Geothermal Technologies Office (GTO)

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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

Canadian Geothermal Energy Association
Fifth Annual Geothermal Conference, "Digging Deep"

Mapping & Database Workshop
March 21, 2013

Arlene Anderson, Physical Scientist
Lead for Geothermal Data Provision, Resource Mapping and Energy & Water Life Cycle Analysis
http://www.eere.energy.gov/geothermal/data_systems.html

National Geothermal Data System

NGDS

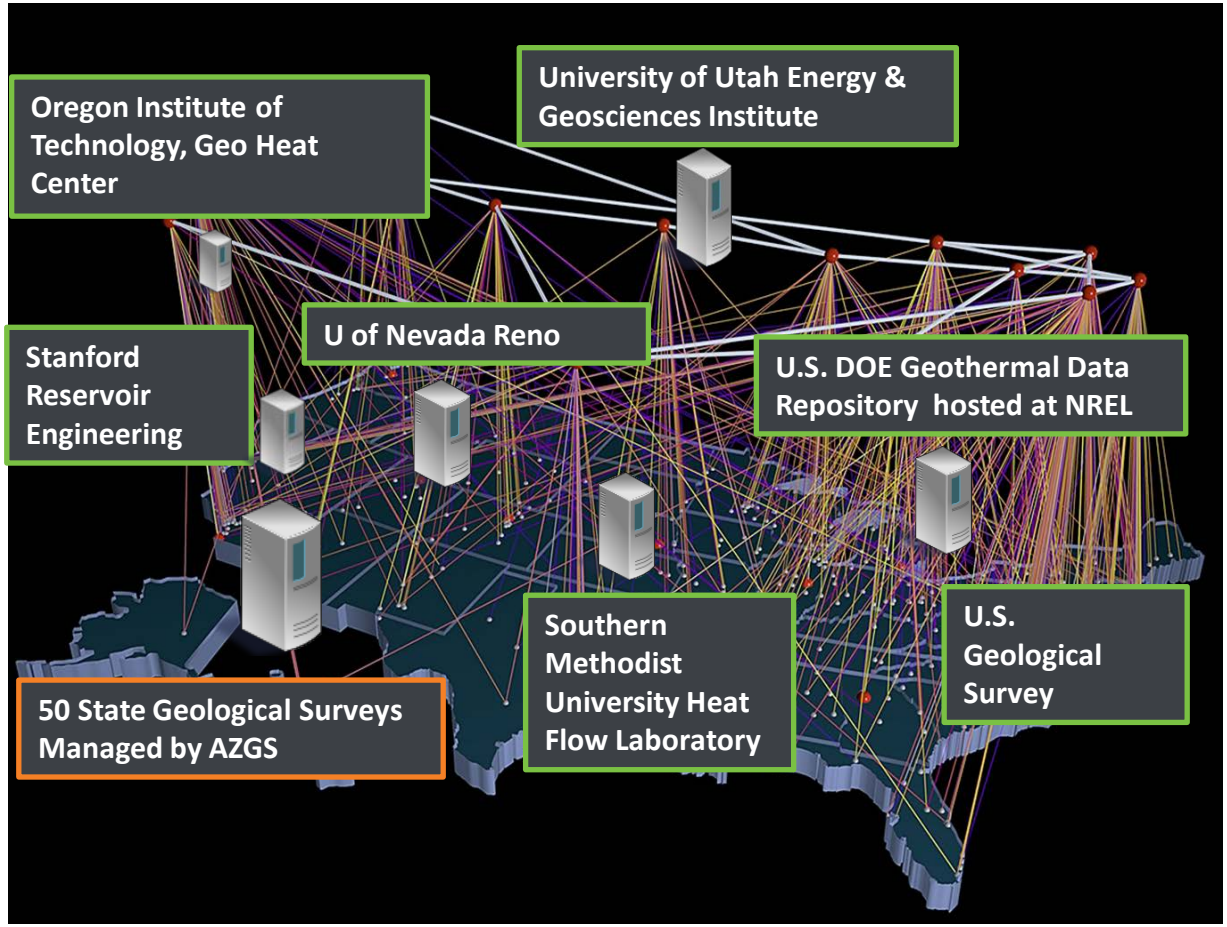
1) How was NGDS developed?

2) Who are the data providers?

3) How does it work?

3) How does it help industry?

4) How do the (map) layers reduce overall project risk?



National Geothermal Data System, Resource Assessment and Classification

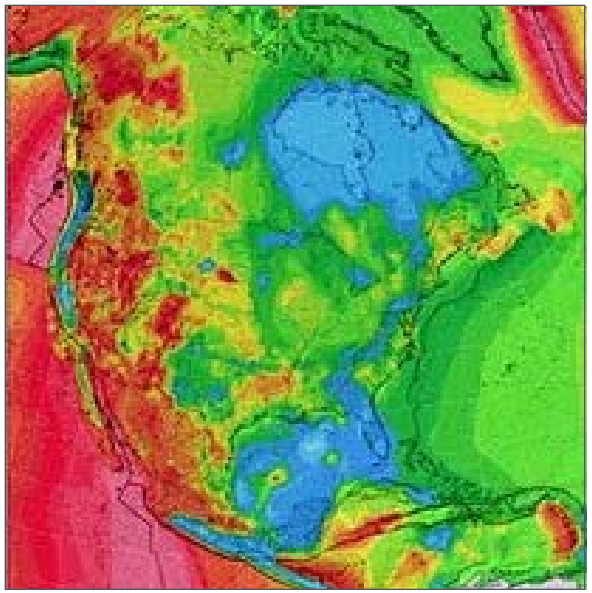
Three-part strategy to reduce geothermal development risks

NGDS National Geothermal Data System

- System Design, Development and Testing: Geothermal Data Consortium led by Boise State University. This distributed web-based system design leverages the Geosciences Information Network (NSF, U.S. Geological Survey, and American Association of State Geologist). Geothermal Desktop to include financial assessment tool.

- Data Development, Collection & Maintenance: Populate NGDS by linking to high quality data sets in partnership with state geological surveys and other geothermal data providers including Southern Methodist University and GTP technology partners.

- National Resource Assessment and Classification: Implement Inter-Agency Agreement with U.S. Geological Survey which includes first time low-temperature geothermal resource assessment.



Future Directions
Collaborators & Linkages

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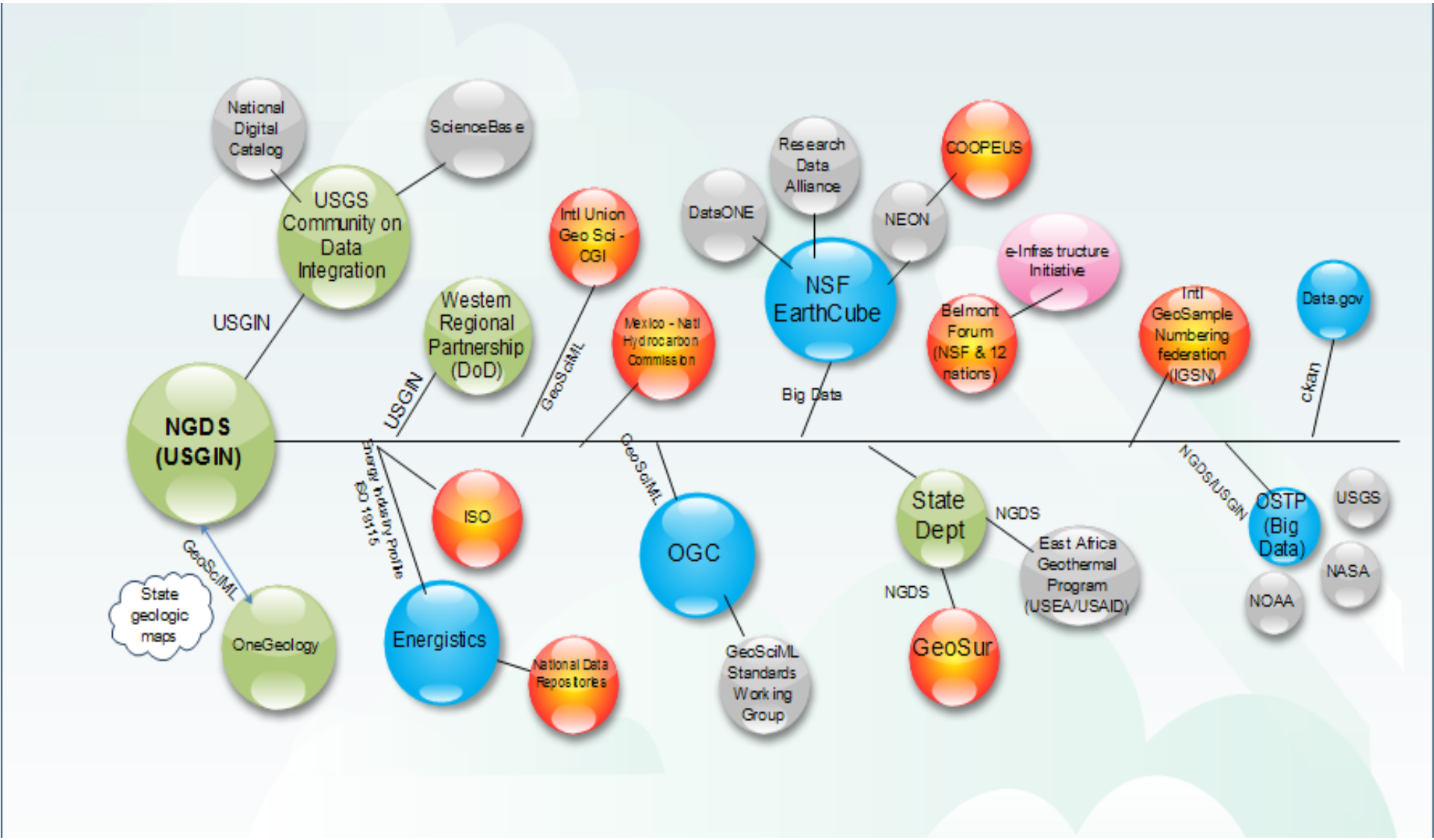
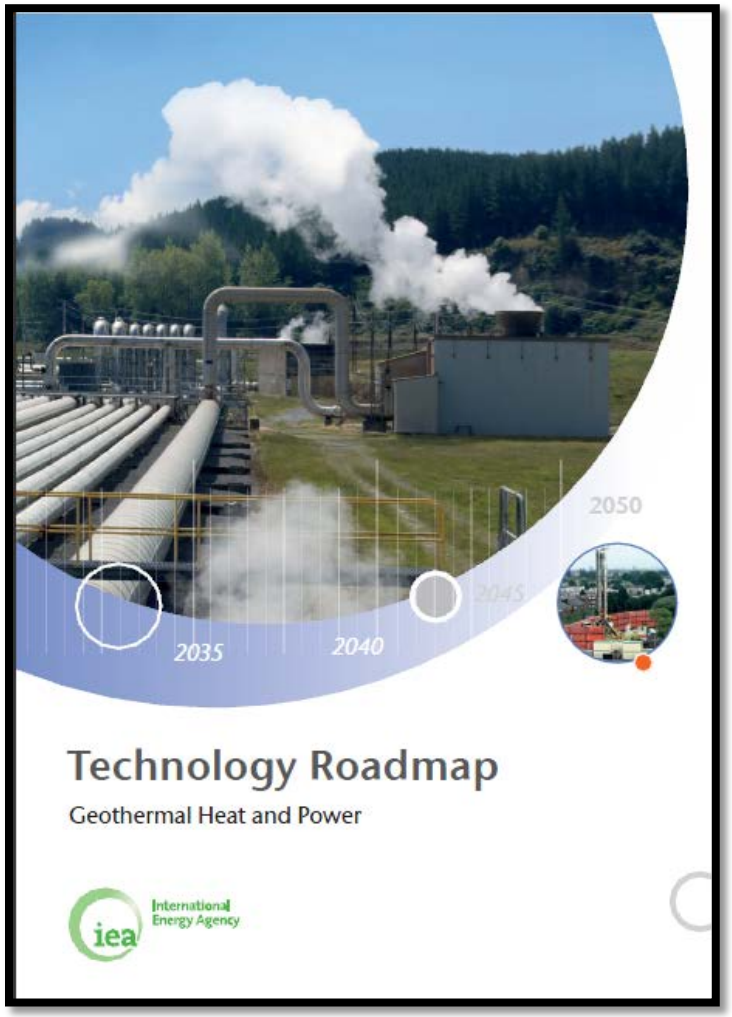


International Cyber Infrastructure



'Key actions in the next 10 years…'

- '…Develop publicly available databases, protocols and tools for geothermal resource assessment and ongoing reservoir management to help spread expertise and accelerate development.'

University Providers

Group	Data Item
University of Utah, Energy & Geoscience Institute (EGI)	2635 Scanned well logs indexed in NGDS Well Log Observation Content Model.
	9010 scanned reports, articles, maps, charts and graphs with metadata.
	Geothermal Sample Library samples registered with System for Earth Sample Registration (SESAR - http://www.geosamples.org/), and correlated with well log and well header data sets
	Create metadata for more than 1000 Scanned Documents
	Catalog and scan 20 boxes of well logs.
University of Nevada, Nevada Bureau of Mines and Geology (NBMG)	Metadata for more than 400 known publications and grey literature relevant to geothermal exploration and development in Nevada
	More than 2000 documents (notices, permits, gray literature) to be scanned and placed online with metadata records
	Approx. 150 1:24k scale geologic maps to be scanned and geo-referenced, with metadata
	Map and report describing all exploration activity reported in 2012 will be scanned, put online, with metadata
	Metadata for more than 179 existing geologic, geophysical and geochemical data sets relevant to geothermal assessment. Update NBMG Geothermal web map applications to operate with Tier 3 NGDS services.
	NBMG Geothermal map applications will be updated to operate with NGDS services and integrated with NGDS applications being developed by Siemens.

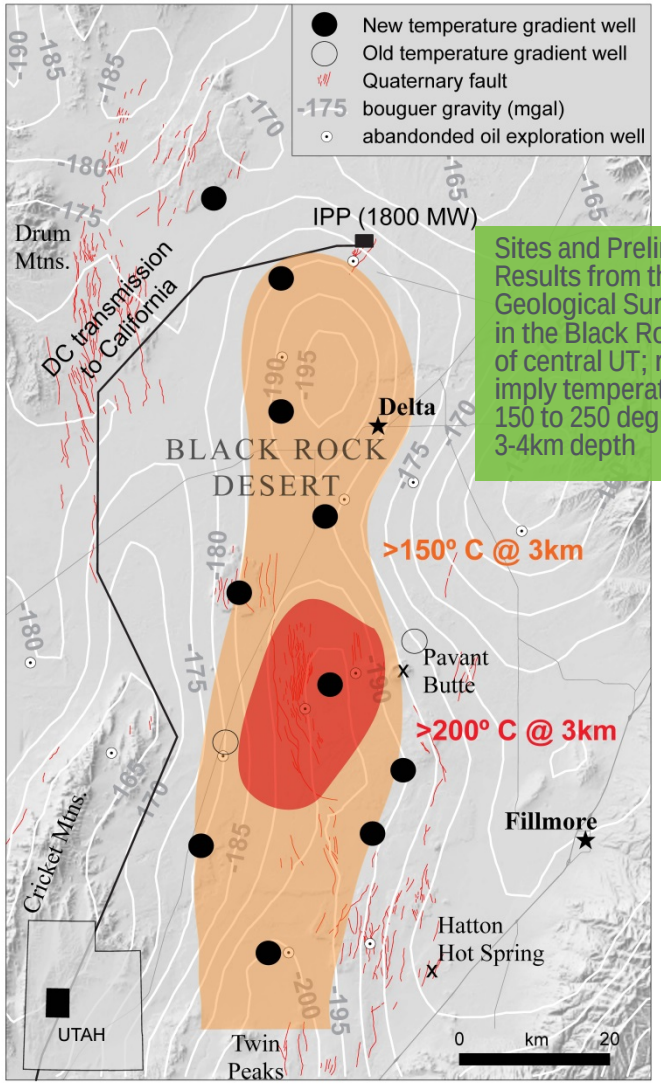
University Providers

Group	Data Item
Stanford Reservoir Engineering Dept.	Bibliographic Database for Proceedings from the annual Stanford Geothermal Workshop count: 2118 metadata records with location keywords
	Metadata Records for 3 Adsorption Data publications
GeoHeat Center, Oregon Institute of Technology (OIT)	717 Technical Papers and bulletin articles online, with NGDS metadata records
	Metadata for 4185 documents in the Geo-Heat Center Library
	Documentation and registration of data set describing 554 Geothermal Wells in Klamath Falls area
	Documentation and registration of data set describing 404 Co-located Sites
	In cooperation with Siemens Corporate Research (SCR) and University of Nevada, Reno (UNR), thermal springs and borehole temperatures will be de-duplicated for the 16 western states, processing non-standard location information, and served in the NGDS content model as the OGC's Web Map Services (WMS, OGC 07-063r1) and Web Feature Services (WFS, OGC 09-025r1 and ISO/DIS 19142).
	Documents and data related to the Klamath Falls #57310 project will be scanned and publicly accessible online with metadata.
	Metadata for GeoHeat software Tools and Spreadsheets.

State Geological Survey Providers

New temperature gradient wells completed in UT, ID, WA, & WI; pending wells in OR & NV

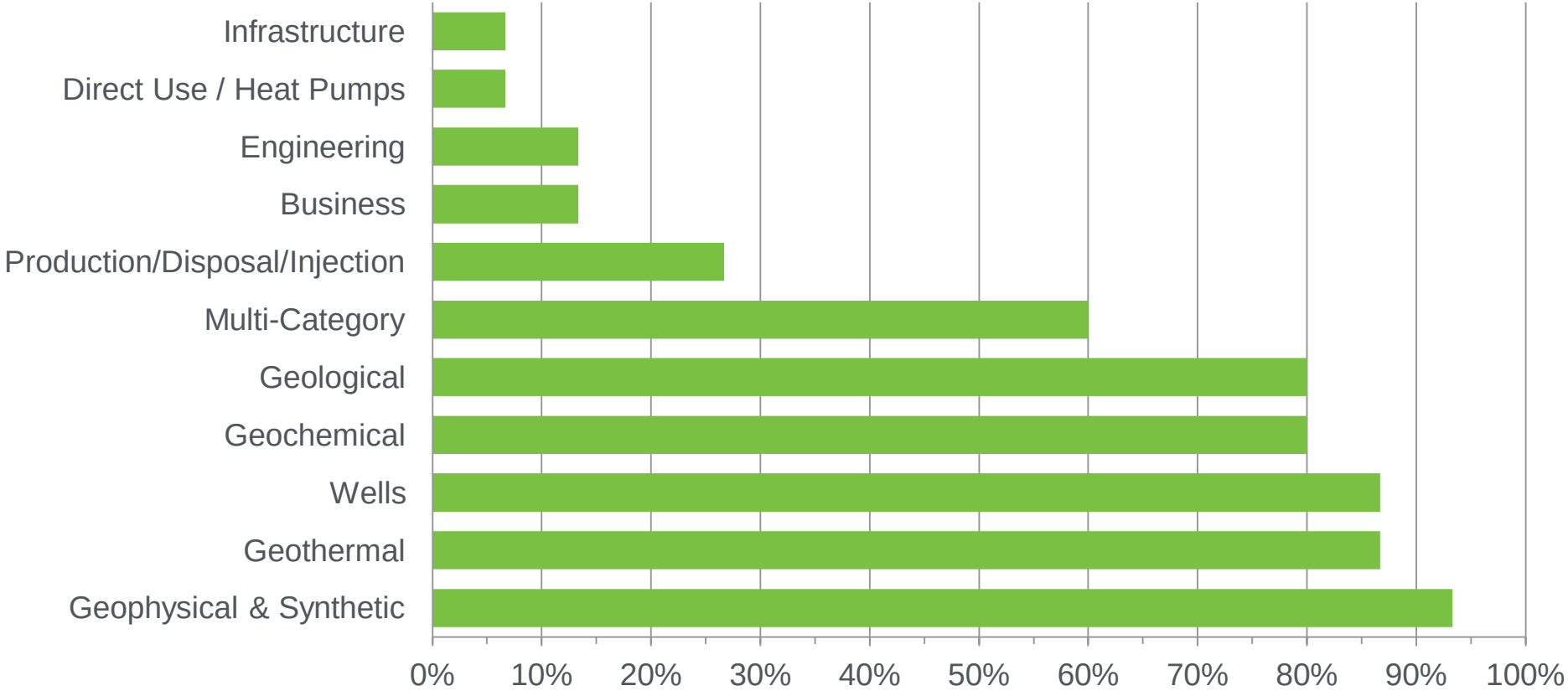
DOE Arlene Anderson and ID Geological Survey PI, John Welhan pose at one of three drill sites within the Blackfoot-Gem Valley of SE ID



Sites and Preliminary Results from the UT Geological Survey wells in the Black Rock Desert of central UT; results imply temperatures of 150 to 250 degrees C at 3-4km depth

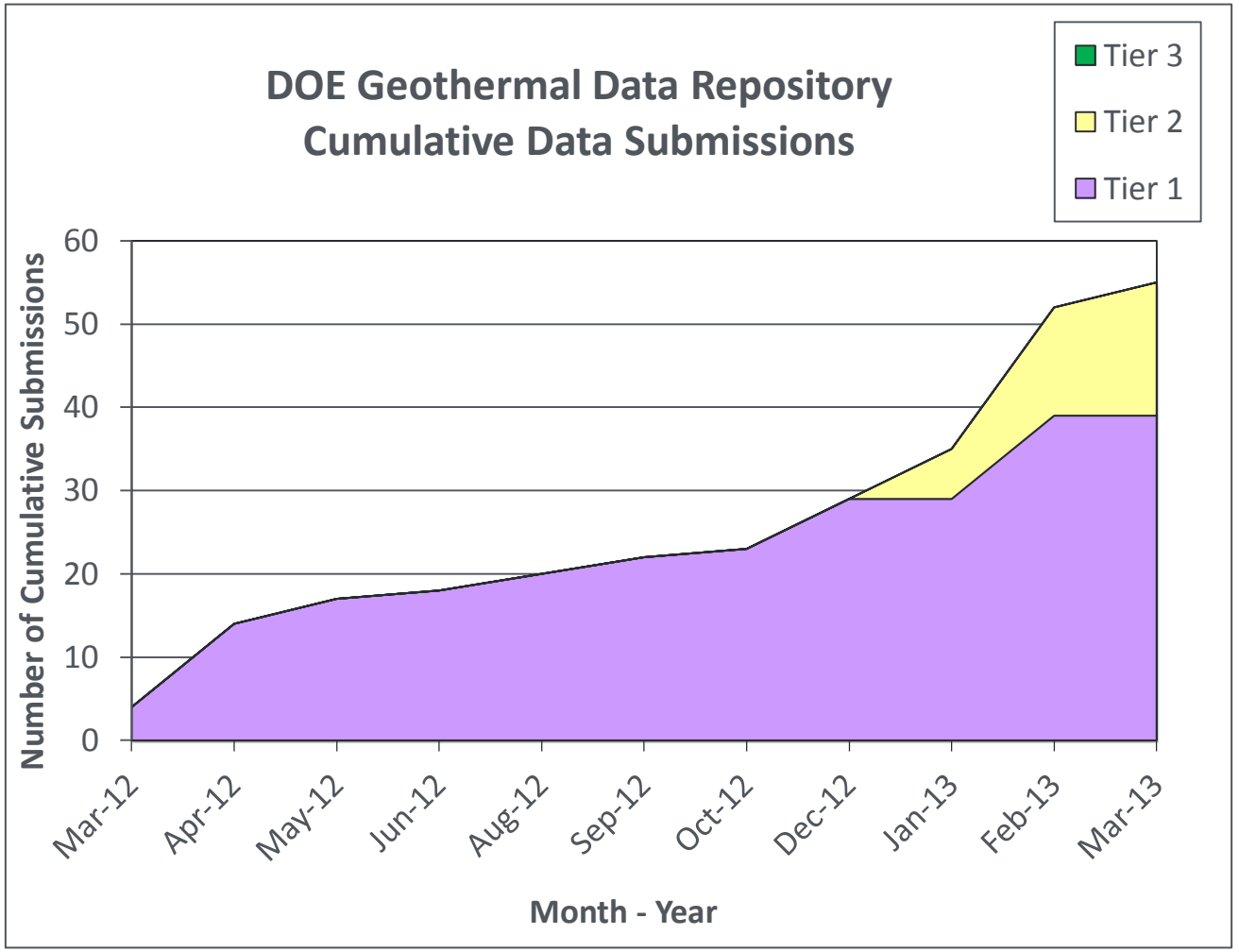
DOE Geothermal Funds Recipients Survey Responses

Intended Data Categories

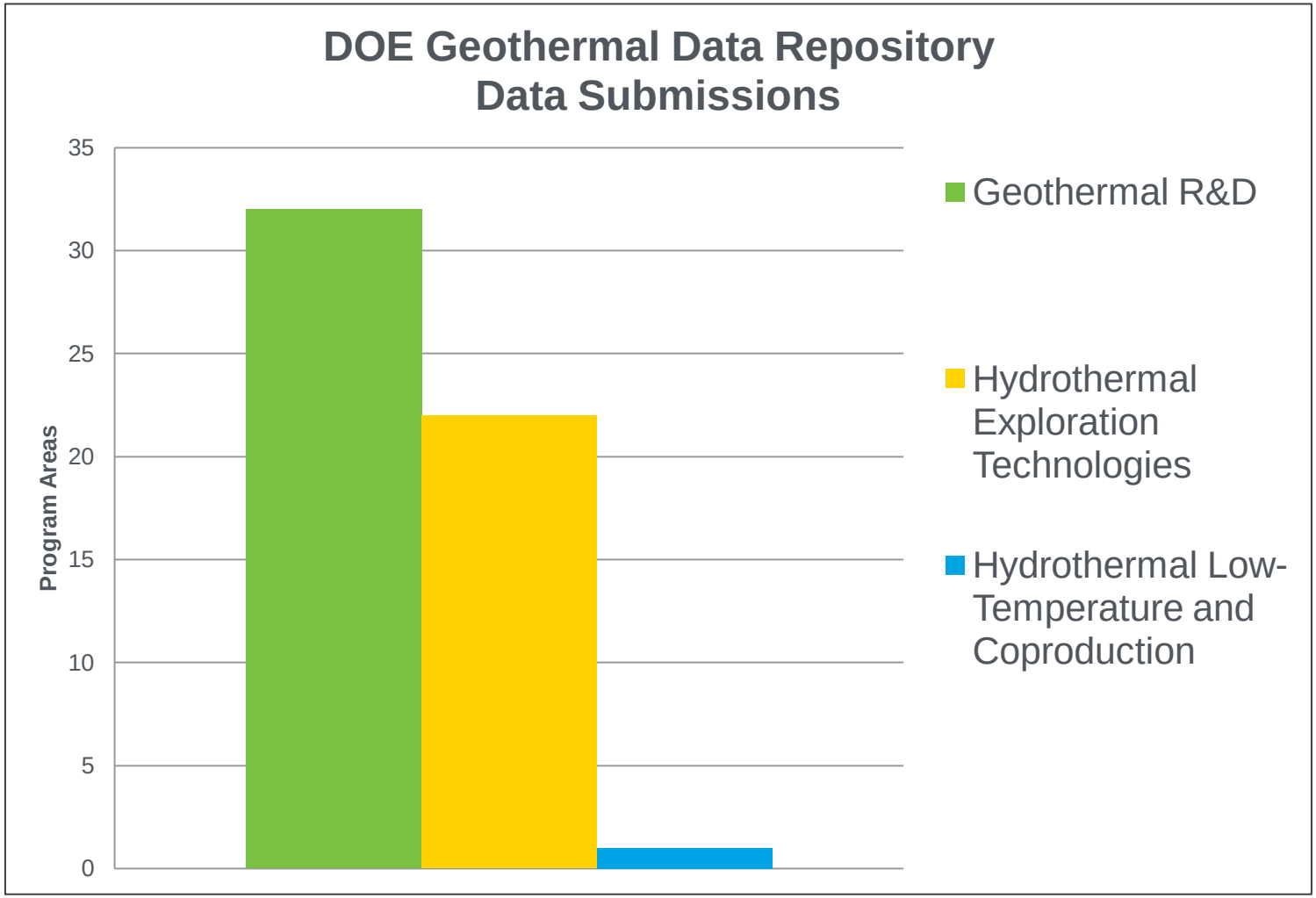


DOE Geothermal Funds Recipients Providers

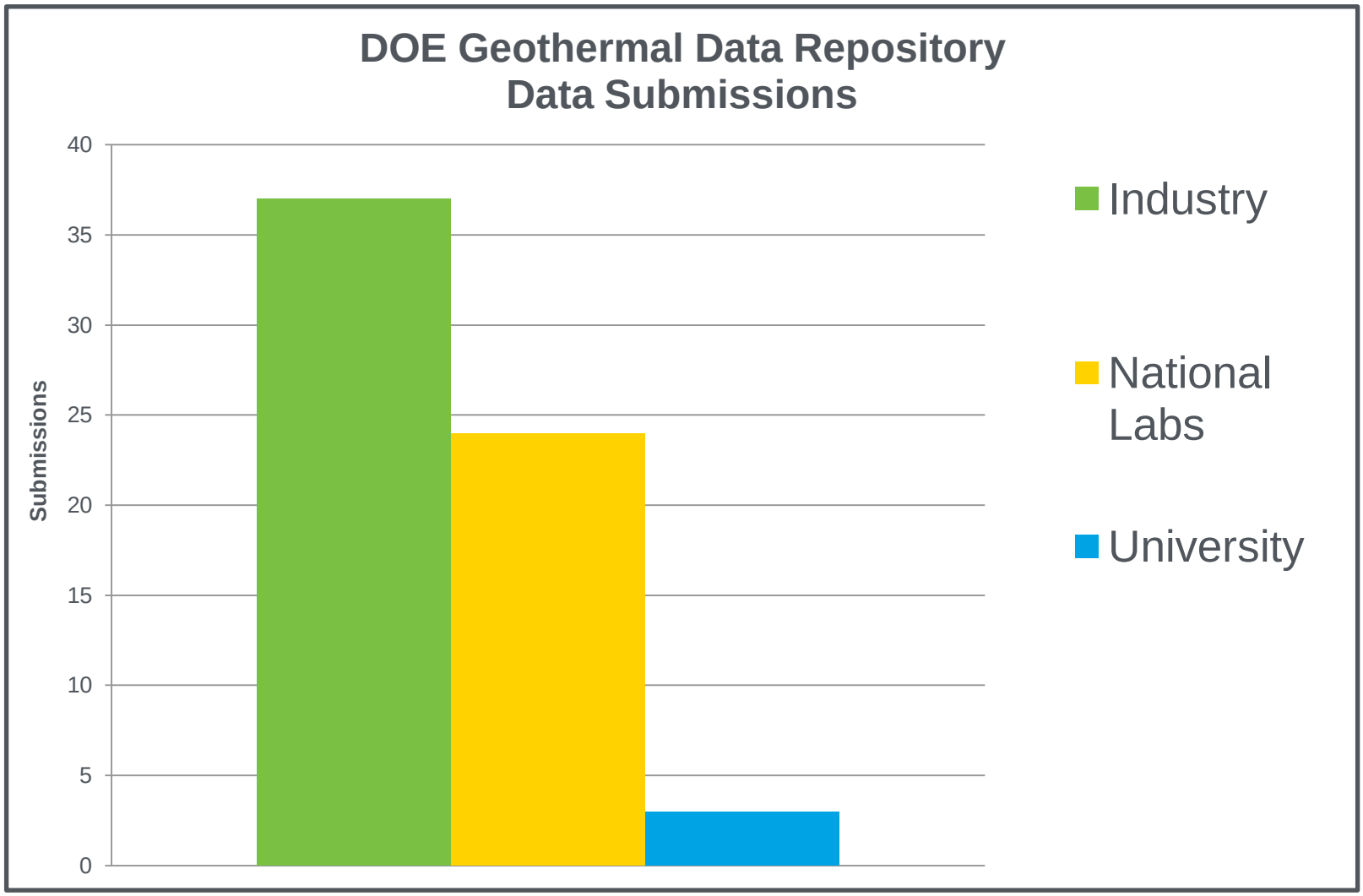
- Total of 75 Submissions
  - 61 are publicly accessible



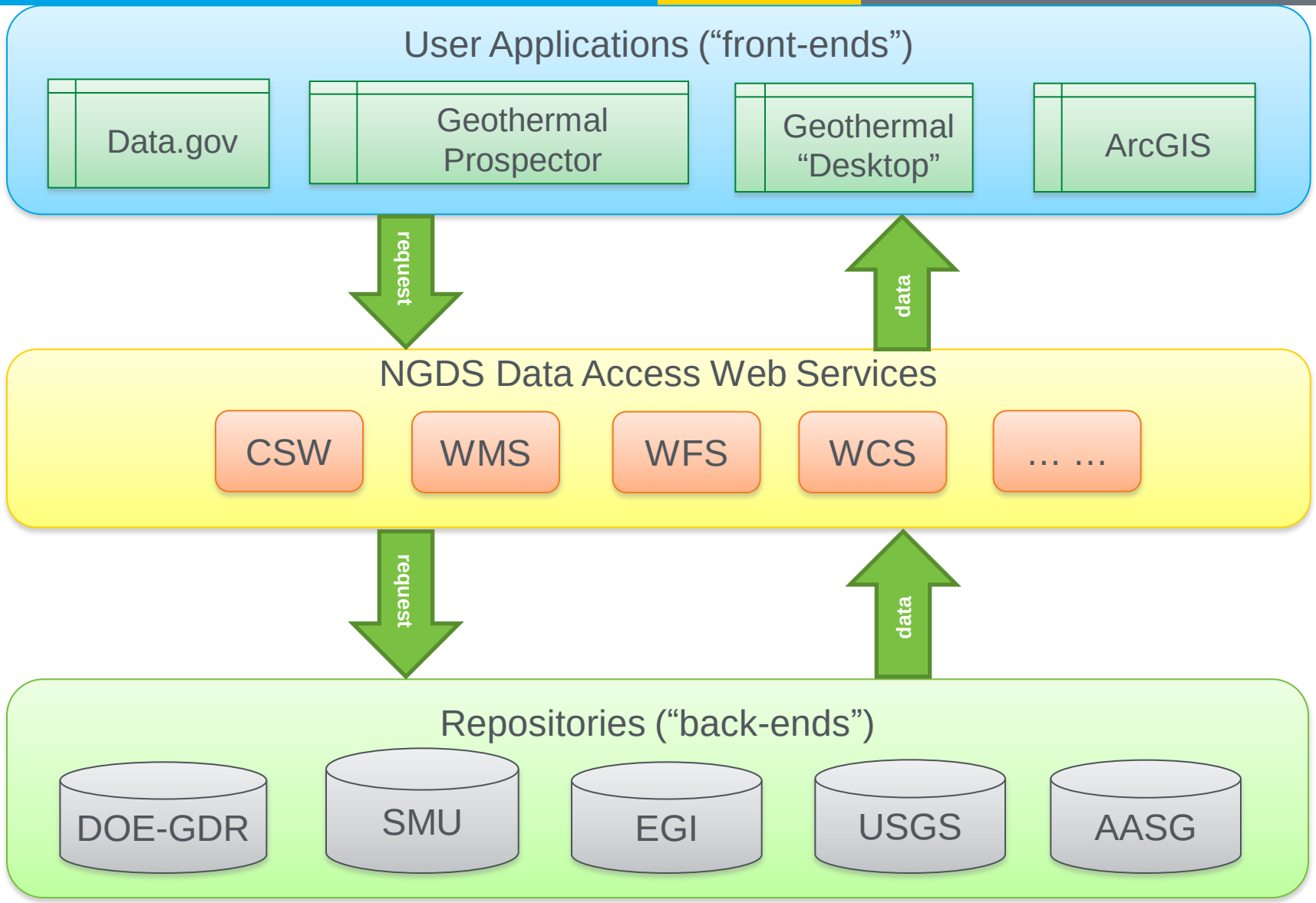
DOE Geothermal Funds Recipient Providers



DOE Geothermal Funds Recipient Providers



NGDS Architecture Approach



OpenEI | OPENENERGYINFO

Wiki | Apps | Datasets | Community | Linked Data

GDR Home | Browse GDR Datasets | Browse All OpenEI Datasets

Geothermal Data Repository

Submit your geothermal project and site data to the Geothermal
(GDR) using the link below. The GDR has been established to se
data based on individual timelines, some of which have identifie
release date. Please note:

1. All GDR data will eventually be made available to the public.
2. Data not intended for eventual public release should not be
   GDR.

If you have questions about this data submission process, please
OpenEI webmaster.

Create an OpenEI account or login to submit data

Frequently Asked Questions

- What kinds of data should I submit?
- What data formats are preferred?
- What should I not submit?

https://gdr.openei.org/index.php

Reporting Checklist Requirements

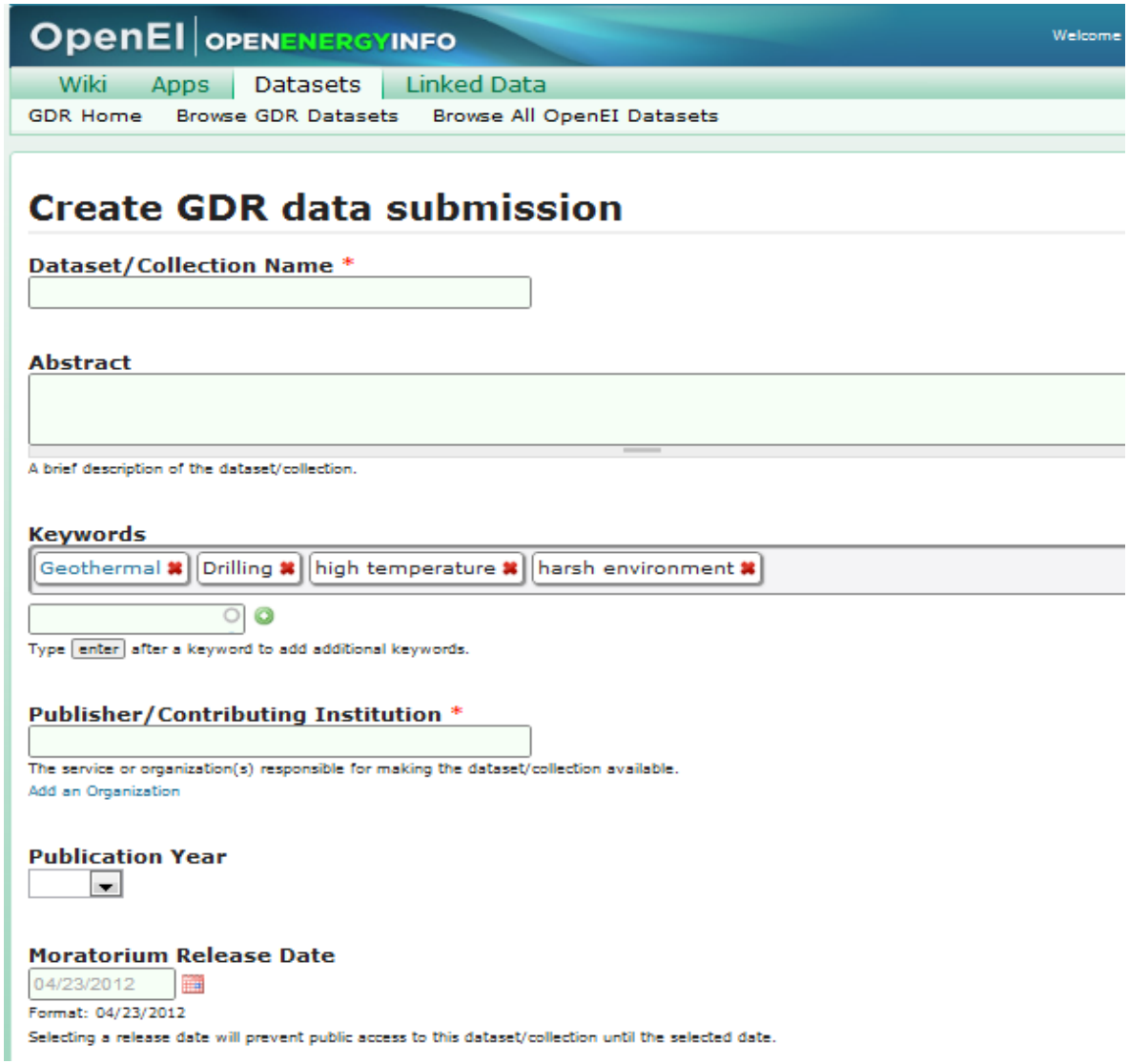
- Within 90 days of DOE request, the Recipient must update their data plan to include a list of the specific type of data that will be generated as part of each task and project deliverable. Should the project change and an updated data plan is needed, the recipient must submit an updated data plan to DOE within 90 days of the project change.
    - This requirement demands Project Officer involvement to help identify anticipated data types (based on the SOPO), and review/approve Recipient Data Plans.
- The Recipient must provide data to the DOE Geothermal Data Repository (DOE-GDR) as it is generated, but no later than the end of each reporting quarter in which the data is generated.
    - With Project Officer approval, the Recipient may postpone data submission until a “dataset” is complete.

DATA TYPES - Geothermal Data Submission Document

- Active Fault/Quaternary Fault
- Aqueous Chemistry
- Borehole Temperature Observation Feature
- Direct Use Feature
- Drill Stem Test Observations
- Earthquake Hypocenter
- Fault Feature
- Geologic Contact Feature
- Geologic Unit Feature
- Geothermal Area
- Geothermal Fluid Production
- Geothermal Power Plant
- Heat Flow
- Heat Pump Facility
- Lithology Interval Log Feature
- Thermal/Hot Spring Feature

Project Officers Responsible for Ensuring that Partners Understand Data Provision Responsibilities

DOE GDR Data Provision Instructions



SMU NGDS Publication Keywords

Keywords will allow users to search the NGDS. Associating synonyms or highly-related words with “primary” keywords will ensure users are led to reliable and accurate search results.

Keyword (primary)	Synonyms (or highly related)
well	wells; borehole; boreholes; downhole
geothermal exploration	energy source development; geophysical prospecting; geothermal exploration and development
seismic surveys	seismic survey; seismic refraction; seismic reflection; reflection seismic; reflection; seismic noise
resistivity surveys	electrical resistivity; resistivity; electric conductivity; electrical conductivity
magnetotelluric surveys	magnetotelluric; magnetotellurics; MT survey; electromagnetic surveys; telluric
heat flow	heat-flow; heat flows, heat flow density
well log	well logs; well logging; logs; logging; borehole logs; drillers’ logs; open hole

NGDS Vision

Support the discovery and generation of geothermal sources of energy. The NGDS will provide online access to important geothermal-related data from a network of data providers in order to:

- *Increase the efficiency of exploration, development and usage of geothermal energy by providing a basis for financial risk analysis of potential sites*
- *Assist state and federal agencies in making land and resource management assessments*
- *Foster the discovery of new geothermal resources by supporting ongoing and future geothermal-related research*
- *Increase public awareness of geothermal energy*

NGDS

REDUCE RISK, INCREASE CREATIVITY

MAP
Find data for a specific geographic area

LIBRARY
Look up data for a specific geographic area

RESOURCES
Use or add to our list of websites & tools for geothermal exploration

CONTRIBUTE
Share data, learn about the National Geothermal Data System

SEARCH

Find geothermal data, images, publications, & more

search in map | Map ▾ | Go

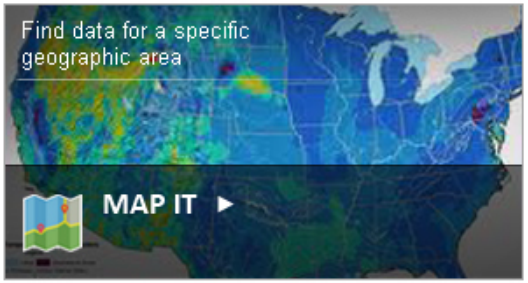
DATA WATCH

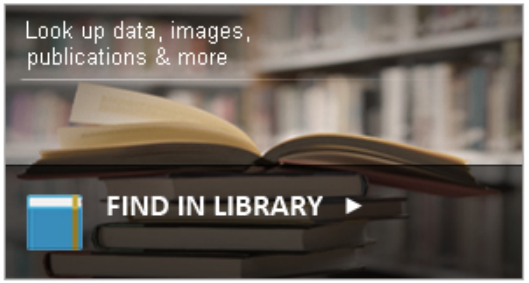
Recently shared with NGDS

Selected Hydrologic Data, San Pitch River Drainage Basin, Utah
By G.B. Robinson. Published February 1, 1968
October 18, 2012

Maryland Oil and Gas Wells Log Metadata
By Maryland Dept. of Environment
October 18, 2012

Geothermal Resources Development needs in Arizona
By Maryland Dept. of Environment
Posted October 18, 2012





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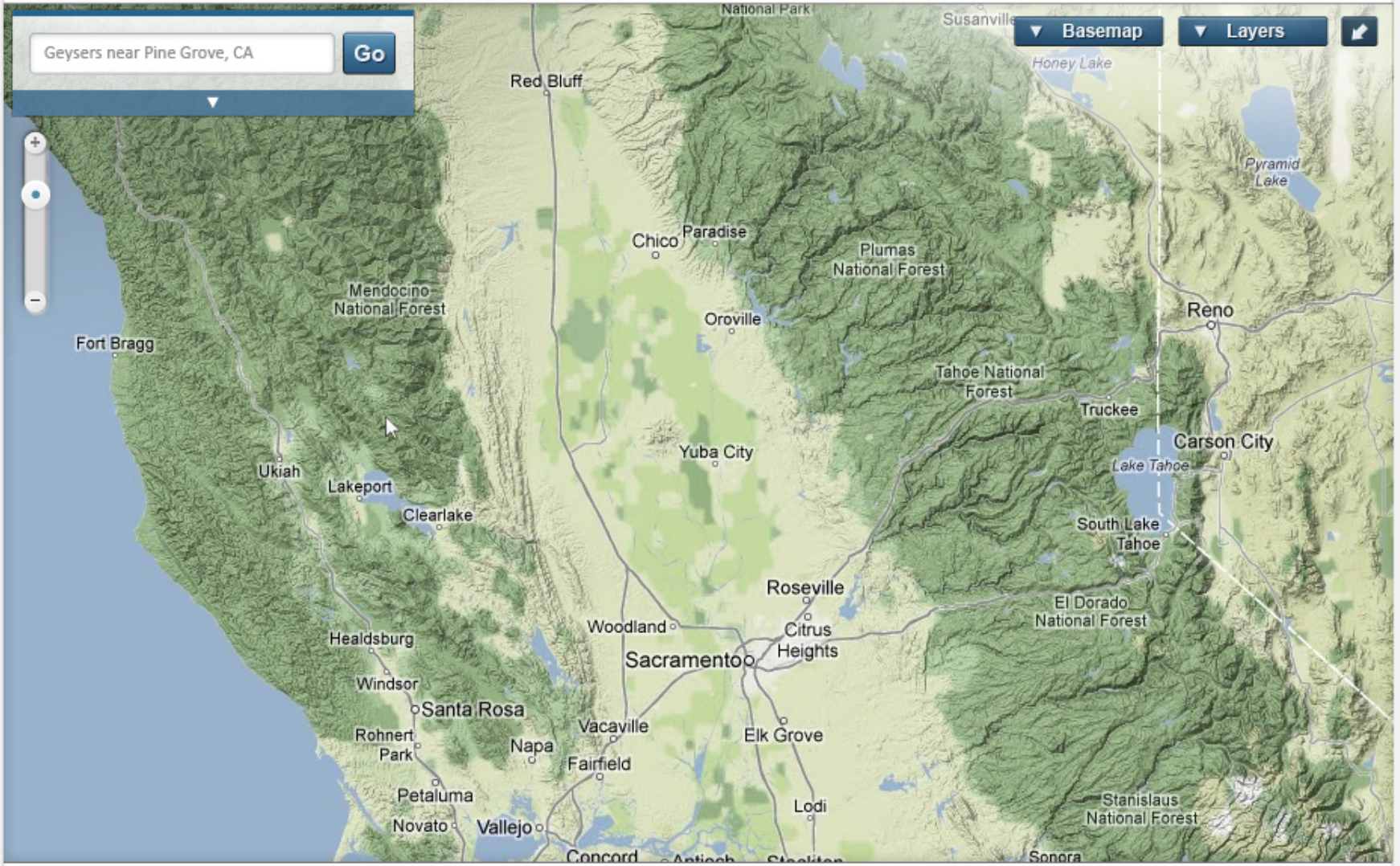
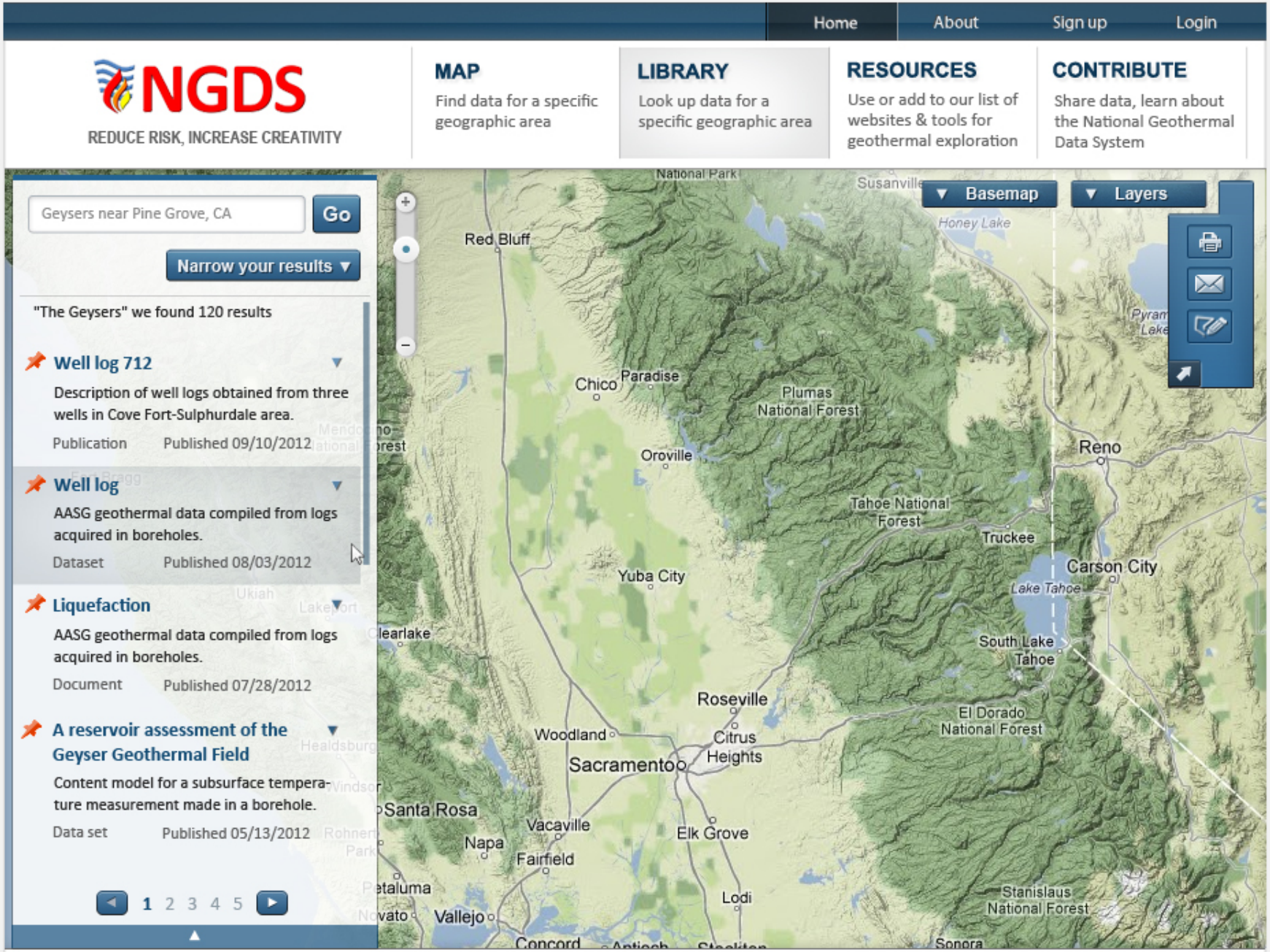


About NGDS

Help

I want to...

Hello, we share data with NGDS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NGDS
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Use or add to our list of websites & tools for geothermal exploration
CONTRIBUTE
Share data, learn about the National Geothermal Data System
Geysers near Pine Grove, CA
Go
Narrow your results
"The Geysers" we found 120 results
Well log 712
Description of well logs obtained from three wells in Cove Fort-Sulphurdale area.
Publication
Published 09/10/2012
Well log
AASG geothermal data compiled from logs acquired in boreholes.
Dataset
Published 08/03/2012
Liquefaction
AASG geothermal data compiled from logs acquired in boreholes.
Document
Published 07/28/2012
A reservoir assessment of the Geyser Geothermal Field
Content model for a subsurface temperature measurement made in a borehole.
Data set
Published 05/13/2012
1 2 3 4 5
Basemap
Layers
Red Bluff
Chico
Paradise
Plumas National Forest
Oroville
Reno
Tahoe National Forest
Truckee
Carson City
Lake Tahoe
Yuba City
South Lake Tahoe
Roseville
El Dorado National Forest
Woodland
Citrus Heights
Sacramento
Santa Rosa
Vacaville
Napa
Fairfield
Elk Grove
Lodi
Vallejo
Concord
Stanislaus National Forest
Sonora
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Geothermal Technologies Office Data Provision Policy & Projects

Ensure open access to both negative & positive experimental data & analysis

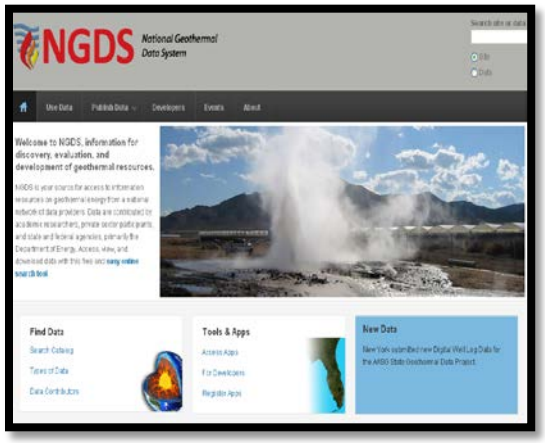
Require DOE-funded geothermal R&D projects to provide appropriate data

- Prefer structured, linked data
- Make data publicly accessible

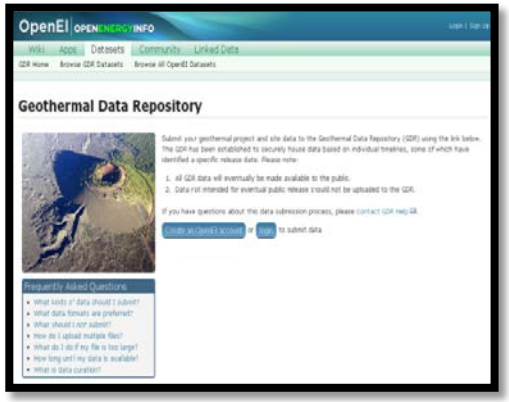
Incentivize industry, government & academia to host or provide data to an NGDS node

Express GTO policy implementation with guidance document

Enable the capture, evaluation, description, & delivery of data



http://geothermaldata.org/



https://gdr.openei.org/

http://www4.eere.energy.gov/geothermal/projects