Innovative Exploration Techniques for Geothermal Assessment at Jemez Pueblo, New Mexico

May 3, 2010

Greg Kaufman

Pueblo of Jemez

Validation of Innovative Exploration Technologies

Overview

Project Timeline:

Start Date:	3/15/2010
Target End Date:	2/29/2012

Project Phases:	Phase I -	Resource Evaluation
	Phase II -	Drilling
	Phase III-	Well Testing

Project Budget:

DOE Funding Level	$4,995,844
Awardee Cost Share	$100,000
Total Project Cost	$5,095,844
Funding for FY10	$1,390,321

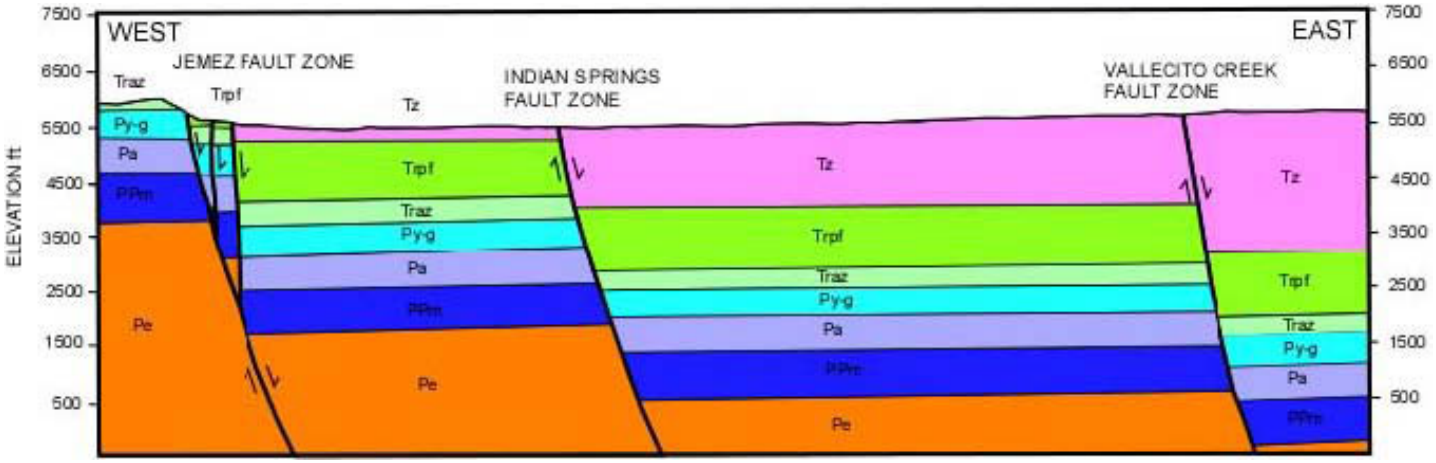
Overview

Project Partners:

Jemez Pueblo	Awardee
	Greg Kaufman
TBA Power	Michael Albrecht
Los Alamos National Laboratory	Lianjie Huang
	Giday WoldeGabriel
	Paul Reimus
Consulting Geologists (ret. LANL)	Jamie Gardner, Fraser Goff
New Mexico Bureau of Geology and Mineral Resources	Shari Kelley et al.
University of Utah	Pete Rose
University of Pittsburgh	Grad. Student
Montana State University	William Inskeep

Relevance/Impact of Research

Locate and drill two exploration wells that will be used to define the nature and extent of the geothermal resources on Jemez Pueblo in the Indian Springs area.

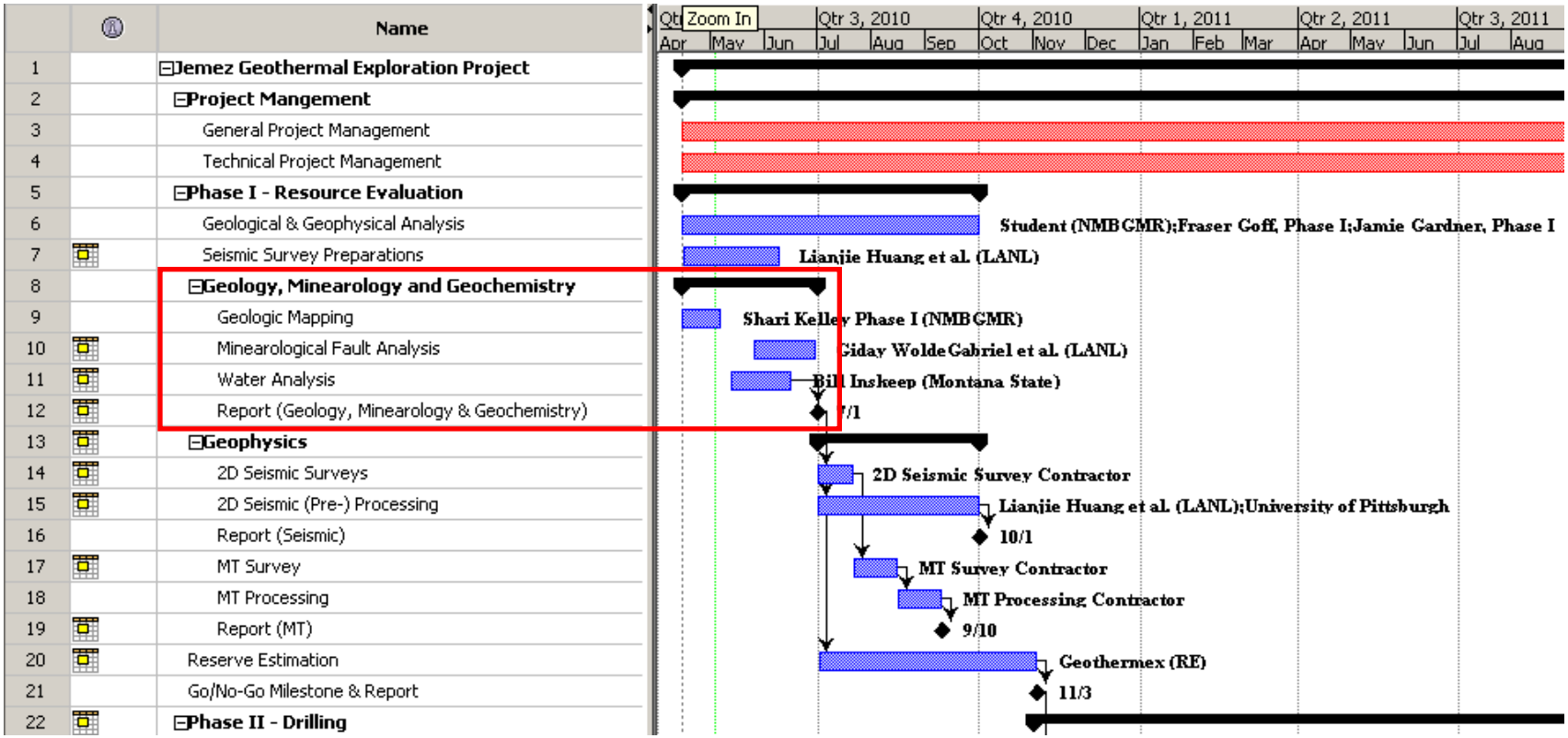


Woodward & Ruetschilling (1976)

Scientific/Technical Approach

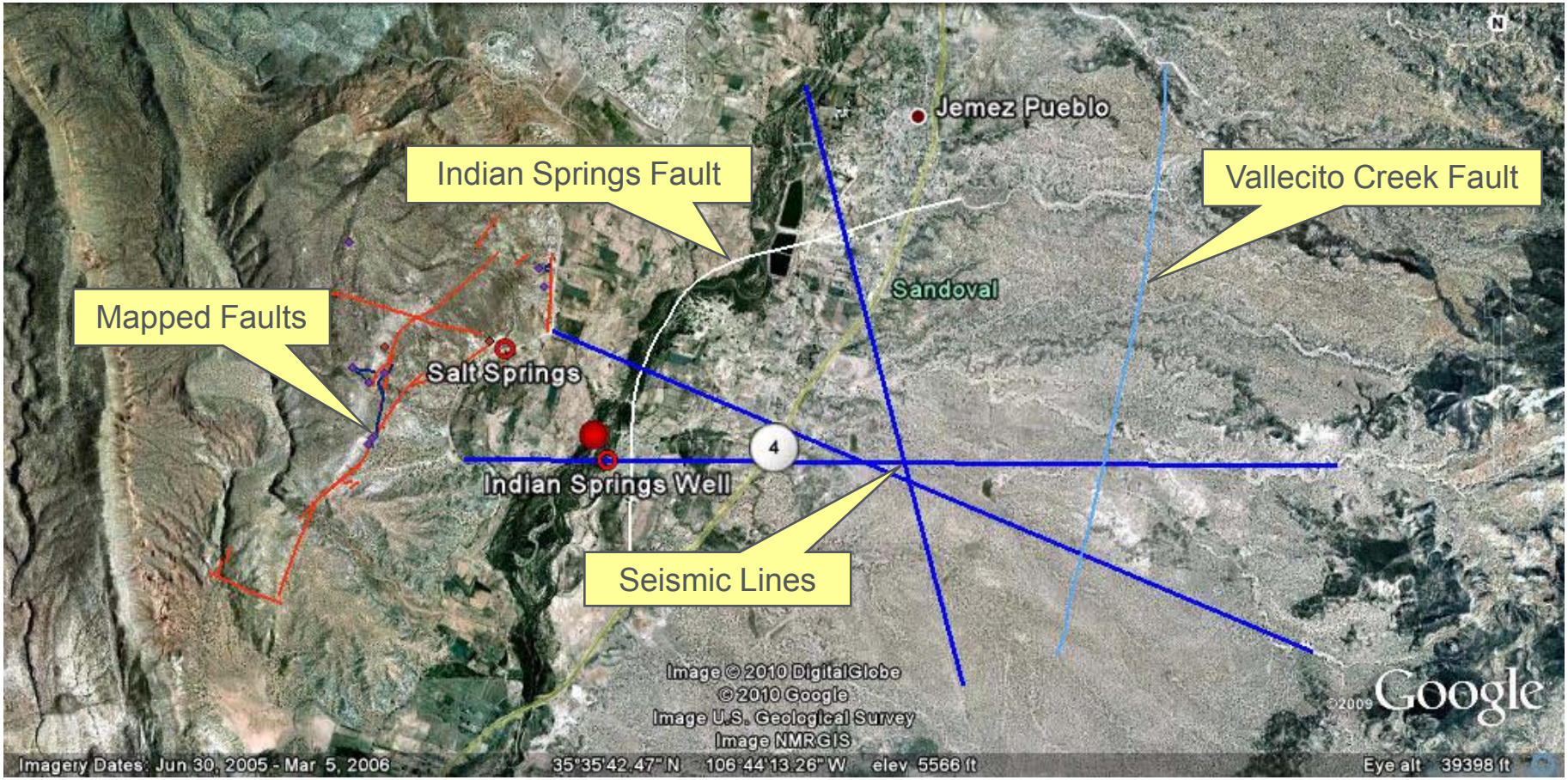
1. 1-6,000-scale geologic mapping of 6 mi2 surrounding the Indian Springs area.
2. Locate one N-S and two E-W seismic lines and run a seismic survey of 4 mi2; reduce and analyze seismic data using innovative high-resolution seismic migration imaging techniques developed by LANL, and integrate with 3-D audio-frequency MT/MT data acquired at the same area for fault and subsurface structure imaging and resource assessment.
3. Locate and drill two exploration wells at least 3000 feet deep to penetrate the deeper geothermal reservoir. At least three hundred feet of core will be collected from the target interval for each well.
4. Conduct detailed well testing, including an innovative tracer test and a test of flowing electrical conductivity (FEC), to determine the fracture surface area, heat content and heat transfer, flow rates, and chemistry of the geothermal fluids encountered by the exploration wells.
5. Final report summarizing the nature and extent of the geothermal reservoir in the Indian Springs area, including the potential for commercial power generation and direct use applications.

Current Status: Pre-Geophysics in Phase I



Progress

Geological Mapping & Seismic Line Planning as of 4/30/2010:



DOE NEPA study to start geophysics

Project Management/Coordination

- Phase I – Resource Evaluation

  Start Date: 3/15/2010
  Target End Date: 10/31/2010

  Reports: Geology, Mineralogy, Geochemistry
  Seismic
  MT
  Reserve Estimation (Milestone)

  Spend Plan: ~ $790,000

Project Management/Coordination

- Phase II – Drilling

Target Start Date: 11/1/2010
Target End Date: 11/30/2011

Reports: Slimhole:
Drilling Planning
Drilling, Logging, Tracer Testing,
Temperature Gradient, VSP (Milestone)

Production Size:
Drilling Planning
Drilling, Logging, Tracer Testing,
Temperature Gradient (Milestone)

Spend Plan: ~ $3,880,000

Project Management/Coordination

- Phase III – Well Testing

Target Start Date: 12/1/2011
Target End Date: 2/29/2012

Reports: Flow Testing, Tracer Testing, Geochemistry, Power Production Forecast (Final Report)

Spend Plan: ~ $330,000

Project Management/Coordination

DRP
Field Headquarter

Los Alamos
Geothermal Technology Center

Web & GIS

Walatowa Pueblo of Jemez

New Mexico Tech
Science • Engineering • Research • University

Los Alamos National Laboratory
Est. 1943

Montana State University

University of Pittsburgh

EGI Energy & Geoscience Institute
at the University of Utah

Future Directions

A unique combination of technologies that if successful will lower overall exploration risk and will transfer technology developed by the Los Alamos National Laboratory to the market.

Summary

- Largest geothermal exploration project in New Mexico since Fenton Hill
- First tribal geothermal project in New Mexico
- Life changing event for the Pueblo of Jemez, generating employment during exploration, potential power plant construction and operation
- Accelerator for geothermal research and commercialization in Los Alamos, resulting in the establishment of TBA Power's Los Alamos Geothermal Technology Center in cooperation with the Los Alamos National Laboratory