



Archive of Fenton Hill Data

Project Officer: Lauren Boyd

Total Project Funding:
\$69300.

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Principal Investigator: Sharad Kelkar
(always include)

Presenter Name (if not the PI)
Organization

Track 4: EGS2

Background

The Fenton Hill project, the first successful EGS project in the world, ran from 1971 until 1995. To date, the Fenton Hill project at LANL remains one of the most successful EGS projects in the world. LANL has prepared the final report titled “Hot Dry Rock, Geothermal Energy Development at Los Alamos National Laboratory: 1970 – 1995 Final Report”. This report will be invaluable to anyone wanting to understand the experiments at Fenton Hill and will provide background and context. Over the life of the project, 8 major wells were drilled and nearly 100 experiments were conducted related to hydraulic fracturing, acoustic wave propagation, flow testing, and tracer testing.

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Background

During this project, the Los Alamos National Laboratory created and tested two reservoirs at depths in the range of 2.8 to 3.5 km in crystalline rock formations underlying the Fenton Hill site. Thermal energies in the range of 3 – 10 MWt were produced demonstrating the feasibility of the concept. Many important lessons were learned regarding the creation, engineering and operation of such subsurface systems – these lessons will prove valuable as the geothermal community moves towards the goal of realizing the immense potential of this ubiquitous renewable energy resource.

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The goal of this project is to sort through the records of Fenton Hill project, archive and index the important documents data, and archive them.

Data needed for model validation could potentially be accessed through the Fenton Hill work. Validated reservoir-scale models are necessary in order to make informed decisions regarding optimal EGS reservoir development (maximizing return on investment and minimize levelized cost of electricity). Valuable contributions of this work will include the ability to provide data and insight on EGS testing and experimentation to the EGS community.

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This project addresses Barrier F; and also I, and L from MYRD&D, as well as the knowledge gap concerning reservoir simulation models.

Barrier F: Modeling – Insufficient modeling and validation capabilities to effectively couple fluid flow, geochemistry, and thermal-mechanical phenomenon for 1) stimulation prediction, and 2) reservoir simulation.

Barrier I: Images of Fractures After Stimulation – Inability to characterize the physical parameters of potential EGS reservoirs after stimulation.

Barrier L: Well Field Design – Inability to assess and select the most efficient well-field des.

Every phase of an EGS development, from initial well stimulation to reservoir development and production optimization requires reservoir modeling. The IPGT (IPGT 2011) has identified the need for reservoir simulators with capabilities to model permeability enhancement and dynamic changes in permeability in response to changes in reservoir pressure, temperature, stresses and chemistry. Models developed for petroleum and hydrothermal applications have been inadequate for making reliable prediction of stimulation results and identification of the best options for creating the EGS system.

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Fenton Hill records at LANL were retained by key project staff, but the number of staff with first-hand knowledge has diminished significantly, and some records have been lost. Nonetheless, records had remained at LANL stored in boxes, filing cabinets, and old compact disks and a hard drive.

We are systematically going through each box with the help of Don Brown (LANL retired , one of the originators of the project), separating out the documents that appear to be of future interest – these consist mostly of technical reports. Additionally, there about 10GB of seismic data from various pumping experiments. These data will be sorted and stored on the data archival system.

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We have identified two main types of records –a hard drive containing about 16 Gb of microseismic data and boxes containing documents. About 100+ boxes were. Additionally, 100-200 feet of geothermal crystalline rock core from the wells GT-1, GT-2 and EE-2 is being held in storage.

The microseismic data are being transferred to a flash drive, and Dr. Leigh House (LANL, retired, one of the original seismologists on the project) is in the process of converting these data in an open readable format.

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We have sorted all the 100+ boxes containing records from the Fenton Hill HDR project, and with the help of Don Brown, we have separated the documents deemed important. The work of creating electronic images of these documents is well under way.

We have identified a list of key words in consultation with the EGS community in the USA.

A database is being created using the software 'EndNote'. This database will incorporate those items that already exist in the LANL electronic library. The data base will be searchable.

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A journal article titled “Lessons Learned from the pioneering Hot Dry Rock project at Fenton Hill, USA” has been submitted to *Geothermics*.

A presentation titled “Enhanced Geothermal Systems Lessons Learned from Fenton Hill Hot Dry Rock and other projects” was made at the Frontiers in Subsurface Energy, March 26, 2015, Austin, Tx, USA.

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Original Planned Milestone/ Technical Accomplishment	Actual Milestone	Date Completed (expected)
Identify keywords of importance to future use of the lessons learned and verification of simulations and models		10/31/2014
Search electronic records for keywords, identify documents relevant to each keyword		05/31/2015
Create a searchable data base of report titles, dates, authors and keywords		07/30/2015
Upload electronic collection of documents to GDR/NGDS		08/15/2015

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There are no Go/No-Go Decisions on this project because of
Small Budget

The project will be concluded at the end of FY15

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Summary of the Key Points

For use in future model validation activities, a searchable archive has been created of the available electronic documents pertaining to the first successful EGS project in the world

The Fenton Hill Hot Dry Rock project conducted from 1970-1995 in New Mexico, USA.

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References

Brown D, Duchane D, Heiken G, Hriscu V. Mining the earth's Heat: Hot Dry Rock Geothermal Energy. (2012). *Springer*

Kelkar S, WoldeGabriel G, Rehfeldt K. Hot Dry Rock Geothermal Energy Development at Los Alamos National Laboratory: 1970-1995 Final Report. *LA- 14433-HDR (2015)*.

Kelkar S, WoldeGabriel G, Rehfeldt K. Lessons learned from the pioneering Hot Dry Rock project at Fenton Hill, USA. Submitted to *Geothermics (2015)*.

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