



*Enel Salt Wells - Courtesy of Enel Green Power – North America*

**IEA-GIA ExCo  
National Geothermal Data System & Online Tools**

**Jay Nathwani**

**September 30, 2011**

Rather than a full country report, the following selected topics will be discussed briefly.

**New Program Manager**

**US Installed Capacity**

**National Geothermal Data System**

**DOE Projects Database Demo**

**2011 R&D Funding Opportunity Awards**

**Existing International Collaborations**

**Capacity Factor Definitions**

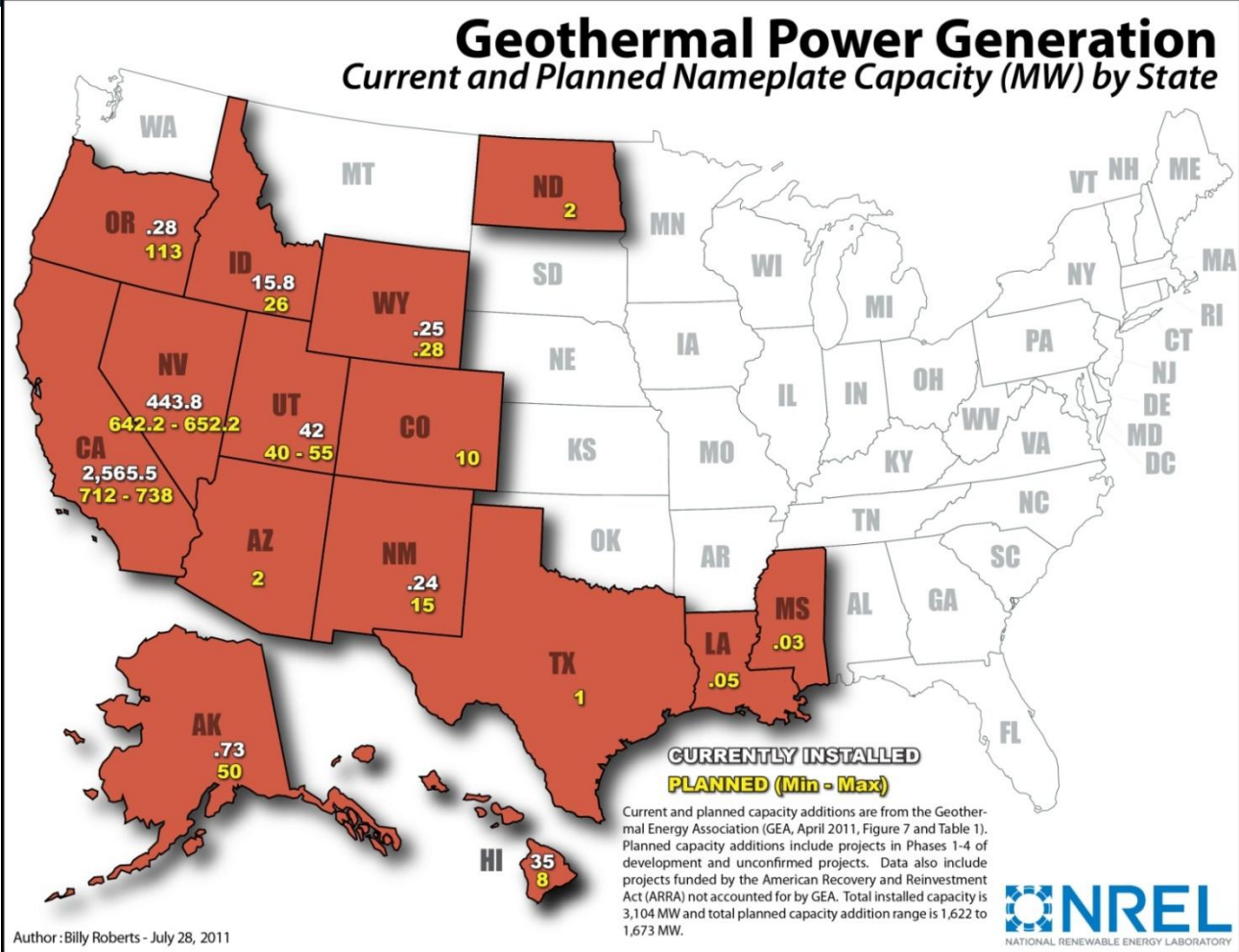
**DOE Quadrennial Technology Review**

After a long search, Douglas Hollett has been selected as the new Program Manager for the Geothermal Technologies Program as of September 26<sup>th</sup> 2011.

## **Experience:**

- 25 years in oil and gas exploration
- With Marathon Oil since 1981
- Geologist with Union Oil Company
- Developed oil and gas R&D programs in Canada
- MS Project Management, York University
- MS Geology, University of Utah
- BS Geology, Williams

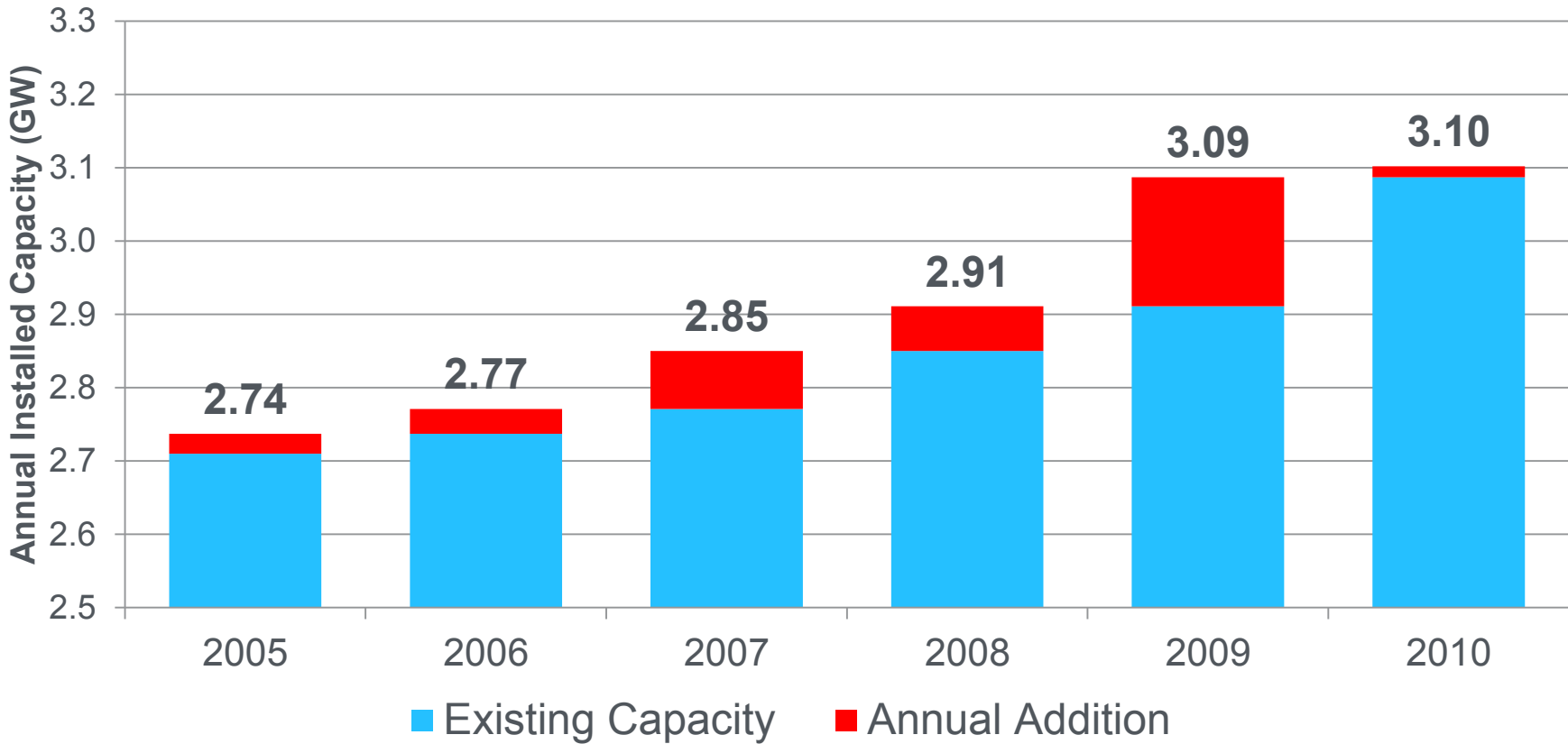
There is approximately 3 GWe of installed geothermal in the US, with 98% in California and Nevada. Industry is developing 1.6 GWe of additional capacity, and geothermal is expanding into new geographic areas.



# Capacity Increases 2005-2010

In 2010 only 15 MW came online in the United States. From 2005 to 2010 there was a 13% increase in installed capacity.

## US Geothermal Installed (Nameplate) Capacity (GWe) 2005-2010



The NGDS provides expanded reference and resource data from all fifty states and the nation's leading geothermal research centers.

## goal

Design, build, implement, deploy and populate a national, sustainable, distributed, interoperable network of data and applications

## strategy

- Develop, collect, serve, and maintain geothermal-relevant data
- Five awards provide the data support, acquisition, and access to cyber infrastructure

## success

- Access to consistent and reliable data
- Reduce high cost and risk of geothermal power projects (especially exploration drilling)

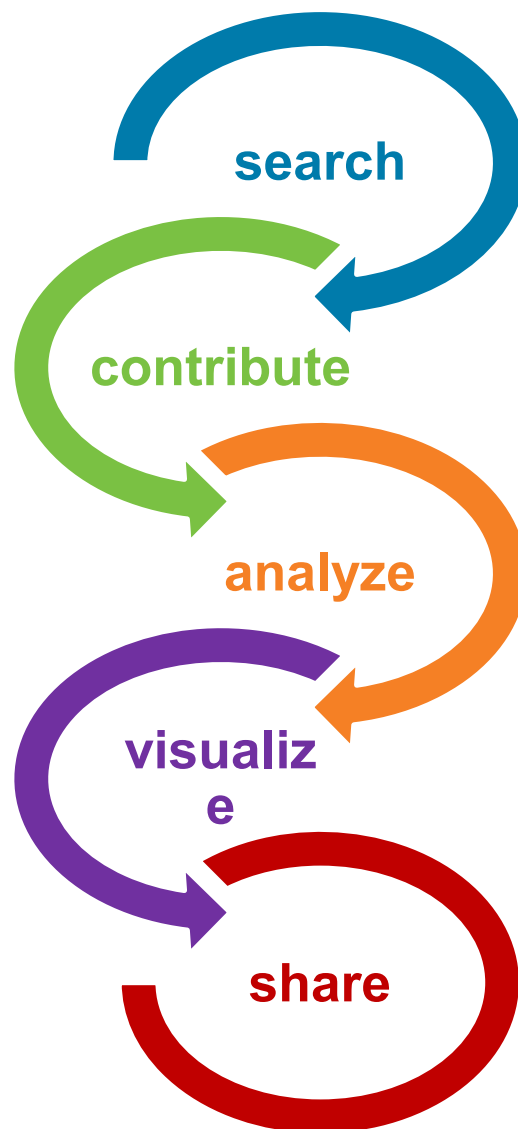


# What can you do with the NGDS?

**Searches can return a list of resources for a specified geographic area**

**Interpret and analyze geothermal data**

**Web services for sharing data and analysis**

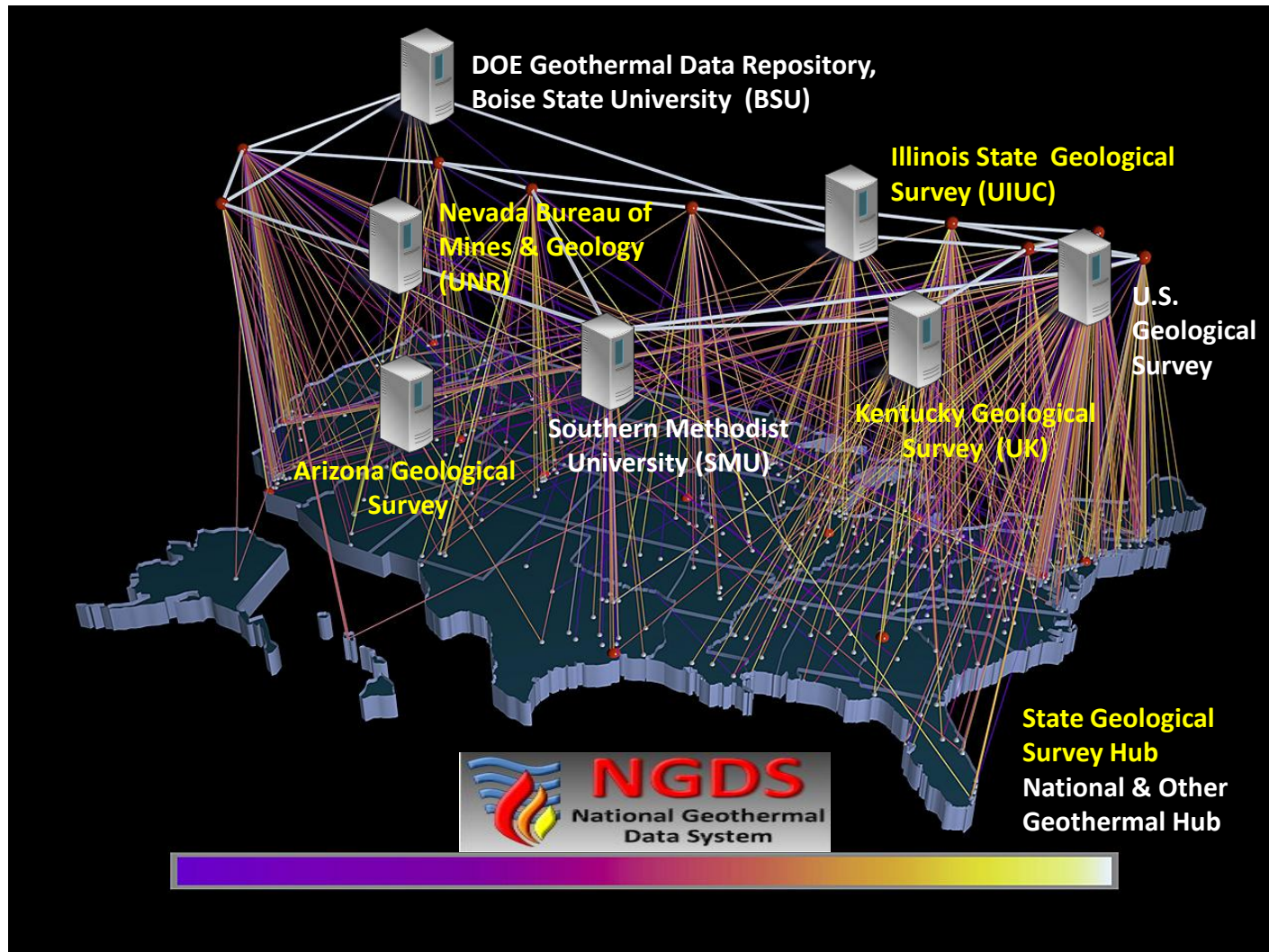


- **Submit data, publications, documents, tools & models**
- **Provide feedback**

Create a geothermal data map by selecting basemaps and datasets of your choice

# System Architecture: An Integrated, Distributed Data Network

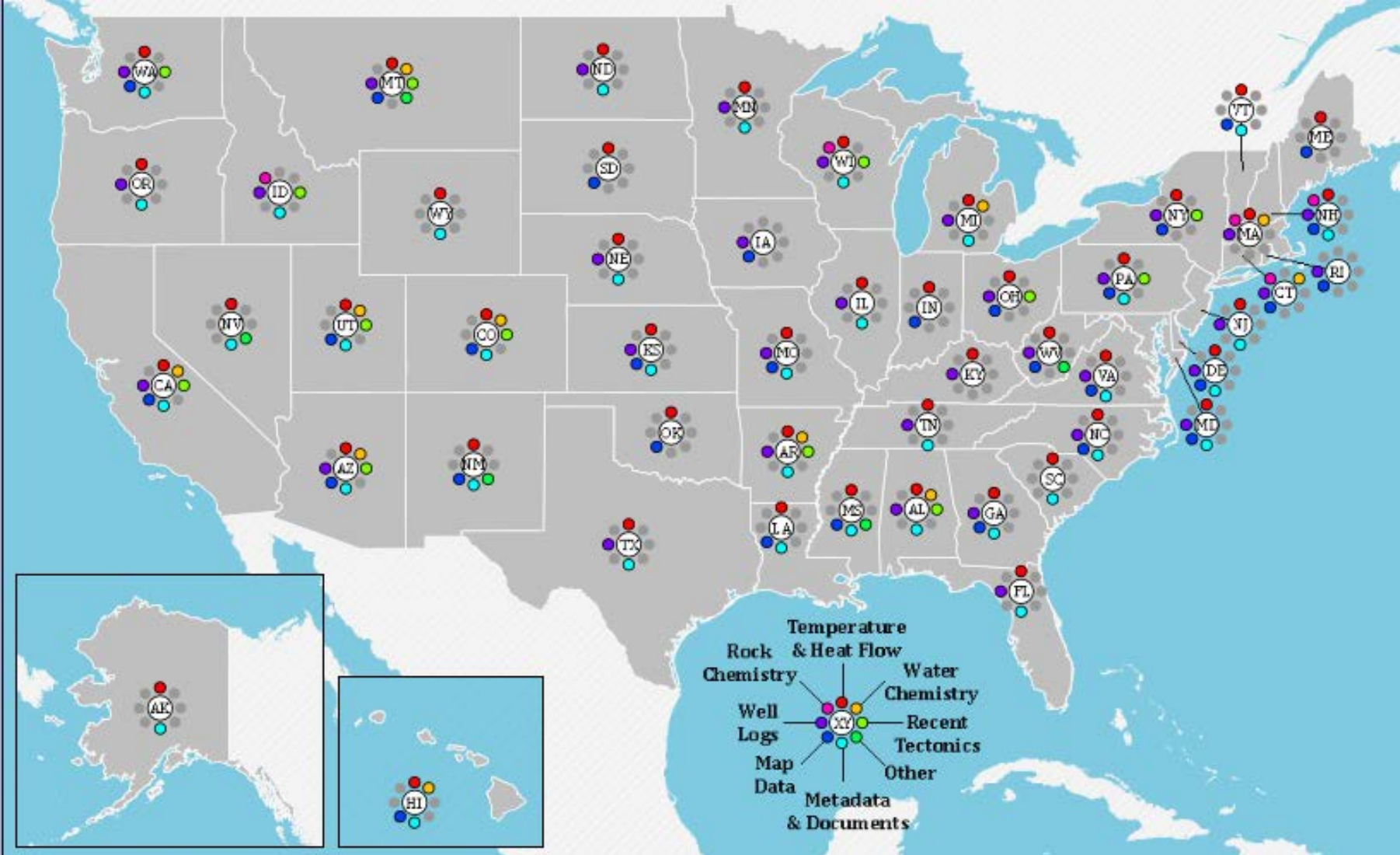
The National Geothermal Data System (NGDS) allows access to updated high-quality geoscience data in all 50 states, reducing geothermal development risks.





# State Data Contributions to NGDS

As of August 2011, States have already contributed significant data.



The DOE Projects Database provides information including finances, objectives and milestones on all funded projects.

1. Go to: <http://www4.eere.energy.gov/geothermal/projects>

2. Search by awardee, technology, or location.

**Geothermal Technologies Program**

HOME ABOUT THE PROGRAM PROGRAM AREAS **PROJECTS** INFORMATION RESOURCES FINANCIAL OPPORTUNITIES

EERE > Geothermal Technologies Program > Projects

### Joint Seismic-Electromagnetics Inversion for Iceland Geothermal Systems

Project Number LBNL FY11 AOP13

Awardee [Lawrence Berkeley National Laboratory](#)

Research Locations [Lawrence Berkeley National Laboratory, Berkeley, CA](#)  
[\[Google Map\]](#)  
[Krafla Volcano](#), [\[Google Map\]](#)

Partners [ISOR \(Iceland GeoSurvey\)](#)  
[Reykjavic University](#)

Program Area EGS Component R&D

Technology Type Fracture Characterization

Start Date October 1, 2010

Principal Investigator [Gregory Newman](#)

Additional Investigator [Michael Fehler](#) (Massachusetts Institute of Technology)

Development of joint geophysical imaging methodologies for geothermal site characterization and the demonstration of their potential in three areas: Krafla volcano and associated geothermal fields in Northeastern Iceland, the Reykjanes-Hengill area in Southwestern Iceland that includes a number of producing geothermal facilities, and

**Geothermal Technologies Program**

HOME ABOUT THE PROGRAM PROGRAM AREAS **PROJECTS** INFORMATION RESOURCES FINANCIAL OPPORTUNITIES

Search by:

Awardee  
 State  
 Partner  
 Program Area  
 Technology Area

### Projects

206 results found

Welcome to the Geothermal Projects Database. Here you will find listings for our currently funded projects throughout the United States. To get started, enter your keywords below, click on a state below, or select an awardee, state, partner, program area, or technology area from the left menu.

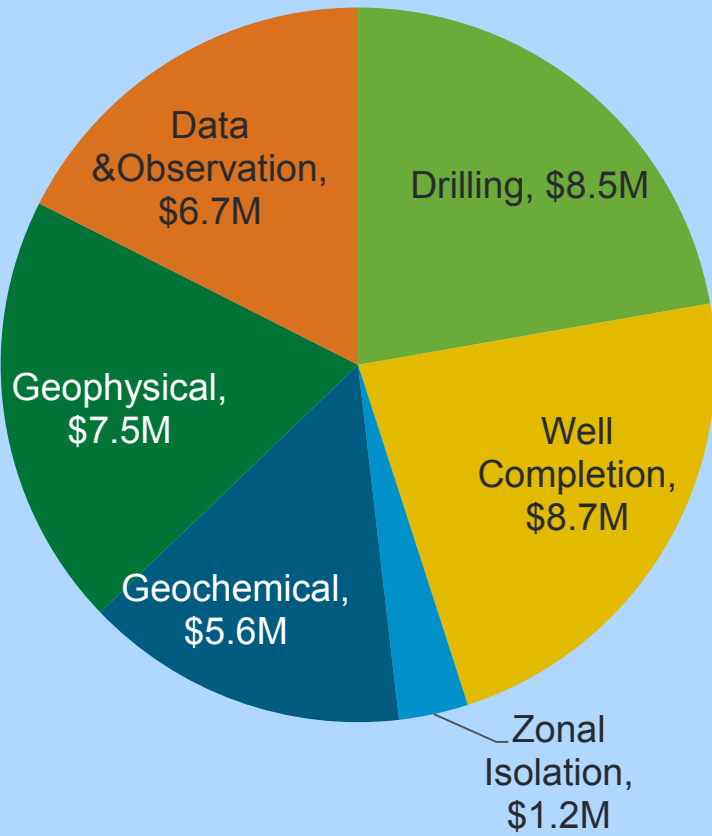
Enter your keywords:

3. Find information on the award, partners, research location, peer review documents, and more.

# FY 2011 R&D Funding Opportunity

32 projects will develop and test new ways to locate geothermal resources and improve resource characterization, drilling, and reservoir engineering techniques

**September, 2011 R&D Funding Opportunity**  
Up to \$38 million (total) over three years



Area	Purpose	Example
<b>Drilling</b>	For non-traditional/innovative drilling technologies	Atlas Copco Secoroc LLC's percussive drilling technology will increase rate of penetration
<b>Data &amp; Observation</b>	To help interpret reservoir evolution during EGS stimulation	Temple University's use of interferometric synthetic aperture radar (InSAR) to optimize reservoir performance
<b>Zonal Isolation</b>	To reduce drilling cost and facilitate the creation of multiple fracture zones	Sandia National Lab's Self-Consuming Downhole Packer
Geochemical	To advance remote temperature prediction and improve sustainability through better understanding of geochemistry	National Energy Technology Lab's reactive transport & fracture flow models to anticipate geochemical reactions in EGS
Well Completion	To reduce well completion costs, improve production and increase well lifetimes	Baker Hughes' bottom hole assemble for real-time measurement of drill string and wellbore properties continuously while drilling
Geophysical	For technologies & tools that better determine resource quality at depth without drilling	U Texas-Austin's vertical shear wave seismic data technology

# Existing International Collaborations

The DOE is currently funding meaningful international collaborations through competitive funding solicitations and with national laboratories – examples are shown below.

**Iceland**  
Advanced 3D Geophysical Imaging Technologies for Geothermal Resource Characterization  
Lawrence Berkeley National Lab (Prime Awardee) with partners MIT, ISOR, University of Reykjavik  
\$3 million award, co-funded by GEORG

**Canada**  
The Snake River Geothermal Drilling Project  
Utah State University (Prime Awardee) with partners including University of Alberta & the Intercontinental Drilling Program  
\$4.6 million Recovery Act award

**EU**  
Toward the Understanding of Induced Seismicity in Enhanced Geothermal Systems  
Array Information Technology (Prime Awardee) with partners including GFZ Potsdam and data sharing with 11 EU countries  
\$1.2 million Recovery Act award

**Indonesia**  
Monitoring and Modeling Fluid Flow in a Developing EGS Reservoir  
Prime awardee MIT is testing methodology on a dataset from the Gunung Salak geothermal field collected by Chevron  
FY 2008 award \$700k

**Japan**  
Develop a 3D hydro-thermal fracturing and proppant flow/transport  
Colorado School of Mines (Prime Awardee) validating 3D hydro-thermal fracturing simulator with data from Ogachi and Hijiori  
\$1.2 million Recovery Act award

**New Zealand**  
Chemical Impact of Elevated CO2 on Geothermal Energy Production  
Lawrence Livermore National Lab (Prime Awardee) working with GNS Science and data from Ohaaki-Broadlands Geothermal Field  
\$1.0 million Recovery Act award





It is evident that different institutions define capacity factor differently – resulting in much different reported capacity factors.

## IPCC Definition

---

## US Energy Information Administration

---

Note: net summer installed capacity is based on utility reports of generating capacity during peak summer demand hours

### Example:

#### Beowawe Geothermal Power Plant

Nevada, Binary Unit

**Nameplate Installed Capacity:** 17 MWe

**Net Summer Capacity:** 12.8 MWe

Source: EIA Generating Units 2008

**2010 Generation Gross:** 124,785 MWh

**2010 Generation Sales:** 108,171 MWh

Source: Nevada Commission on Mineral Resources

**IPCC (Net) Capacity Factor =  
73%**

**US EIA (Net) Capacity Factor =  
96%**



The President's Council of Advisors on Science and Technology recommended that DOE conduct a Quadrennial Technology Review to get stakeholder input on DOE priorities and planning.

## Some Questions for the Public

- What should be the criteria for including a technology in the DOE portfolio?
- What are principles and best practices in performing large-scale demonstration projects?
- What, if any, role should the DOE have in addressing non-technical barriers?

Page 40 of the Quadrennial Technology Review Framing Document: [http://www.energy.gov/qtr/documents/DOE-QTR\\_Framing.pdf](http://www.energy.gov/qtr/documents/DOE-QTR_Framing.pdf)

## Current Language on Geothermal in QTR Framing Document

“DOE expects that each of clean electricity supply technologies described above [solar, wind, nuclear, CCS] could contribute significantly to meeting the Nation’s energy goals, and DOE RD&D support has the potential to materially improve these technologies. Other clean electricity supply technologies could also contribute to varying degrees; these include hydroelectric, marine, and **geothermal power technologies** ... **Geothermal** and marine power technologies face uncertainties that exceed those of the previously discussed clean power technologies, including uncertainty in the materiality of their impact.”

- Joint IEA-GIA and IPGT Induced Seismicity Meeting to be held November 14, 2011, in conjunction with the Australian Geothermal Energy Conference
- US Draft Induced Seismicity Protocol is available:  
[http://esd.lbl.gov/files/research/projects/induced\\_seismicity/egs/EGS-IS-Protocol-Final-Draft-20110531.pdf](http://esd.lbl.gov/files/research/projects/induced_seismicity/egs/EGS-IS-Protocol-Final-Draft-20110531.pdf)
- In addition, a Best Practices document is being developed
- Live induced seismicity information is available online for all EGS demonstration projects:  
[http://esd.lbl.gov/research/projects/induced\\_seismicity/egs/](http://esd.lbl.gov/research/projects/induced_seismicity/egs/)

