



National Geothermal Data System
DOE Geothermal Data Repository Node

Geothermal Technologies Program, Annual Peer Review
Tuesday, May 8 Working Lunch

Arlene Anderson
Physical Scientist

U.S. Department of Energy

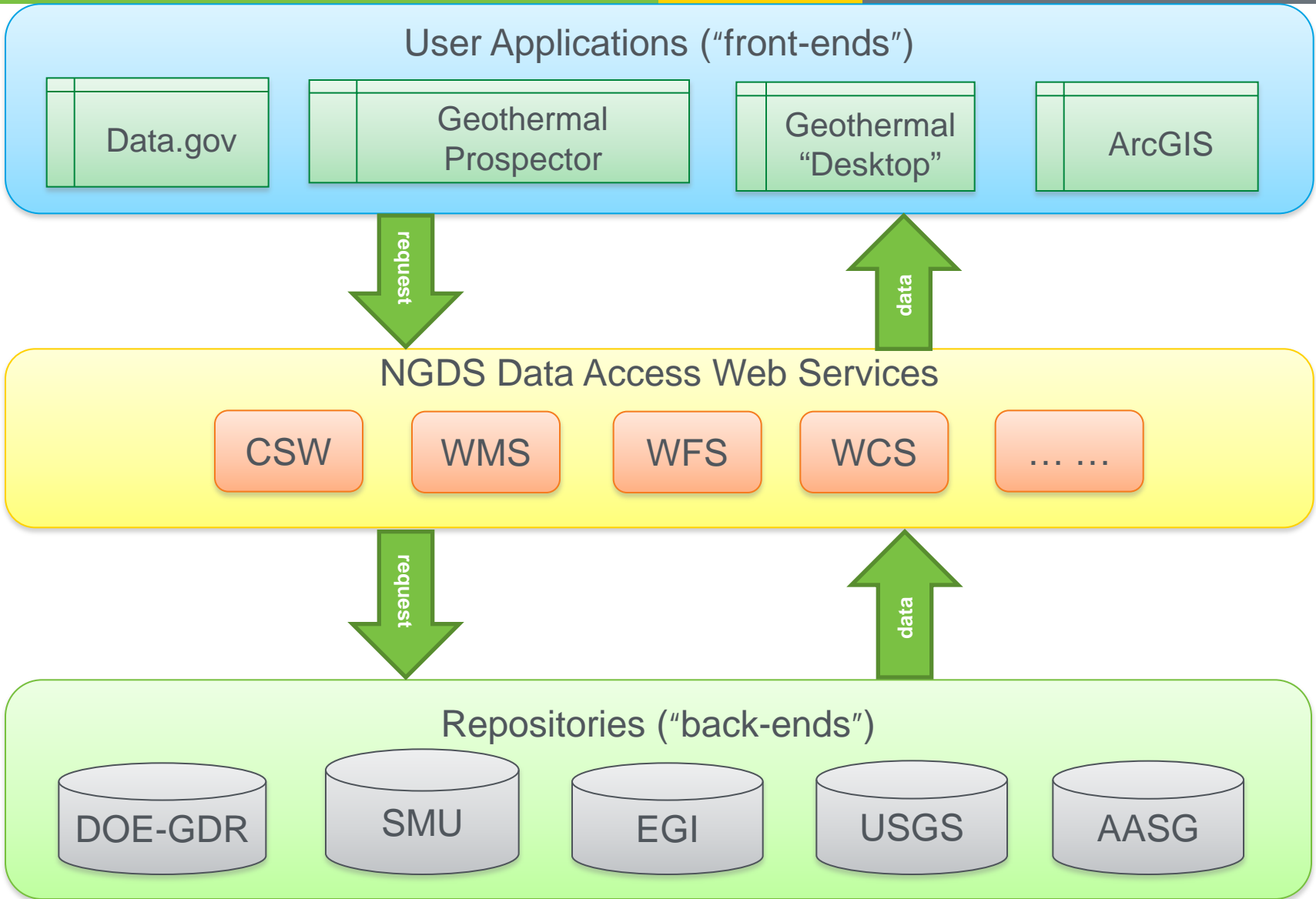
"Our **success** should be measured not when a project is completed or an experiment concluded, but when **scientific and technical information is disseminated**. Beyond broad availability of technical reports, e-prints and multimedia, and publication in peer-reviewed journals, **open access to experimental data and analysis codes** is increasingly important in policy-relevant research areas. The Department will establish guidelines for use with both grants and contracts to **ensure appropriate access to, and retention of, scientific data and analysis methods**. In more applied areas, **knowledge of what did not work** can be of equal value with **positive results**, for that can prevent the misapplication of significant private resources. The Department will therefore encourage the documentation and archiving of negative results from all its performers **using the most advanced informatics tools**."

DOE Strategic Plan, May 2011; Assure Excellence in R&D Management, pp. 43-44



National Geothermal Data System (NGDS)

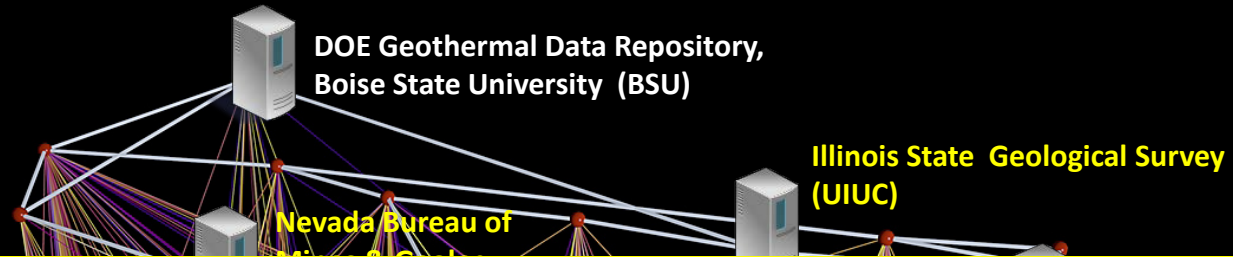
The NGDS is a distributed network of repositories and data sites mitigating the upfront risk of geothermal energy development by employing state-of-the-art information science to provide access to quality and comprehensive data.



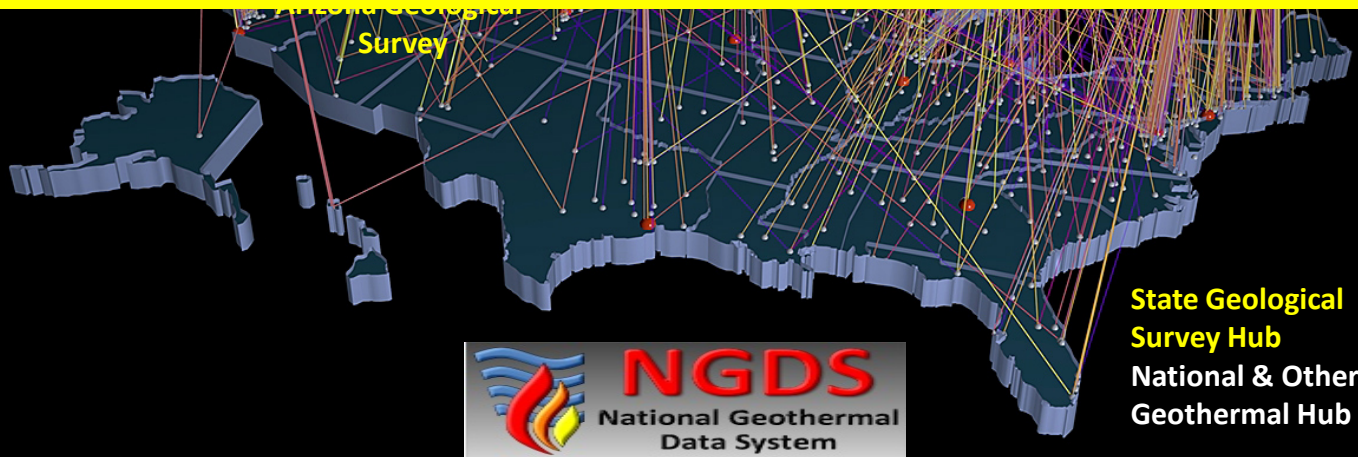
NGDS Architecture: An Integrated, Distributed Data Network

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy

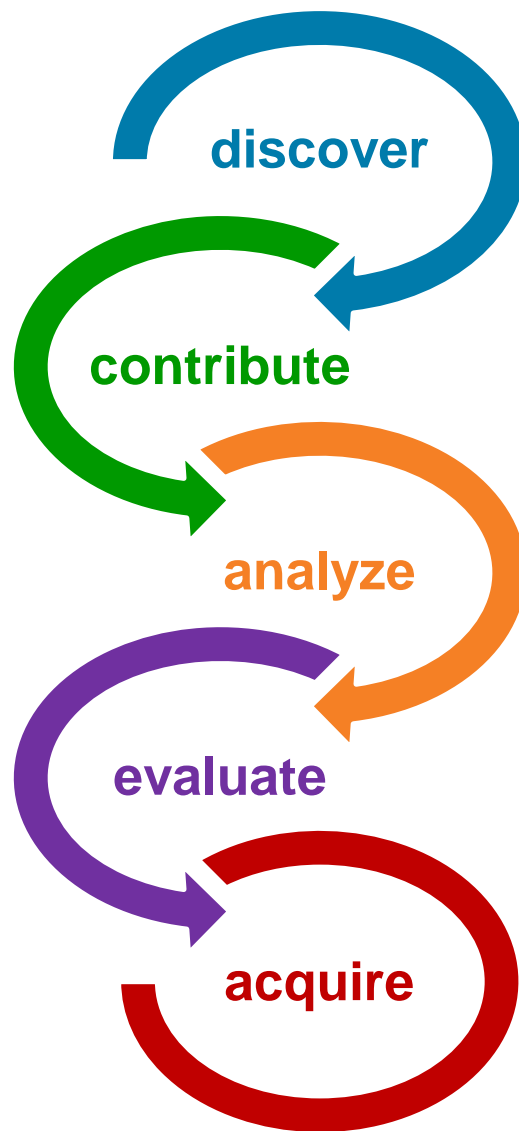


**The “killer app” for geothermal
data integration in the U.S.**



- Add and catalog data resources
- Provide feedback

- Determine resource relevance, timeliness, pedigree, methods, etc. of data resources

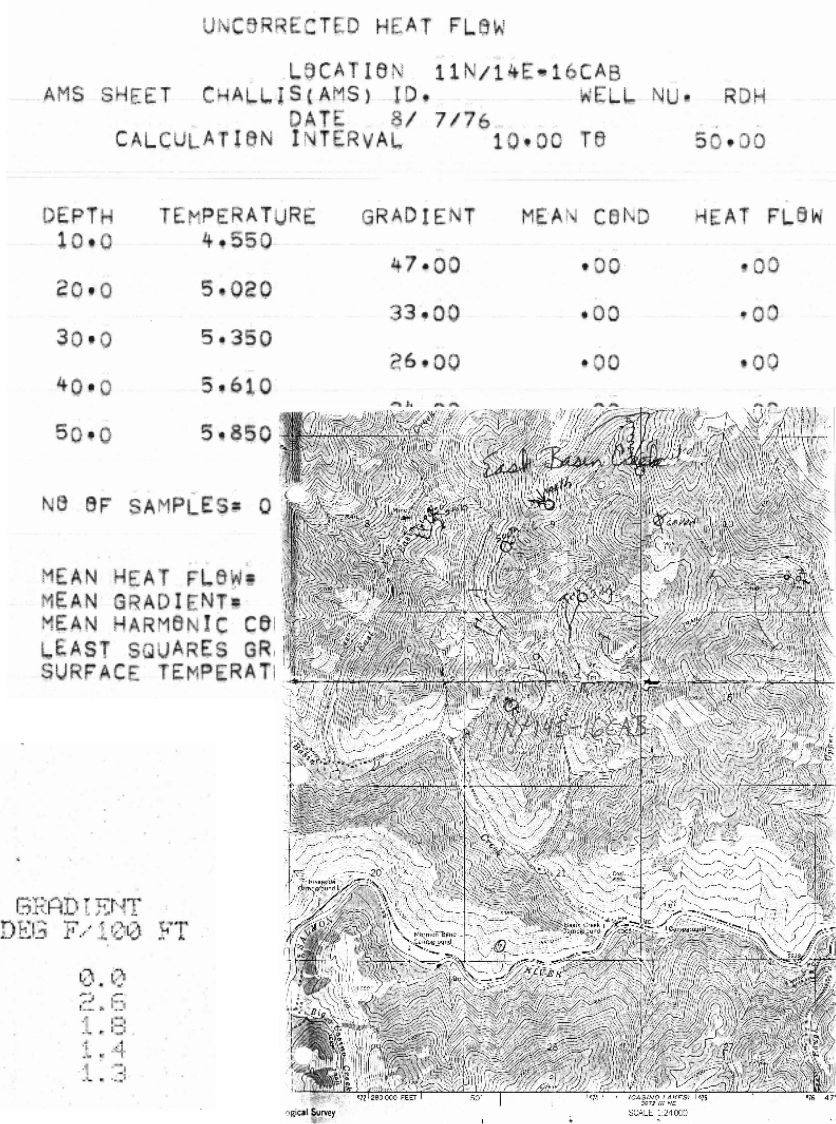


- Search NGDS catalog to find data relevant to a need

- Utilize data for your own calculations/simulations
- Derive new data

- Access and download useful data resources in consumable formats
- Data sharing applications (web services) and tools

- Researcher utilizes the SMU Heat Flow Database and questions certain results.
- Because field notes are scanned, SMU can now **quickly respond and give in-depth information** about specific wells in the database and **increase researcher's understanding** of how heat moves through the crust.



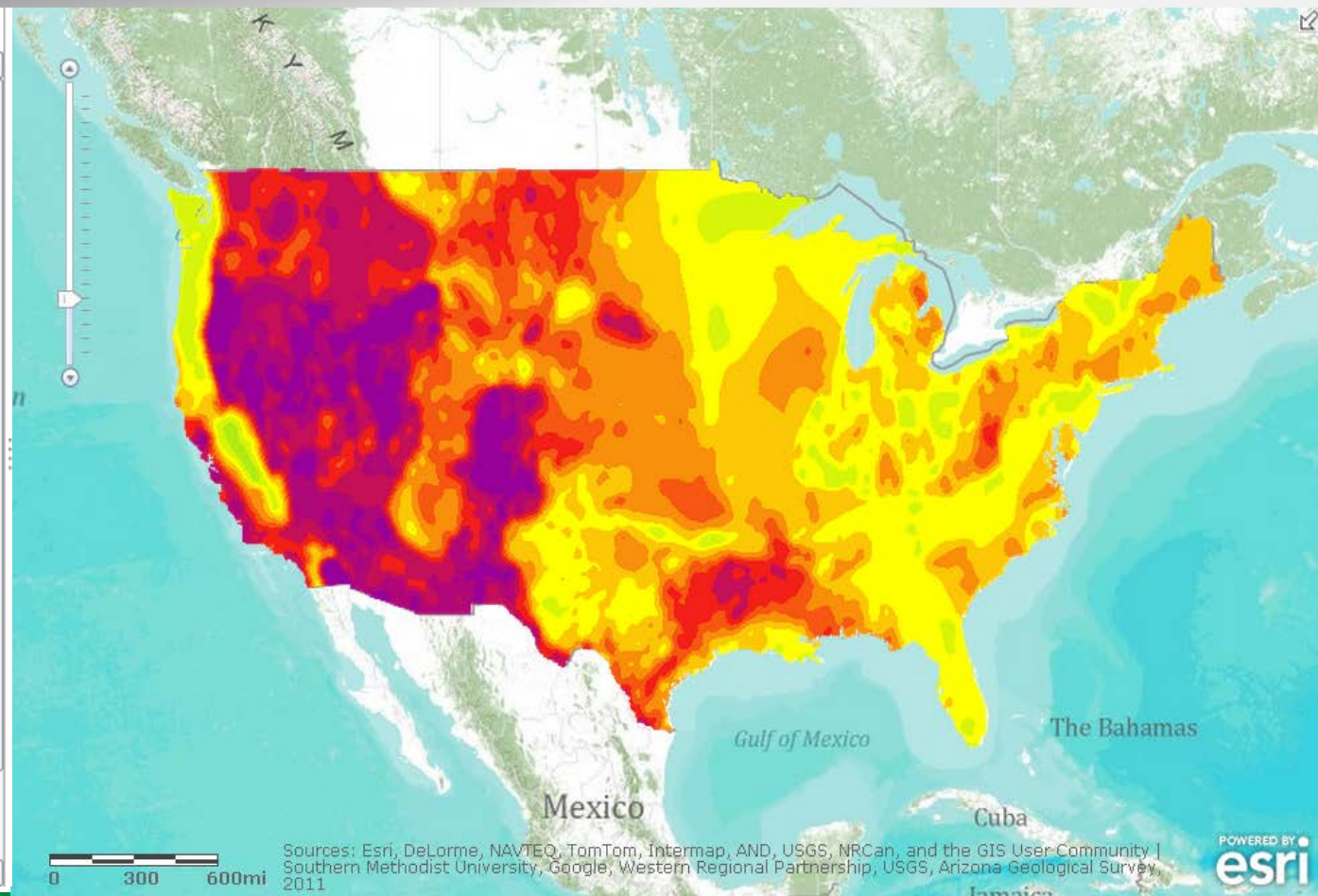
LOCATION: CHALLIS(AMS) ID.
11N/14E-16CAB
HOLE NUMBER: RDH
DATE MEASURED: 8/ 7/76

DEPTH METERS	DEPTH FEET	TEMPERATURE		GEOTHERMAL GRADIENT	
		DEG C	DEG F	DEG C/KM	DEG F/100 FT
10.0	32.8	4.550	40.19	0.0	0.0
20.0	65.6	5.020	41.04	47.0	2.6
30.0	98.4	5.350	41.63	33.0	1.8
40.0	131.2	5.610	42.10	26.0	1.4
50.0	164.0	5.850	42.53	24.0	1.3



Contents

- Geothermal Potential Service
 - Active Geothermal Sites (Moderate to High-Temperature)
 - Public Lands Not Withdrawn
 - Land Managed for Biodiversity
 - Electrical Transmission Lines
 - Known Geothermal Resource Areas
 - Ave. Potential (Linear Regression)
- Google, Temperature with Depth
 - 3.5 km
 - 4.5 km
 - 5.5 km
 - 6.5 km
 - 7.5 km
 - 10 km
- 2004 Heatflow Maps
- Continental US,



Who Submits Data?

When?

Where?

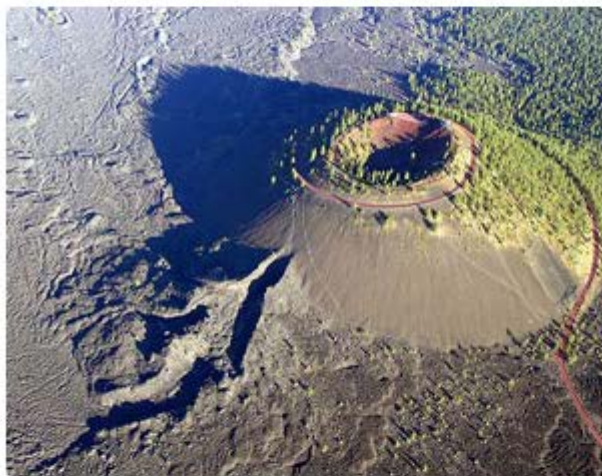
How?

What Kind of Data?

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.

Geothermal Data Repository



Submit your geothermal project and site data to the Geothermal Data Repository (GDR) using the link below. The GDR has been established to securely house data based on individual timelines, some of which have identified a specific 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 uploaded to the GDR.
3. Boise State University is serving as the data curator for the GDR and is also responsible for approving the data release schedules based on previous agreements.

If you have questions regarding this data submission process, please [contact the OpenEI webmaster](#) .

[Create an OpenEI account](#) or [login](#) to submit data

Step 1. Registration

- You must register for an account at the data submission site prior to submitting any data.
- Registration establishes a user account with ID and password, and authorization to submit data to the DOE-GDR.
- Visit the DOE-GDR website at <https://gdr.openei.org> to initiate your account registration and perform all actions associated with data submission.
- For technical assistance with the registration or data submission interface, contact the OpenEI team at openei.webmaster@nrel.gov.

Step 2. Data Submission

- Once registered, you must log into the data submission site <https://gdr.openei.org> to submit data.
- For each data resource (e.g., Excel file, Word document, PDF, or data containment software), you must:
 - Provide appropriate metadata and contact information
 - Agree to the data handling terms of the DOE-GDR
 - Specify the release date for any Protected Data (if applicable), consistent with your Intellectual Property Provisions
 - Attach the data

After your data has been submitted, you will not be able to edit it for the duration of the review and curation process—Boise State University (BSU) curates all DOE geothermal project data. It is recommended that you retain a copy of the submitted data.

OpenEI | OPENENERGYINFO Welcome

[Wiki](#) [Apps](#) [Datasets](#) [Linked Data](#)

[GDR Home](#) [Browse GDR Datasets](#) [Browse All OpenEI Datasets](#)

Create GDR data submission

Dataset/Collection Name *

Abstract

A brief description of the dataset/collection.

Keywords

Geothermal ✖ Drilling ✖ high temperature ✖ harsh environment ✖

⊞

Type **enter** after a keyword to add additional keywords.

Publisher/Contributing Institution *

The service or organization(s) responsible for making the dataset/collection available.
[Add an Organization](#)

Publication Year

 ▼

Moratorium Release Date

Format: 04/23/2012
Selecting a release date will prevent public access to this dataset/collection until the selected date.

How - DOE-GDR Metadata Loader

The screenshot shows a Microsoft Excel spreadsheet titled "GDExGeneralProductsMetadataLoader V221.xlsm". The ribbon includes File, Home, Insert, Page Layout, Formulas, Data, Review, View, Add-Ins, and Design. The active cell is E24. The spreadsheet contains the following data:

	A	B	C	D	E	F	G	
2	GRANT/Project ID:							
3	GRANT/Project Title:							
4	GRANT/Project Principal Investigator:							
6	Resource/File Name	Format	Type	Public	Moratorium Release Date	Language	Title	DateP
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								

The bottom status bar shows "Cell C2 commented by Administrator" and a zoom level of 85%.

Step 3. Protected Data

- Data submitted to the DOE-GDR and identified as "Protected Data" are subject to the terms and conditions set forth in your Intellectual Property Provision incorporated into your Award.
- During the period prior to the public release date, Protected Data are held in a secure data store with restricted access pursuant to the Intellectual Property Terms and Conditions. All other submitted data will be made publically available once accepted into the DOE-GDR system.

Step 4. Cancellation or Resubmission

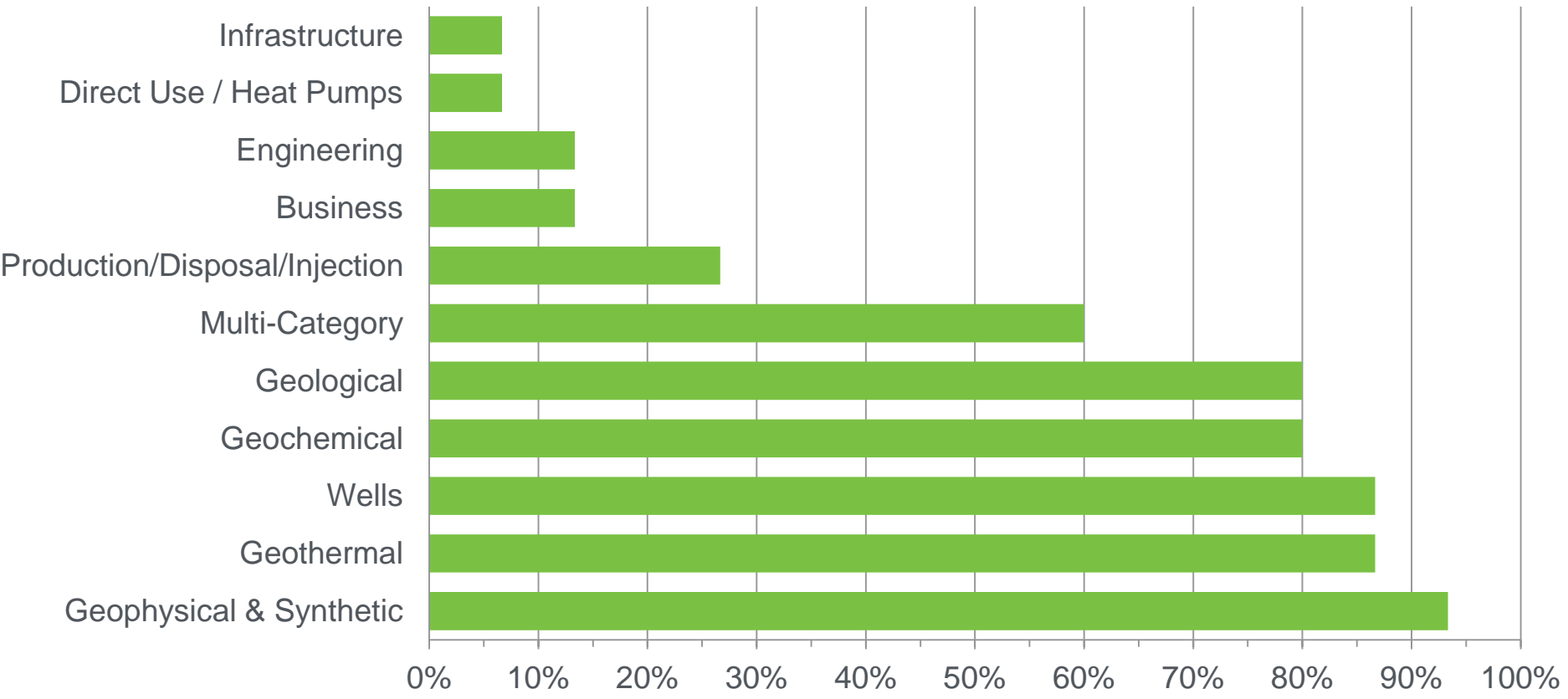
- You may cancel a submission at any time prior to public release. Cancellation will terminate the curation process and remove any copies of the originally submitted data from the system.
- If you wish to edit data or metadata after submission, you will need to cancel and resubmit.

DATA TYPES - Geothermal Data Submission Document Available June 2012

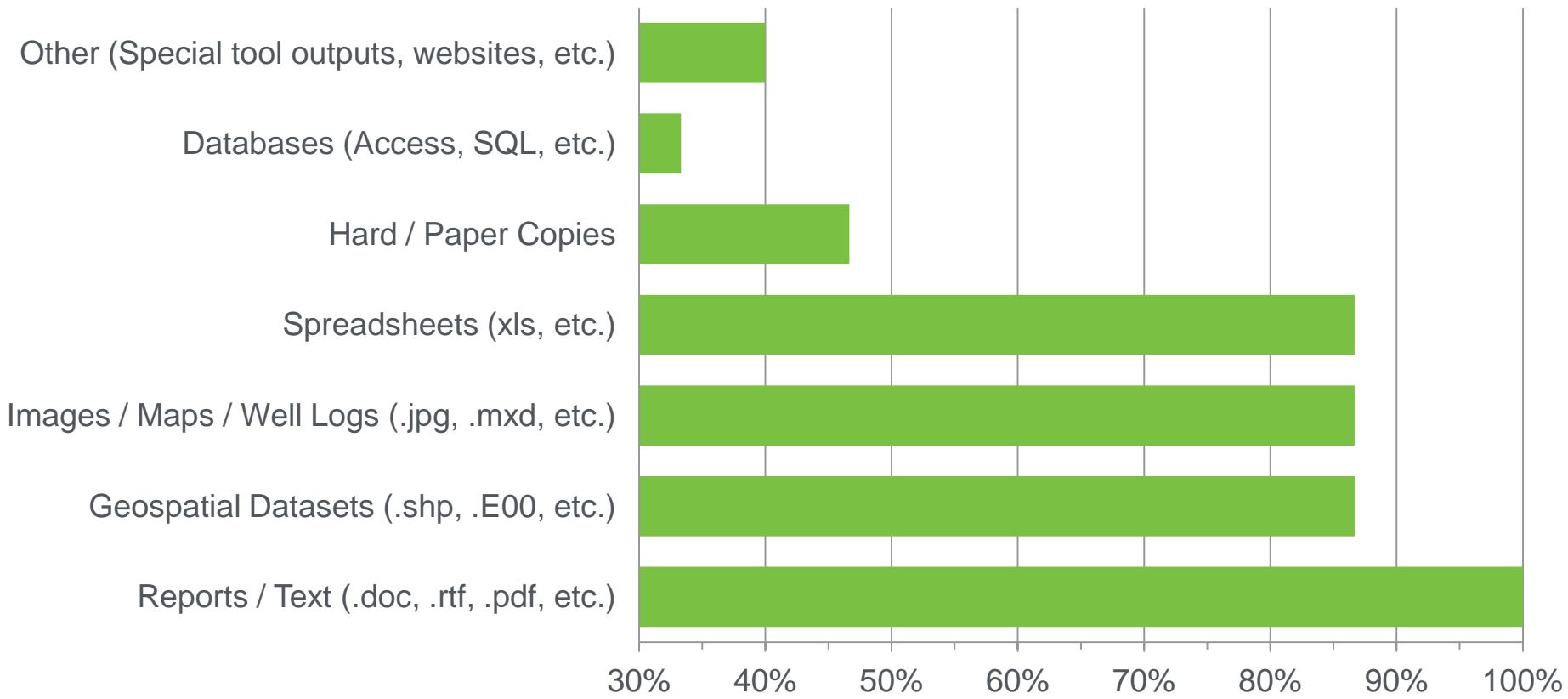
- [Active Fault/Quaternary Fault](#)
- [Aqueous Chemistry](#)
- [Borehole Temperature Observation Feature](#)
- [Direct Use Feature](#)
- [Drill Stem Test Observations](#)
- [Earthquake Hypocenter](#)
- [Fault Feature](#)
- [Geologic Contact Feature](#)
- [Geologic Unit Feature](#)
- [Geothermal Area](#)
- [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

Intended Data Categories



Intended Data Formats



State Geothermal Data Templates

<http://stategeothermaldata.org>

The screenshot shows a Mozilla Firefox browser window displaying the State Geothermal Data website. The browser's address bar shows the URL <http://stategeothermaldata.org/>. The website's header features the logo and the text "STATE GEOTHERMAL DATA" in large white letters on a dark blue background. To the right of the header, there are links for "CONTACT", "LOGIN", and "NEW USER?", along with a search bar. Below the header is a navigation menu with buttons for "HOME", "ABOUT", "DATA DELIVERY", "PROGRESS", "NEWS", "FORUMS", "MEDIA", and "MEMBERS". The "DATA DELIVERY" button is highlighted in orange, and a dropdown menu is open, listing several options: "DATA DEVELOPMENT CYCLE", "DATA DELIVERY TECHNICAL DISCUSSION", "DATA ITEM CATEGORIES", "GEOLOGIC MAP DATA", "GLOSSARY OF TERMS", "USER SCENARIOS", "VOCABULARIES", and "CONTENT MODEL TEMPLATES". The "CONTENT MODEL TEMPLATES" option is circled in red. The background of the website is a photograph of a snowy mountain landscape with a large plume of white steam rising from a geothermal vent. At the bottom of the browser window, the address bar shows the full URL: http://stategeothermaldata.org/data_delivery/content_model_templates.

Microseismic monitoring: Hypocenter Template

Active Fault template has been review and 'adopted', hypocenter is still in comment period.

Title NGDS Data Delivery Model: Hypocenter Observation Feature

	A	B	C	D	E	F	G	H	I	J	K
1	HypocenterURI	EarthquakeName	Source	CatalogSourceCode	OriginDateTime	County	State	Latitude	Longitude	SRS	Depth
2	http://eq.iris.org/1253175	theBigOne			1995-01-01 00:00:00Z			19.8782	-155.9351	WGS84	
3											
4											
5											
6											
7											
8											
9											

Thermal water and tracer data: Aqueous Chemistry Template

Title NGDS Data Delivery Model: Aqueous Chemistry Analysis

The screenshot shows two overlapping Excel windows. The top window, titled 'AqueousChemistryTemplate1.5.xlsx - Microsoft Excel', displays a spreadsheet with a yellow header row containing the text 'Basic properties reported for all analyses'. Below this is a pink row labeled 'Sample characterization'. The bottom window, also titled 'AqueousChemistryTemplate1.5.xlsx - Microsoft Excel', shows a detailed table with the following structure:

1	Basic Data	Quality	Common Analytes	Base Metals	Major Dissolved Constituents	mgL = mg/L						
2	AnalysisURI	pH_field	FractionAnalyzed	fractionAnalyzed	Ca_mgL	Mg_mgL	Na_mgL	K_mgL	SiO2_mgL	Cl_mgL	F_mgL	SO4_mgL
3												

Temperature, pressure, and flow monitoring: Oil, Gas, and Geothermal Well Templates

- Multiple Borehole temperature observation feature
- Titles
 - Drill Stem Test Observations
 - Well Header template
 - Well Log Data Compilation workbook

WellLogDataTemplate1.2.xls [Compatibility Mode] - Microsoft Excel










WellHeader URI	WellName	APINo	OtherID	OtherName	BoreholeName	Operator	LeaseOwner	LeaseNo	SpudDate	EndedDrillingDate	WellType
42-501-20130-03-00	Bozo 1 OilCompany. <i>This row contains example data for reference only.</i>	42-501-20130-03-00							1980-01-01T00:00	1981-02-22T00:00	shut in oil and gas

Data Provision Contacts

Data Provision Summary	Website	Contact
Registration	https://gdr.openei.org	Open EI Team at NREL openei.webmaster@nrel.gov
Data submission	https://gdr.openei.org	Open EI Team at NREL openei.webmaster@nrel.gov
Information and assistance concerning: <ul style="list-style-type: none">• Preparation of data files and metadata, or• The curation process (prior to, during and/or post submission of data).	www.geothermalex.org/DOEFundedProjects.aspx	GDEx Team at BSU geothermaldata@boisestate.edu
General information about the DOE Geothermal Data Repository and the National Geothermal Data System	www.geothermal.energy.gov	Arlene Anderson at U.S. DOE Geothermal Technologies Program arlene.anderson@ee.doe.gov

BACK-UP

What Makes an NGDS "Node"? (capabilities)

what capabilities does this node host?				
Example Node	self-hosted	hosted elsewhere	not hosted	
NGDS "Node" Functional Component				If hosted elsewhere, what node is hosting?
Data Asset Repository				
Data Access Services (WMS, WFS, WCS, ...)				GDEx
Data Access Application				
Metadata Repository (catalog data store)				
Catalog Service (CSW)				GDEx
Catalog Access Application				GDEx

What Makes an NGDS "Node"? (data formats)

to what kinds of data is this node providing access?				
Example Node	self-hosted	hosted elsewhere	not hosted	
NGDS "Node" Asset Types (geothermal-relevant assets that get a metadata record)				If hosted elsewhere, what node is hosting?
Web Sites				various
Files				
Documents (.doc, .pdf, .ppt, ...)				
Structured data sets (.xls, .xml, ...)				
GIS (maps, shape files, features, ...)				
non-GIS (.las, ...)				
Images (.tif, .jpg, .png, ...)				
Audio (.mp3, .wav, .wma, ...)				
Video (.mp4, .mov, ...)				
Databases				
Traditional Relational (Access, SQL, Oracle, ...)				
non-Traditional (HBase, Virtuoso, MongoDB, ...)				
Applications				
Web Applications				
Desktop Applications (Windows, MacOS, ...)				
Mobile Applications (iOS, Android, ...)				



<h3>? WHAT IS USGIN?</h3> <p>A national distributed, interoperable data network for the Geosciences.</p> <p>Learn more ></p>	<h3>📍 WHY USGIN?</h3> <p>The motivation for a geoscience information network is based on addressing very specific user needs...</p> <p>Read more ></p>	<h3>📄 HOW DOES IT WORK?</h3> <p>The system architecture is component based and streamlines providing solutions for users...</p> <p>Read more ></p>	<h3>💡 GET INVOLVED</h3> <p>Learn about the management of network development, how to get involved, and what kind of resources are required...</p> <p>Read more ></p>
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- #### MAIN MENU
- Home
 - The News
 - FAQ
 - Web Links
 - News Feeds

THE US GIN PROJECT

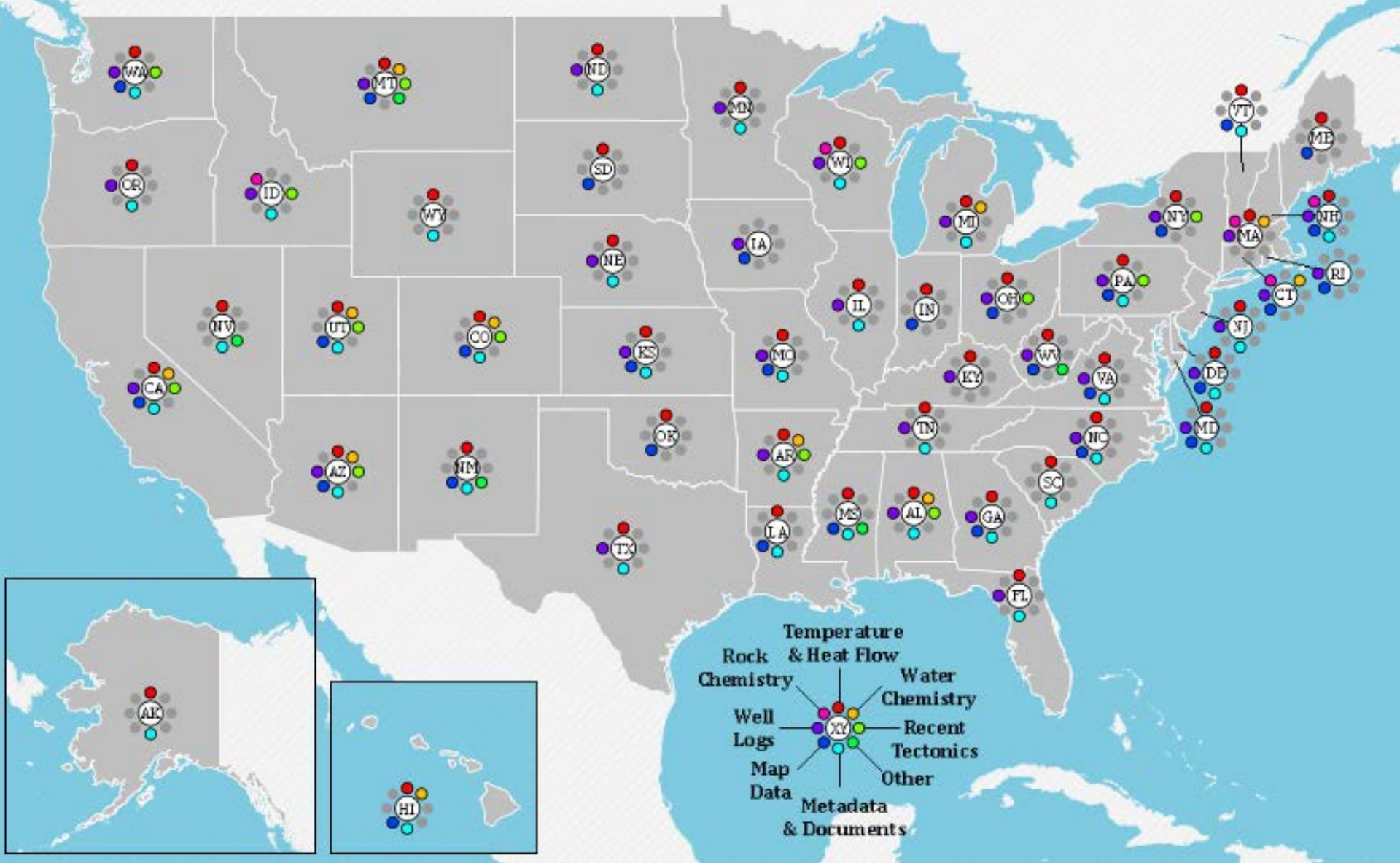
The US Geoscience Information Network (GIN) is a system of state and federal geological survey online data providers and user applications linked together by a collection of shared web services and interchange formats for the purpose of finding accessing, and using geoscientific information.

The objective of the GIN project is to develop standardized services to make data resources of the state and federal geological surveys accessible online in a distributed network using a few standards and protocols, and to work with data providers to implement these services. The network is open to all providers and users. We hope it will become a core component of the emerging cyberinfrastructure for the Earth sciences.

State Geothermal Data Contribution Status by Data Theme

8/11/2011

Interactive Online
Deliverables Map - YR 1

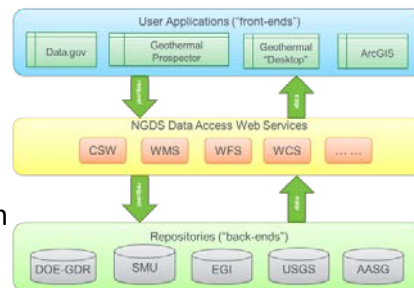


NGDS Projects Overview For AASG

March 14, 2012

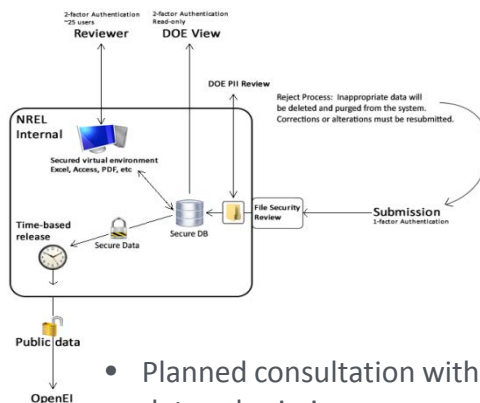
NGDS Design & Testing: BSU & UNR, EGI, OIT, Stanford, AZGS 35% spent of \$4,992,089

- March 15, 2012: Progress Review indicates continued system design challenges
- May 10, 2012 NGDS Design and Testing Phase II go/no-go review
- October 1, 2012: Phase II I review
- EERE CTO providing BSU technical assistance about distributed system design and user interface



DOE Geothermal Data Repository: BSU & NREL

83% spent of \$1,550,000



- October 1, 2012: go/no-go final decision point.
- Now accepting DOE GTP Project Data in a secure environment hosted by OpenEI. BSU continues serving as data curator.

- Planned consultation with DOE RD&D project PI's assist with data submissions

SMU Heat Flow Database: SMU & SCR, BEG, Cornell, GRC, MLKay, TTU, UND 46% spent of \$5,250,000

- System Information Architecture for SMU Consortium's heat flow and geothermal data aggregation platform finalized
- Documenting quality and correction methods used for new heat flow data underlying 2011 heat flow map
- GRC online database under construction
- Prepared over 800,000 well records from TX, NY, PA, ND, and Gulf Coast Offshore
- Cornell automated software tools demonstrated at FY12 2nd QTR Data Quality and Site Visit

State Contributions to NGDS: AZGS & AASG

33% spent of \$21,858,224

- Approved and placed online 185 data sets during FY12 (overlap in approval from FY11) Completed a Metadata Editor
- GTP to request waiver Extending project through December 2013.
- June 2012: Update Management Advisory Board at AASG Annual
- June 21012 Science Advisory Board conduct Year 2 data review
- Excel based catalog search plug-in for data access and services
- Host a web map services workshop for state geological surveys and geothermal expert panel for state surveys

Nationwide Launch of NGDS Portal to Geothermal Repositories - 2014

Supplemental funding for new data acquisition

Drilling Projects	Funding Received
Idaho*	\$457,662.80
Nevada*	\$504,201.80
Oregon*	\$526,803.80
Utah*	\$516,294.80
Washington	\$648,878.80
Non Drilling Projects	Funding Received
Arizona	\$179,976.00
Colorado	\$174,763.00
Indiana	\$69,975.00
Maine	\$49,912.00
Massachusetts	\$74,839.00
New Jersey	\$49,989.00
New Mexico	\$200,000.00
Oklahoma	\$20,000.00
Pennsylvania	\$83,425.00
Vermont	\$78,870.00
West Virginia	\$42,858.00

**Total Awarded:
\$3,678,449.00**

* Members of the Great Basin Drilling Consortium, awarded \$1,000,000.00 for drilling services split equally between members

Top 15 Funded States

State	Funding Amount
Washington	\$1,249,146
Nevada	\$1,070,639
Utah	\$966,834
Oregon	\$958,847
Idaho	\$873,562
Texas	\$743,481
Colorado	\$617,021
New Mexico	\$605,483
Kentucky	\$585,977
Massachusetts	\$515,901
Illinois	\$507,809
Hawaii	\$499,951
Montana	\$401,009
Indiana	\$378,499
Wisconsin	\$329,135

*AZ & CA data collection is part of the AZGS award and is not included in this summary