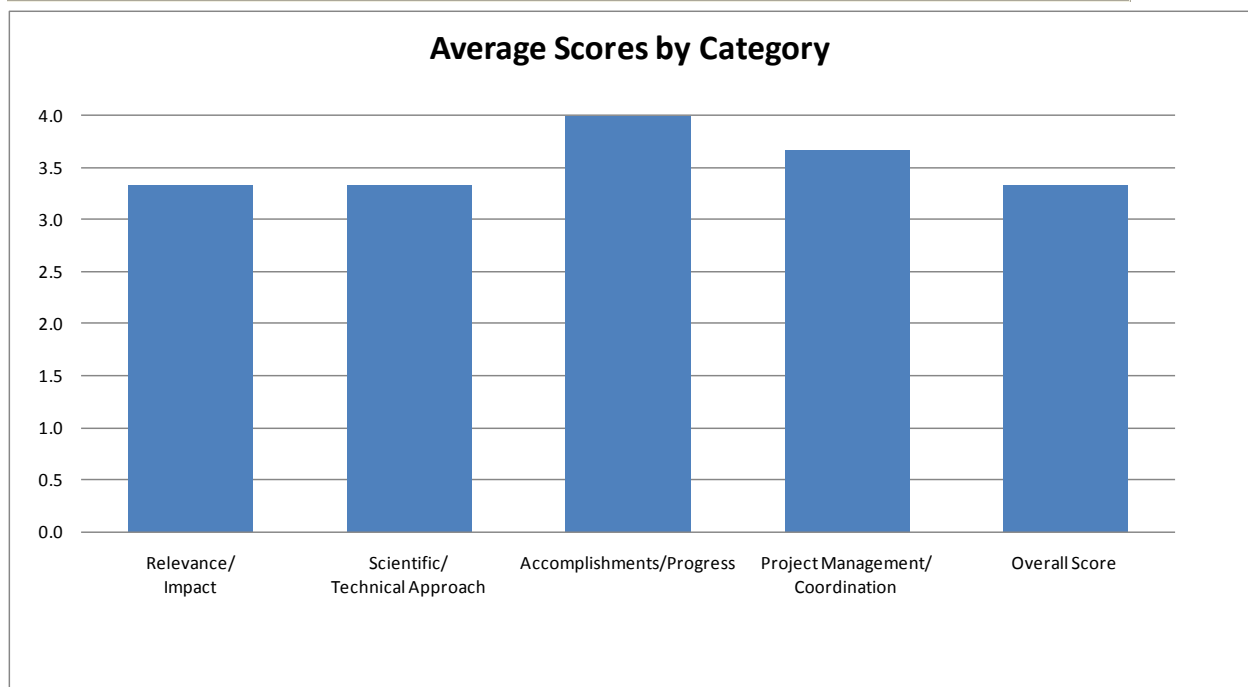


Figure 9: Demonstration of an Enhanced Geothermal System at the Northwest Geysers Geothermal Field, California

4.1.5.1 Relevance/Impact of the Research

Ratings of Three-member Peer Review Panel: Good (3), Outstanding (4), Good (3)

Supporting comments:

- While the project has not moved to demonstration stage, the support work to date is appropriate for a demonstration project. This is a well documented project that should provide objective evidence regarding the efficacy of thermal stimulation efforts. Would consideration of possible hydraulic stimulation (albeit requiring high injection rates) be reasonable for this project?

- This important project directly addresses an EGS reservoir creation technique under a particular set of conditions (low-pressure cold water injection) at The Geysers, a vapor-dominated field. It is rated highly even though the project is temporarily stalled until completion of the NEPA process by DOE.
- This Northwest Geysers EGS demonstration project, if successful, will make a significant contribution to the Geothermal Program mission. The project activities will address, not necessarily solve, known technical barriers, such as how are MEQs created in cold-water injections into steam-dominated reservoirs. If this project is successfully completed, this reviewer is confident that the EGS program will benefit greatly and that the results will surely add to the knowledge base.

4.1.5.2 Scientific/Technical Approach

Ratings of Three-member Peer Review Panel: Good (3), Outstanding (4), Good (3)

Supporting comments:

- See comment in Criteria 1.
- The approach is well thought out and comprehensive, by a well experienced team.
- The overall technical approach is good to outstanding. This work is not state-of-the-art R&D but rather applied technology, which is appropriate for a demonstration project. There are adequate resources and more than sufficient rigor of the work elements, procedures and methods that, if followed, will achieve the project objectives. The design of the project is straightforward and deemed reasonable and the technical approach is adequately described and clearly laid-out in the tasks provided and project timeline.

4.1.5.3 Accomplishments, Expected Outcomes and Progress

Ratings of Three-member Peer Review Panel: Outstanding (4), Outstanding (4), Outstanding (4)

Supporting comments:

- Similar to all EGS demonstration projects reviewed, these personnel and facilities are outstanding and the primary recipient appears dedicated to this effort. While NEPA issues have delayed some project activities, supporting efforts have been completed.
- The project team is very well qualified to do this project, and their productivity has been good. They have great support from all of the facilities and information at The Geysers field.
- The overall quality of the research team, equipment and facilities is excellent. The PI has been working at The Geysers as a geologist for decades and is very knowledgeable, experienced and highly regarded. Several other of the researchers on this team are known to this reviewer and are of the highest caliber. Relevant experience and the balance of appropriate skills of the research team are known and are of excellent quality. Schedule variance is about 10% with some accomplishments to date but the project is behind schedule by about 3 months (reviewer's estimate from schedule table presented in report). Was not able to ascertain cost

variance to date since current costing was not given. Clearly, the bulk of the important activities remain and it is possible that costs reflect this also.

4.1.5.4 Project Management/Coordination

Ratings of Three-member Peer Review Panel: Outstanding (4), Outstanding (4), Good (3)

Supporting comments:

- To date the project is well managed with responsibilities and coordination appropriately defined.
- The project is well staged and managed. Project participants have a history of successfully working together. A decision point occurs with the assessment of Prati 31 as an injection well.
- The technical, policy, business, and spend plans for the project are well thought-out, make sense and are, at least logistically, on track. There are no decisions points presented in the schedule, though a decision point was mentioned in the text.

4.1.5.5 Overall

Ratings of Three-member Peer Review Panel: Good (3), Outstanding (4), Good (3)

Supporting comments:

- Thermal stimulation efforts are a viable EGS option but it is moderately disappointing that other methods are not considered; particularly since thermal stimulation is believed to be effective in The Geysers field today. However, the project aims to document the effectiveness of thermal techniques and that is to be applauded.
- This is an important project that, if successful, will demonstrate methods for developing the northwest area of The Geysers, particularly the so-called “high-temperature zone” which results from an intrusion younger in age than that underlying much of The Geysers field. The temperature pulse resulting from this intrusion and now moving upward through the field represents a great target for substantially extending the life of The Geysers field. The project team is well qualified to carry out this project.
- Overall, this is a very good project and this reviewer recommends that the project proceed. Two modifications are suggested: 1) accelerate the tasks to catch-up on schedule variance and 2) add “go-no go” decision points to the schedule.

4.1.5.6 PI Response

No response.