

Geoscience Information Network (US GIN)



1,000's of databases

1,000's of collections

80,000+ geologic maps

**Distributed
Web-based
Interoperable
Open source**



A different business model

Traditional

Lobby Congress for a new program, housed in USGS. Share the appropriation.

SGS 2.0

Build capacity and services that we can market to agencies, industry, academia

Implementation



INTEROP-GIN: system design and demonstration



Validated as data integration mechanism by USGS Community on Data Integration



Metadata profile for upstream petroleum industry



Contributions to National Geothermal Data System

Geoscience Partners



Oceans

Ocean Observing Initiative (OOI)

Atmospheres

Earth Science Information Partnership (ESIP)
Federation

Earth Sciences

CUAHSI- Hydrologic Information System
National Geoinformatics Community (NGC)

Environment

DataONE (Data Observation Network for Earth)

International

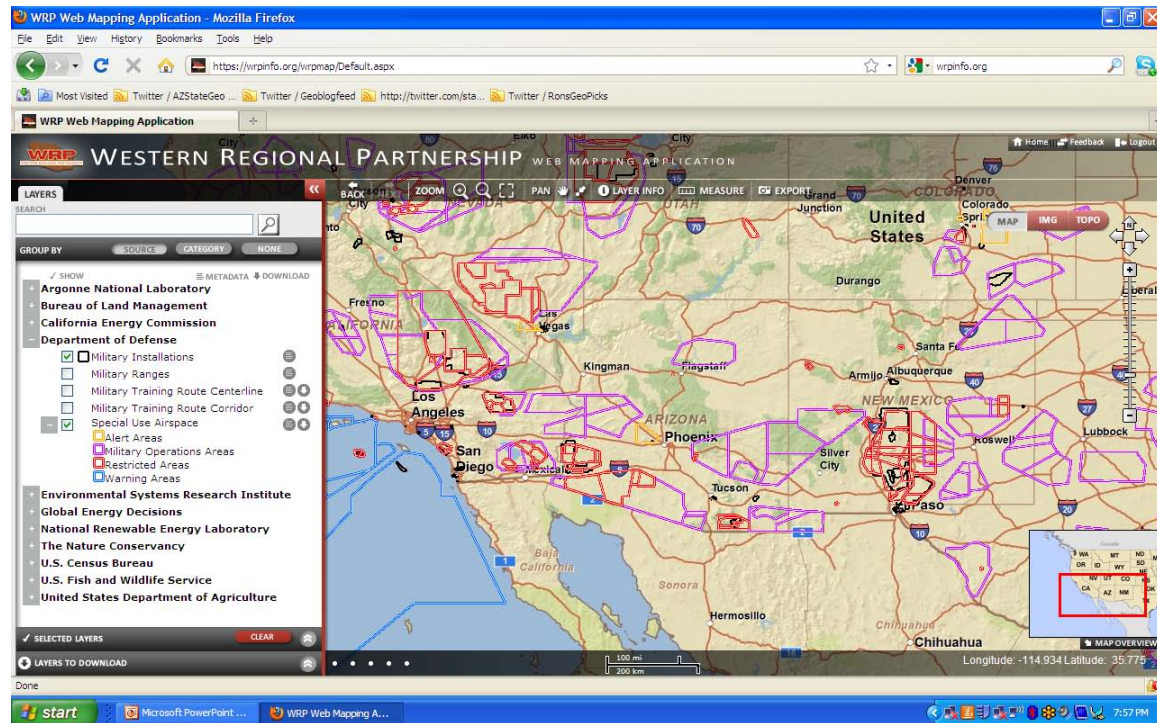
OneGeology

AuScope

Collaborators – New Partners



WESTERN REGIONAL PARTNERSHIP



- Working Agreement
 - 15 Federal Agencies and Governors in NM, AZ, UT, NV, CA
 - 10,000 GIS layers for land use management



Energy Industry Metadata Standards Working Group

- End-to-end discovery, access, and exchange of upstream petroleum data



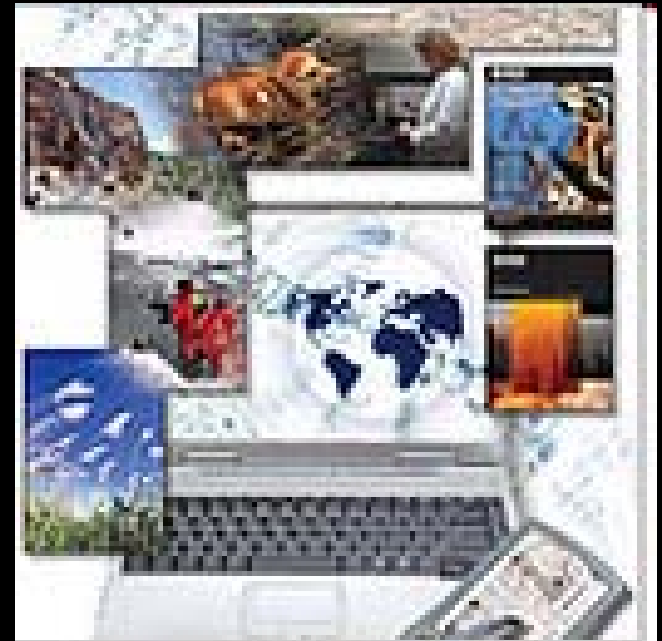
GIN (Geosciences Information Network)
Architecture Example – *The NGDS Pilot Project*



Core Science Systems

Core System Informatics

- data integration services
- capacity
- framework for science programs



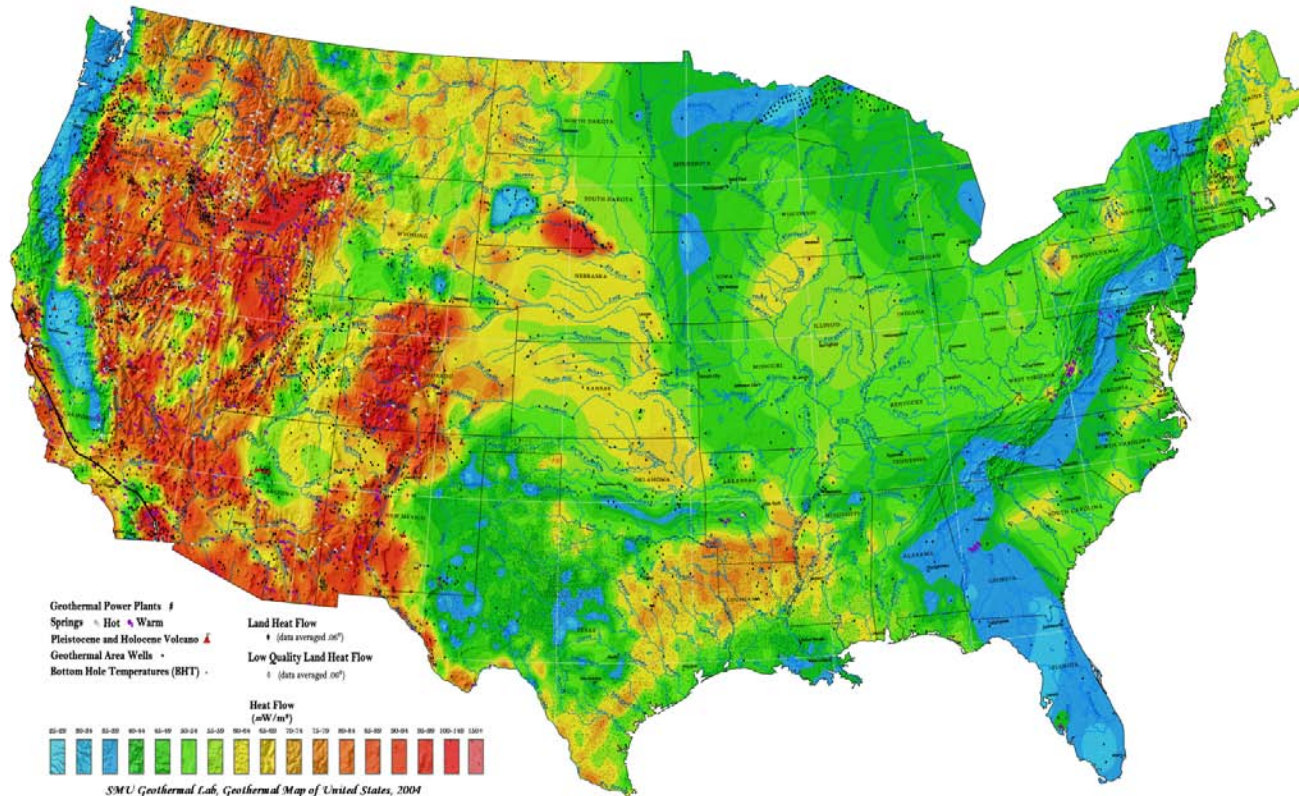
US GIN Strategic Plan

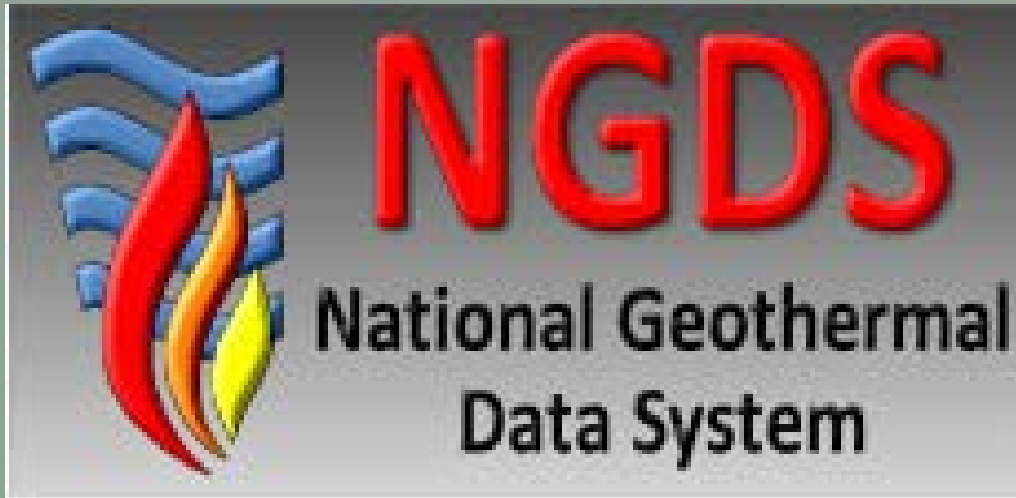
- business/sustainability model
- governance
- inventory of 'owned' resources
- delivery August 2011



State Geological Survey Contributions to the National Geothermal Data System

www.stategeothermaldata.org





**DOE & USGS
Data**

*Boise State
University*

**National
Assessment**

USGS

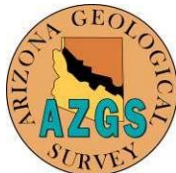
**University
Data**

*Southern
Methodist
University*

**“State
Geological
Survey
Contributions
to the NGDS”**

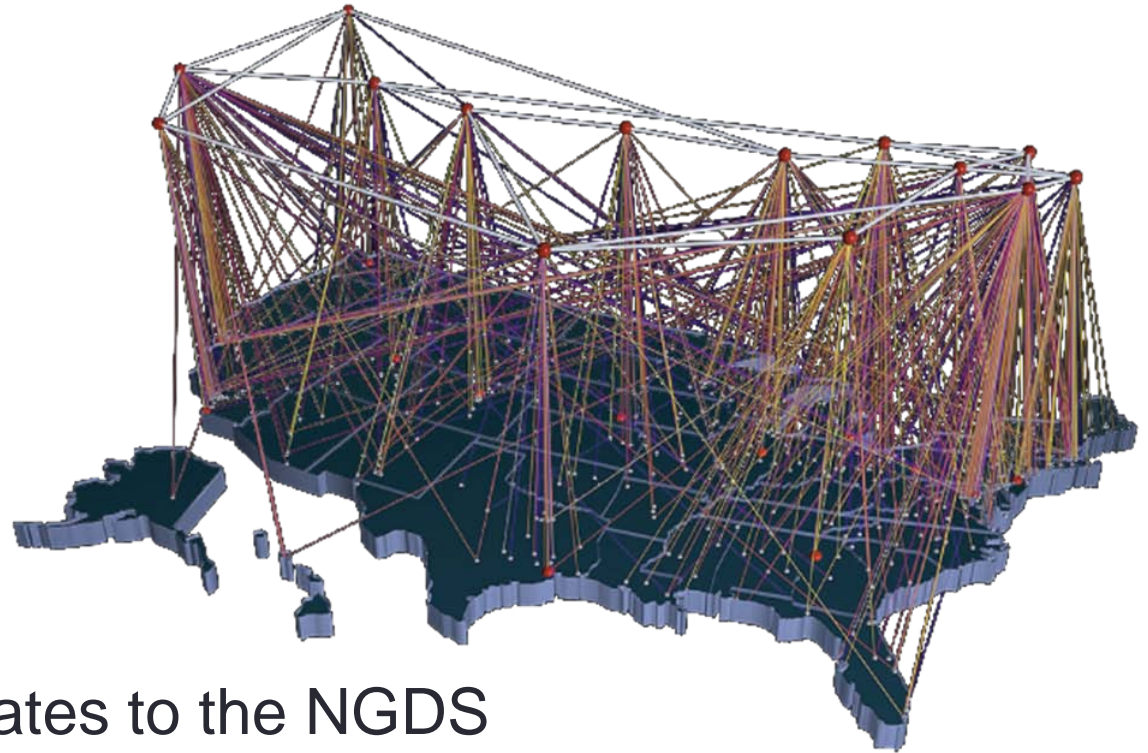
AASG - AZGS

**DOE
GTP-funded
projects**



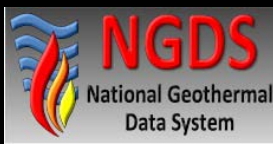
Overview

National Geothermal Data System



- Data from all 50 states to the NGDS
- Streamline access to geoscientific information used to locate, evaluate, and develop geothermal resources
- Web-based, distributed, interoperable, open source
- New paradigm in data stewardship





**Nevada Bureau of
Mines & Geology
(UNR)**

DataONE



**Illinois State
Geological Survey
(UIUC)**

WRP



**Arizona Geological
Survey**



SMU

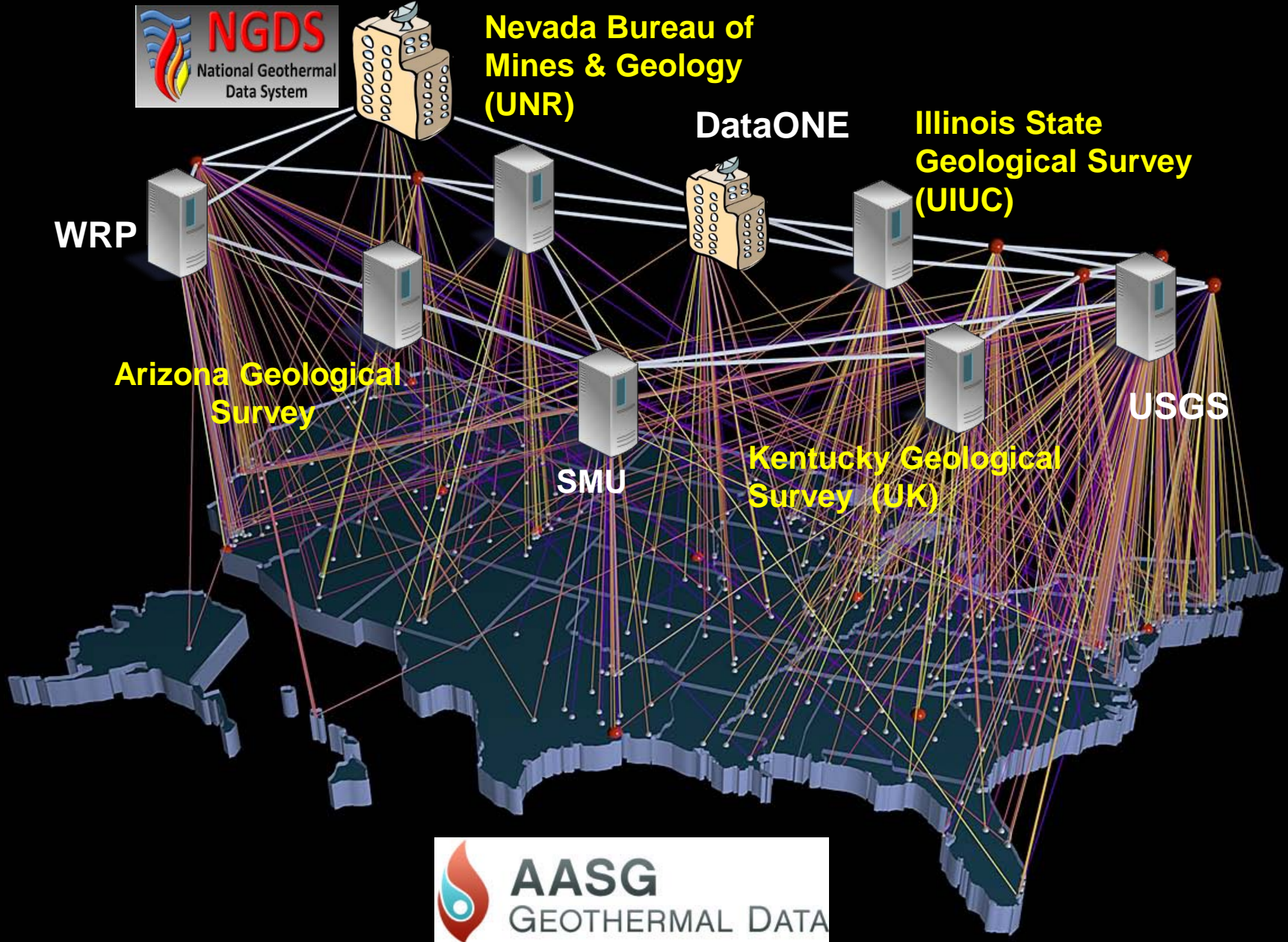
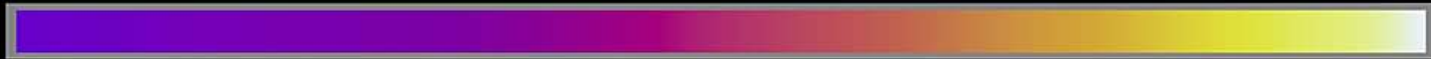


**Kentucky Geological
Survey (UK)**

USGS



**AASG
GEOTHERMAL DATA**





STATE GEOTHERMAL DATA

Selected data resources in State Geological Surveys

3.5 million wells – oil & gas, water

195,000 well logs

50,000 geothermal wells

750,000 BHT's

6 Tb existing digital data

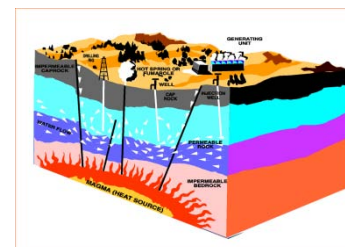
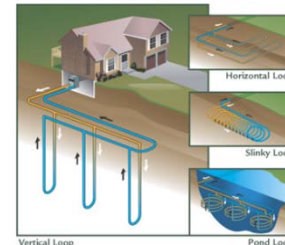
>75,000 scanned publications & maps

2.5 million feet of core

600,000 sample logs



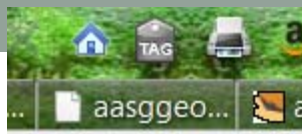
Geothermal Energy for the Home



The components

- **Catalog – find information**
- **Services – get information**
- **Clients – use information**





JET TECHNICAL SERVICES	
TEMPERATURE LOG	
WELL NAME	CREST OIL SPURLOCK
WELL NUMBER	1
WELL TYPE	WELDER
WELL STATUS	ACTIVE
WELL DEPTH	1780' MAX & 1900' TEL
WELL DATE	3 7 2006
WELL TIME	3:20 PM
WELL LOCATION	STATE OF ARIZONA
WELL SURFACE	4' 3.5' SURFACE
WELL SURFACE	1527

USGIN AASG

HOME

SEARCH

Search

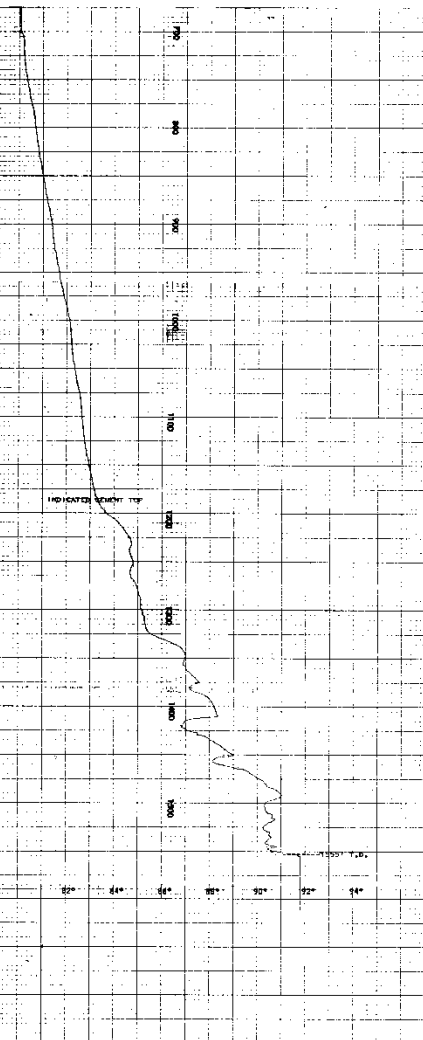
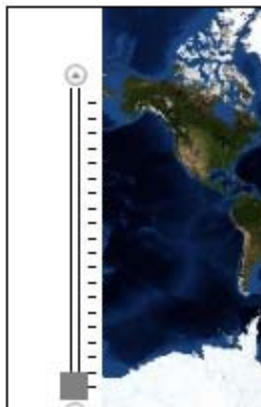
"temperature log"

Records shown for 1 record
Click here to select different records

Additional Options
Clear

WHERE

Anywhere In



portal/catalog/main/home.page

IN A... EarthSc... http...WFS News an... USG... x

Login Register Help About Feedback

Data Catalog



Results 1-10 of 142 record(s) 1 2 3 4 5 > Last

Expand results Zoom To Results Zoom To Searched Area

Scanned Temperature Log for Hallett Development 1 State

Scanned Temperature Log for Merrion 1 Navajo-E

Scanned Temperature Log for Arkla Exploration 64 State

Scanned Temperature Log for Crest Oil 1 Spurlock

Tiff image file, scanned with NeuraLog scanner. Originator organization is the name of the company that ran the log where that is available. Includes log run 1. Logged by Jet Technical Services. Formation at TD is Precambrian granite.

Open Preview Details Metadata Zoom To

Scanned Temperature Log for AmeriGas 3 Roach-Baker

Scanned Temperature Log for AmeriGas 3 Roach-Baker

Scanned Temperature Log for AmeriGas 3 Roach-Baker

Scanned Temperature Log for AmeriGas 2 Roach-Baker

Scanned Temperature Log for Phillips Petroleum A1 State

Association of American State Geologists



Content Models

- **Active Fault**
- Alteration description
- Aquifer temperature map
- Borehole lithology log
- **Borehole temperature data**
- Crustal Stress data
- Developed geothermal system feature
- **Direct use feature**
- **Drill stem test**
- **Earthquake hypocenter**
- Enhanced geothermal system feature
- **Aqueous chemistry**
- Geologic map
- Geologic Unit geothermal characterization
- Geothermal map
- Gravity data
- Heat flow measurement
- **Hot spring description**
- Isopach map
- **Metadata**
- Permeability
- Production statistics record
- Resource suitability map
- Rock chemistry
- Thermal conductivity measurement
- **Well header**
- **Volcanic vent description**



Content Models

STATE GEOLOGY

HOME OVERVIEW DATA DELIVERY FILE REPORTS

Home » Data Delivery » Content Model Templates

Content Model Templates

Each of the following information content system servers observe and include:

In order of the content model desired template:

- Active Fault Templates
- Basic Metadata Template
- Direct Use Feature
- Hot Spring Feature Template
- Oil, Gas and Exploratory Well Templates

	AP	AQ
1	MeasuredTemperature	CorrectedTemperature

	A	B
1	HotSpringURI	Name
2		
3		

```

services.azgs.az.gov/arcgis/services/aasggeothermal/AZThermalSprings/MapServer/WFS?
<wfs:FeatureCollection xsi:schemaLocation="http://stategeothermaldata.org/uri-gin/aasg/xmlschema/simple
http://services.azgs.az.gov/arcgis/services/aasggeothermal/AZThermalSprings/MapServer/WFSServer?request
http://www.opengis.net/wfs http://schemas.opengis.net/wfs/1.1.0/wfs.xsd" xmlns:aasg="http://stategeothe
xmlns:gml="http://www.opengis.net/gml" xmlns:wfs="http://www.opengis.net/wfs" xmlns:xsi="http://www.w3.
<gml:boundedBy>
  <gml:Envelope srsName="urn:ogc:def:crs:EPSG:6.9:4326">
    <gml:lowerCorner>31.361999999999998 -114.745</gml:lowerCorner>
    <gml:upperCorner>36.899500000000003 -109.1289</gml:upperCorner>
  </gml:Envelope>
</gml:boundedBy>
<gml:featureMember>
  <aasg:thermalSprings gml:id="F2__1">
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    <aasg:Name>Salado Springs</aasg:Name>
    <aasg:Source>Waring, Gerald A., 1965. Thermal Springs of the United States and Other Countries c
    y.USGS Prof Paper 492, 407 pp. | Berry, George W. , Grim, Paul J. and Ikelman, Joy A. June 19
    d Atmospheric Administration Key to Geophysical Records Documentation No. 12.</aasg:Source>
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    <aasg:County>Apache</aasg:County>
    <aasg:OtherLocationName>AMS SAINT JOHNS | USGS SALADO 7.5</aasg:OtherLocationName>
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    <aasg:Township>12N</aasg:Township>
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    <aasg:Temperature>21.850000000000001</aasg:Temperature>
    <aasg:TemperatureUnits>C</aasg:TemperatureUnits>
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    <aasg:Flow>2</aasg:Flow>
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  </aasg:thermalSprings>
</gml:featureMember>
  </wfs:FeatureCollection>
  
```

WMS for well headers

The screenshot shows the ArcMap interface with a map of well headers overlaid on a topographic map. The search results window is open, displaying the following information:

Oil and Gas Records Search Results:
 Sort By: Record Number (Ascending) | Records Per Page: 10 | Results: 1-10 of 1

[download all oilgas results](#)

-Record #- -Permit #-	E-Log (download if avail)	DiVu Record	<i>if available:</i> Well Sample Report Link
-County / Quadrangle- -Carter Coords-			Core Information Link
-Quick Map View- -Petroleum Map View- -Geologic Map Service- -upload location to GPS (help)-			Production Data Link More info/key
			Pay Data Report Link (every well)
Rec #: 138021 Per #: 105716 ---- County/Quad: Leslie / CUTSHIN Carter Coords: 12-G-75 1360N, 1455W ---- Quick Map: google map view Geol. Map Service: new: geologic map service Petroleum Map: geologic map service Upload to GPS:	✓ Image/File Download	View Documents	Pay Data Report

[download all oilgas results](#)

The Identify window shows the location coordinates (-83.278412, 37.046588) and a table with the following data:

RecNo	HeaderU
13802	http://resources.usgin/kgs/well/R138021

WFS example

ServicesDemo.mxd - ArcMap - ArcInfo

File Edit View Bookmarks Insert Selection Geoprocessing Custc

1:4,456,700

Table Of Contents

Layers

- AZthermalSprings WFS
 - Temperature
 - <25
 - 25-35
 - 35-50
 - 50-75
 - >75
- NGDS_BHT_ELOG_TEST
- California Well Headers
- aasggeothermal/AZBoreholeTemperat
- Basemap
 - Topographic
- Basemap
 - USA Topo Maps
 - USA Topo Maps

Table

AZthermalSprings WFS

SHAPE *	ThermalSpringURI
Multipoint	http://resources.usgin.org/uri-gin/azgs/thermalspring/AP34.43441
Multipoint	http://resources.usgin.org/uri-gin/azgs/thermalspring/CE31.36201
Multipoint	http://resources.usgin.org/uri-gin/azgs/thermalspring/CE31.59211
Multipoint	http://resources.usgin.org/uri-gin/azgs/thermalspring/CE31.67381

services.azgs.az.gov/arcgis/services/aasggeothermal/AZThermalSprings/MapServer/WFS

```
<wfs:FeatureCollection xsi:schemaLocation="http://stategeothermaldata.org/uri-gin/aasg/xmlschema/simple
http://services.azgs.az.gov/arcgis/services/aasggeothermal/AZThermalSprings/MapServer/WFS/Server?request
http://www.opengis.net/wfs http://schemas.opengis.net/wfs/1.1.0/wfs.xsd" xmlns:aasg="http://stategeothe
xmlns:gml="http://www.opengis.net/gml" xmlns:wfs="http://www.opengis.net/wfs" xmlns:xsi="http://www.w3.
<gml:boundedBy>
  <gml:Envelope srsName="urn:ogc:def:crs:EPSG:6.9:4326">
    <gml:lowerCorner>31.361999999999998 -114.745</gml:lowerCorner>
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  </gml:Envelope>
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    <aasg:Name>Salado Springs</aasg:Name>
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    y.USGS Prof Paper 492, 407 pp. | Berry, George W. , Grim, Paul J. and lkelman, Joy A. June 19
    d Atmospheric Administration Key to Geophysical Records Documentation No. 12.</aasg:Source>
    <aasg:FeatureType>warm spring</aasg:FeatureType>
    <aasg:SourceURI>http://www.ngdc.noaa.gov/hazard/data/pp492.pdf</aasg:SourceURI>
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    <aasg:OtherLocationName>AMS SAINT JOHNS | USGS SALADO 7.5</aasg:OtherLocationName>
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    <aasg:State>Arizona</aasg:State>
    <aasg:Range>28E</aasg:Range>
    <aasg:Township>12N</aasg:Township>
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    <aasg:LongDegree>-109.3986</aasg:LongDegree>
    <aasg:LocationUncertaintyStatement>Group of springs on topo</aasg:LocationUncertaintyStatement>
    <aasg:Temperature>21.850000000000001</aasg:Temperature>
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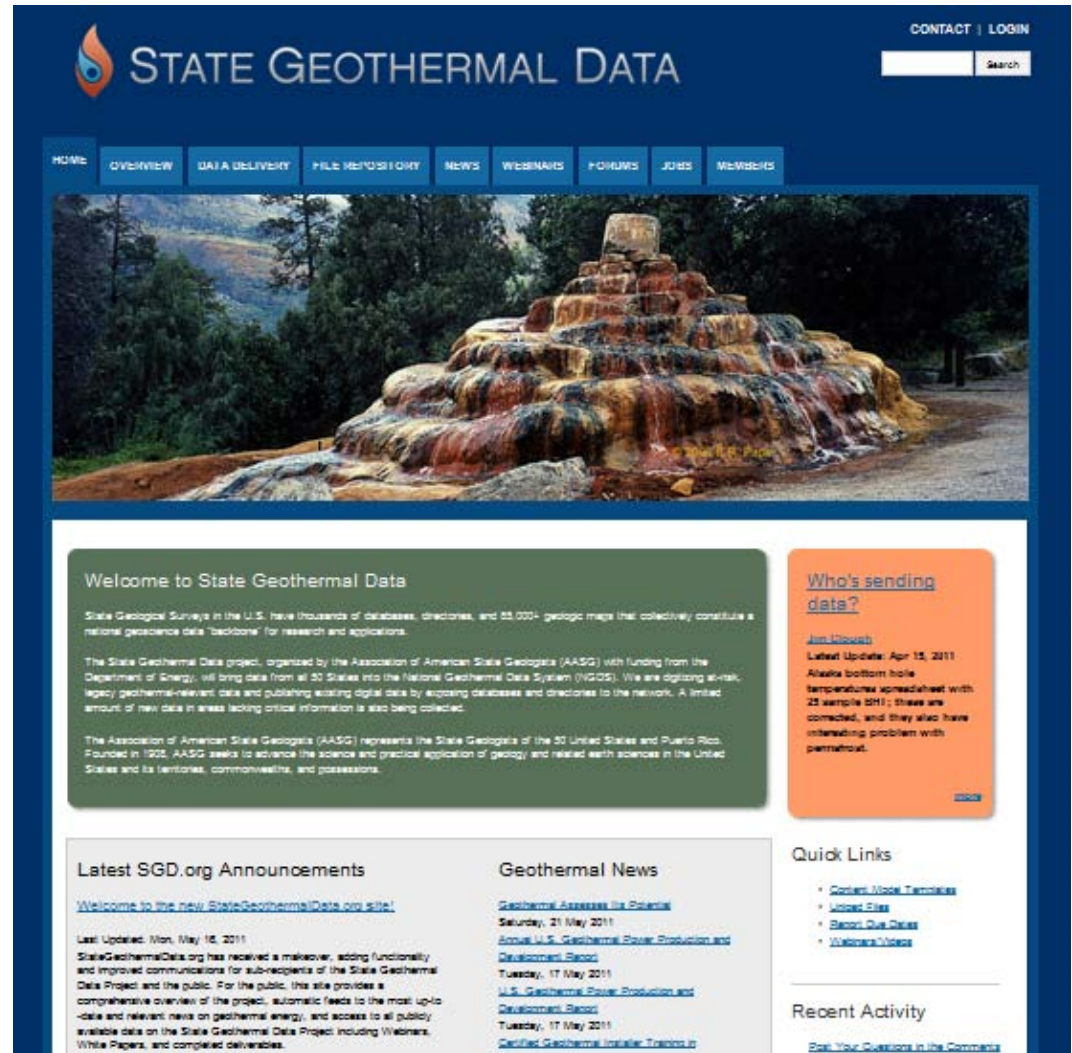
Progress

- Subcontracts for data acquisition from 50 states
- Announcement, review and decisions on supplemental funding for new data from 16 states; contracts in negotiation
- Project web site designed, implemented, and maintained (www.stategeothermaldata.org)
- Implementation of catalog (<http://catalog.usgin.org/geoportal>)
 - Metadata for 20,000+ digital resources (as of 6/10/2011)
- Development of procedure and web tools for tracking data submission review and processing
- Compilation identified and documented 27 draft content models
 - 10 content models developed, reviewed and version 1 posted <http://www.stategeothermaldata.org/data-delivery/content-models/>
- First 20 WFS and WMS services online
 - See <http://services.azgs.az.gov/ArcGIS/rest/services/aasggeothermal> or catalog (<http://catalog.usgin.org/geoportal>, search WMS)



Web site

- Overview
- Announcements
- Jobs
- Webinars
- Content Models
- Member Site
 - Reporting
 - Repository
 - Newsletter
 - Upcoming Dates



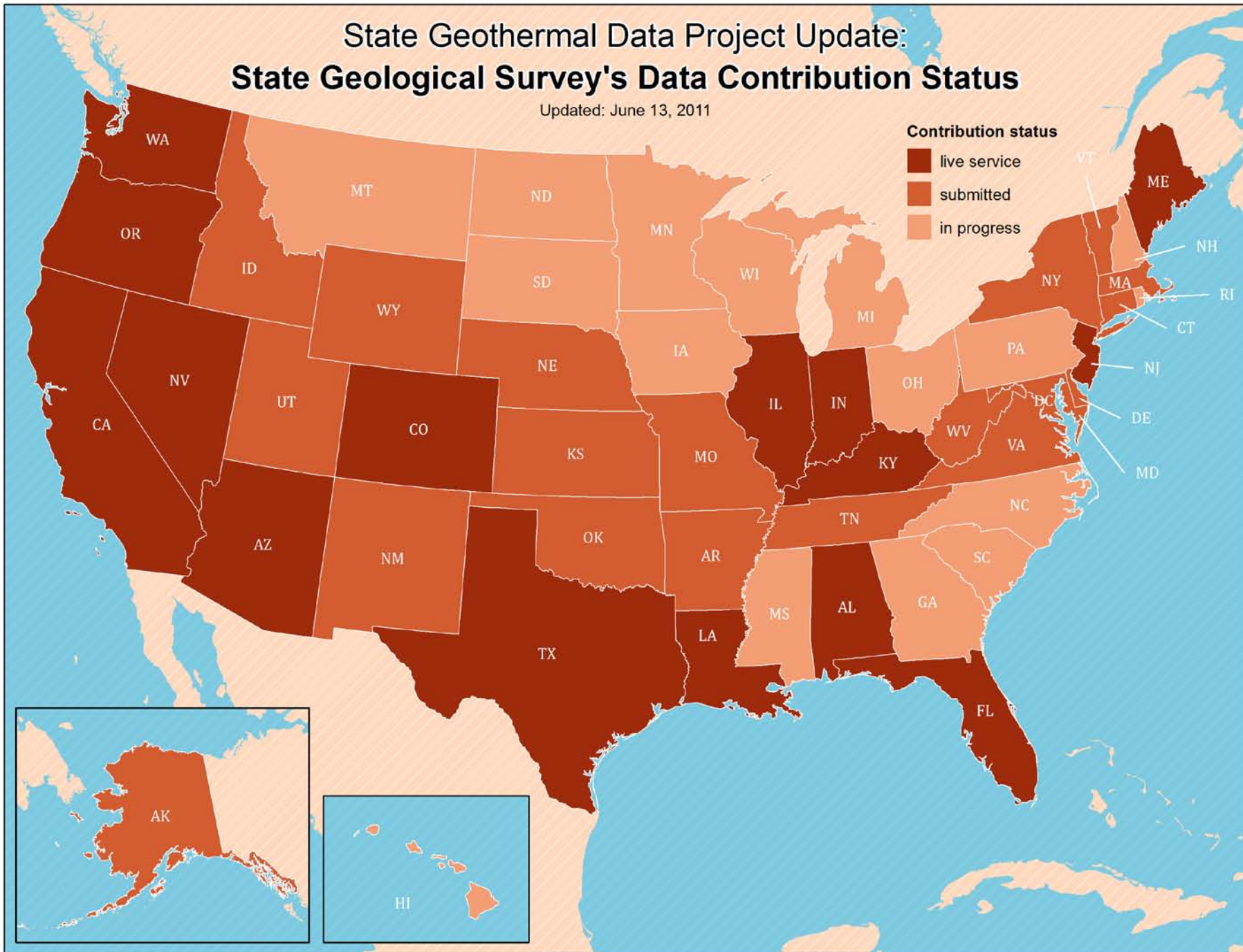
The screenshot shows the homepage of the State Geothermal Data website. At the top, there is a navigation bar with the site title "STATE GEOTHERMAL DATA" and a search box. Below the navigation bar is a large banner image of a colorful geothermal spring. The main content area is divided into several sections: a "Welcome to State Geothermal Data" section with introductory text, a "Who's sending data?" section with a link to "Jim Kloss", "Latest SGD.org Announcements" and "Geothermal News" sections with recent updates, and "Quick Links" and "Recent Activity" sections.

www.stategeothermaldata.org



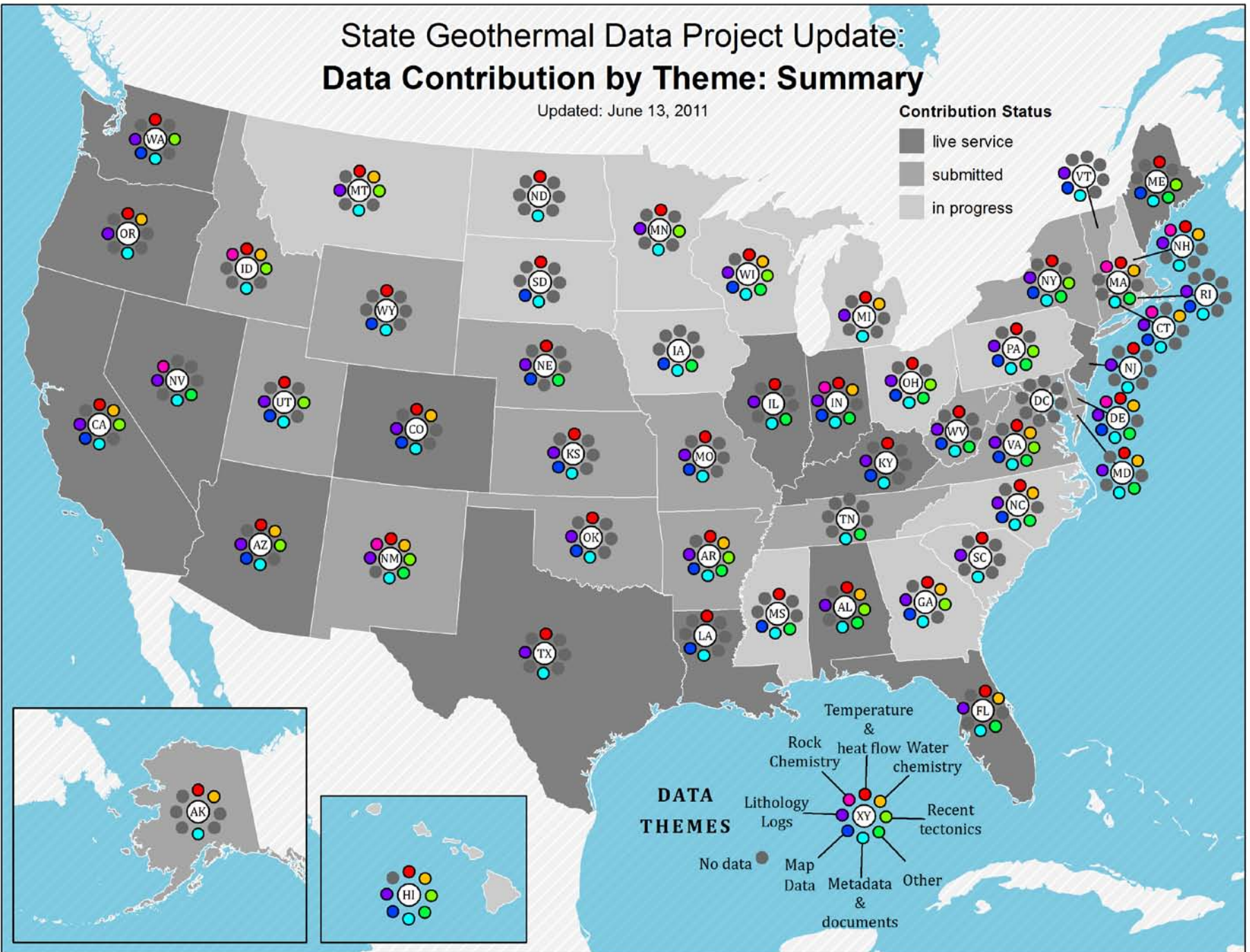
State Geothermal Data Project Update: State Geological Survey's Data Contribution Status

Updated: June 13, 2011



State Geothermal Data Project Update: Data Contribution by Theme: Summary

Updated: June 13, 2011

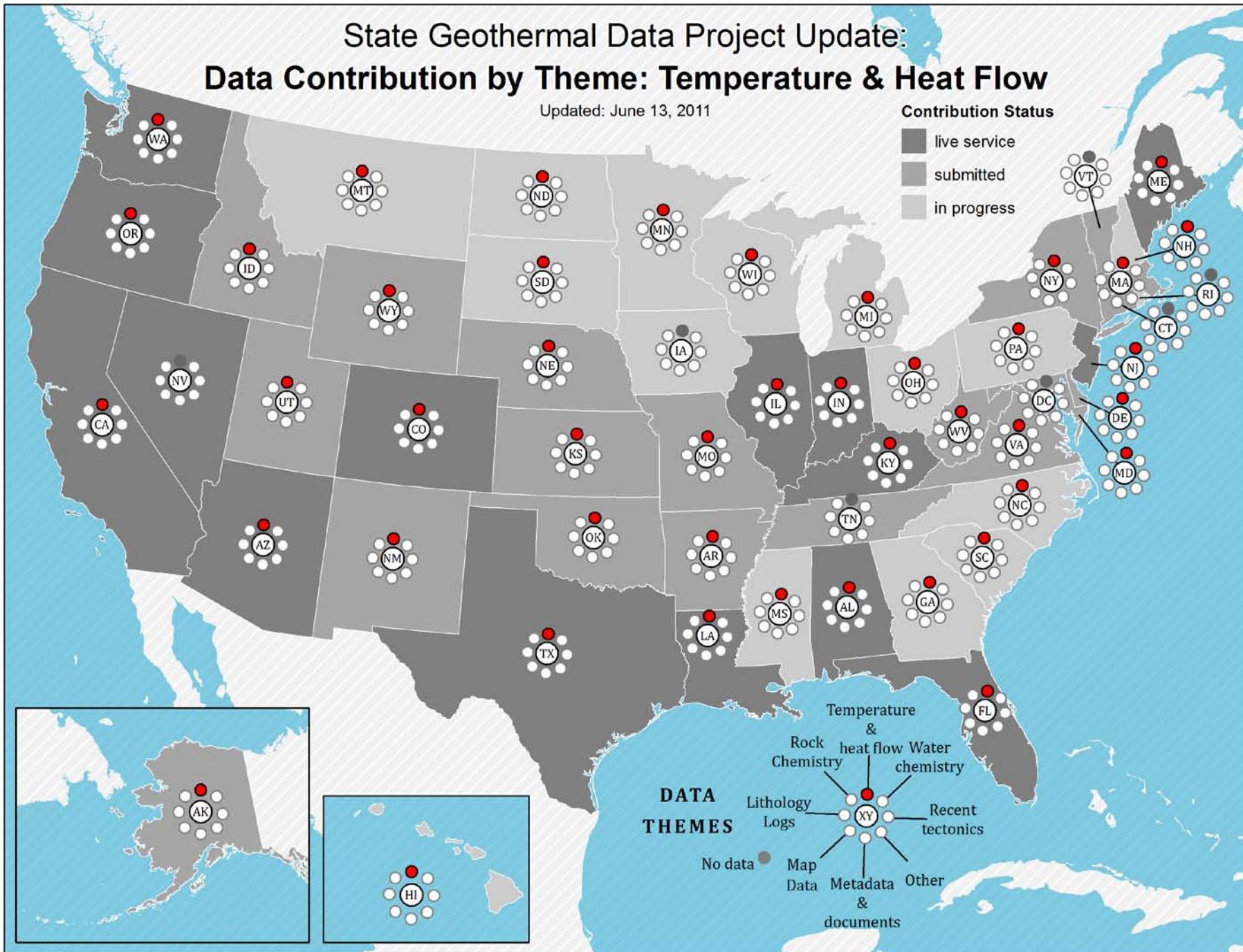


State Geothermal Data Project Update: Data Contribution by Theme: Temperature & Heat Flow

Updated: June 13, 2011

Contribution Status

- live service
- submitted
- in progress

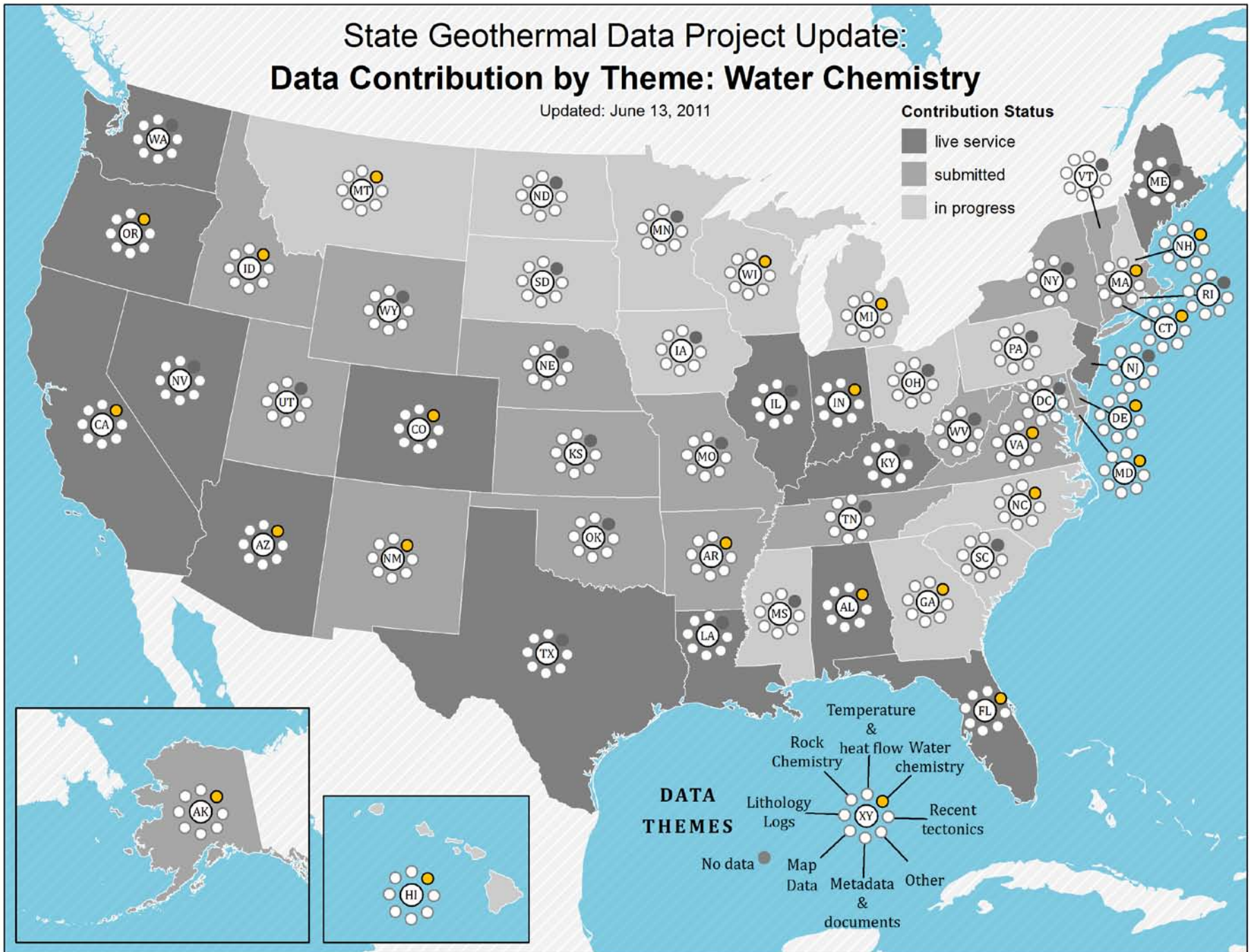


State Geothermal Data Project Update: Data Contribution by Theme: Water Chemistry

Updated: June 13, 2011

Contribution Status

- live service
- submitted
- in progress



DATA THEMES

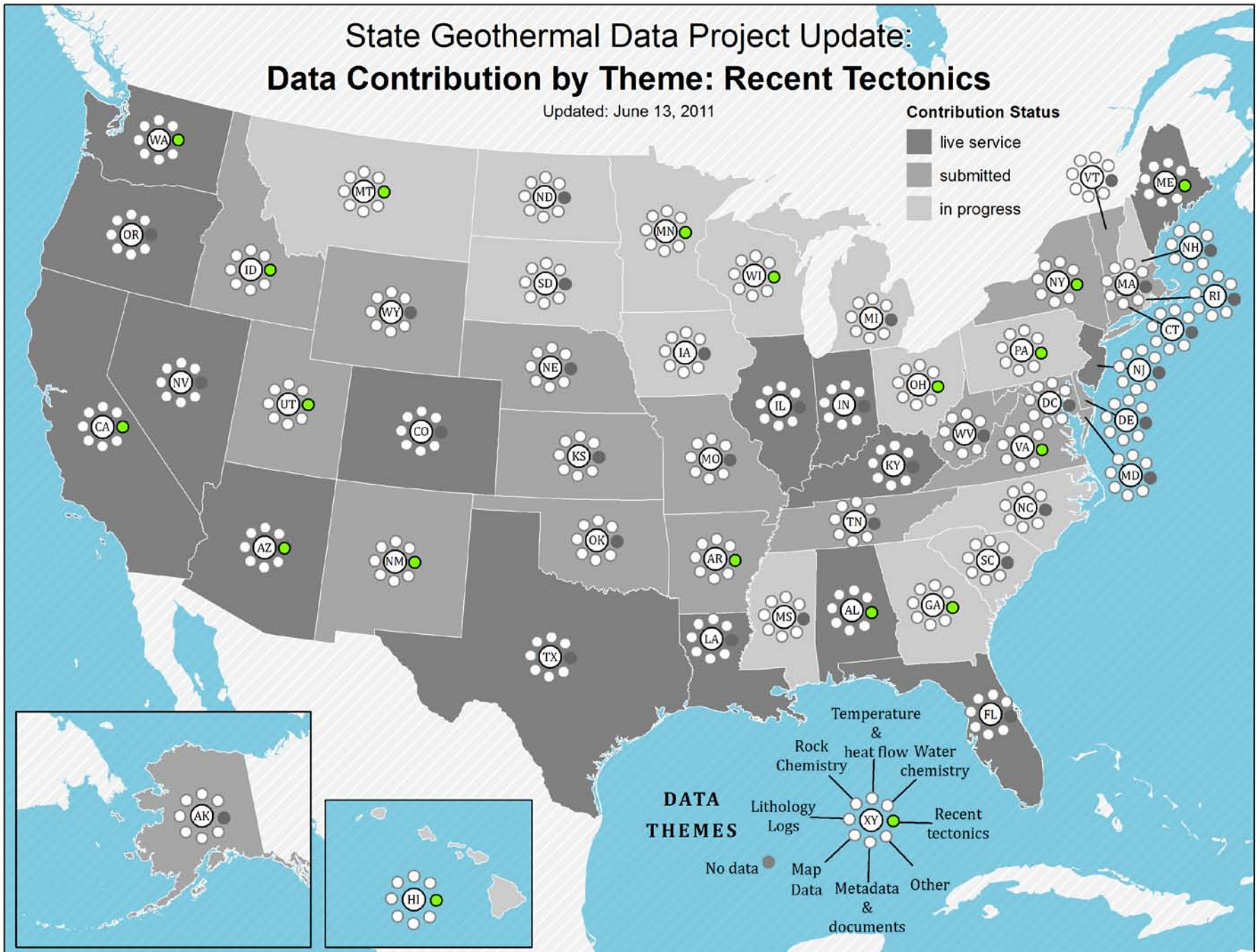
- Temperature & heat flow
- Rock Chemistry
- Lithology
- Logs
- No data
- Map Data
- Metadata & documents
- Other
- Recent tectonics
- Water chemistry

State Geothermal Data Project Update: Data Contribution by Theme: Recent Tectonics

Updated: June 13, 2011

Contribution Status

- live service
- submitted
- in progress

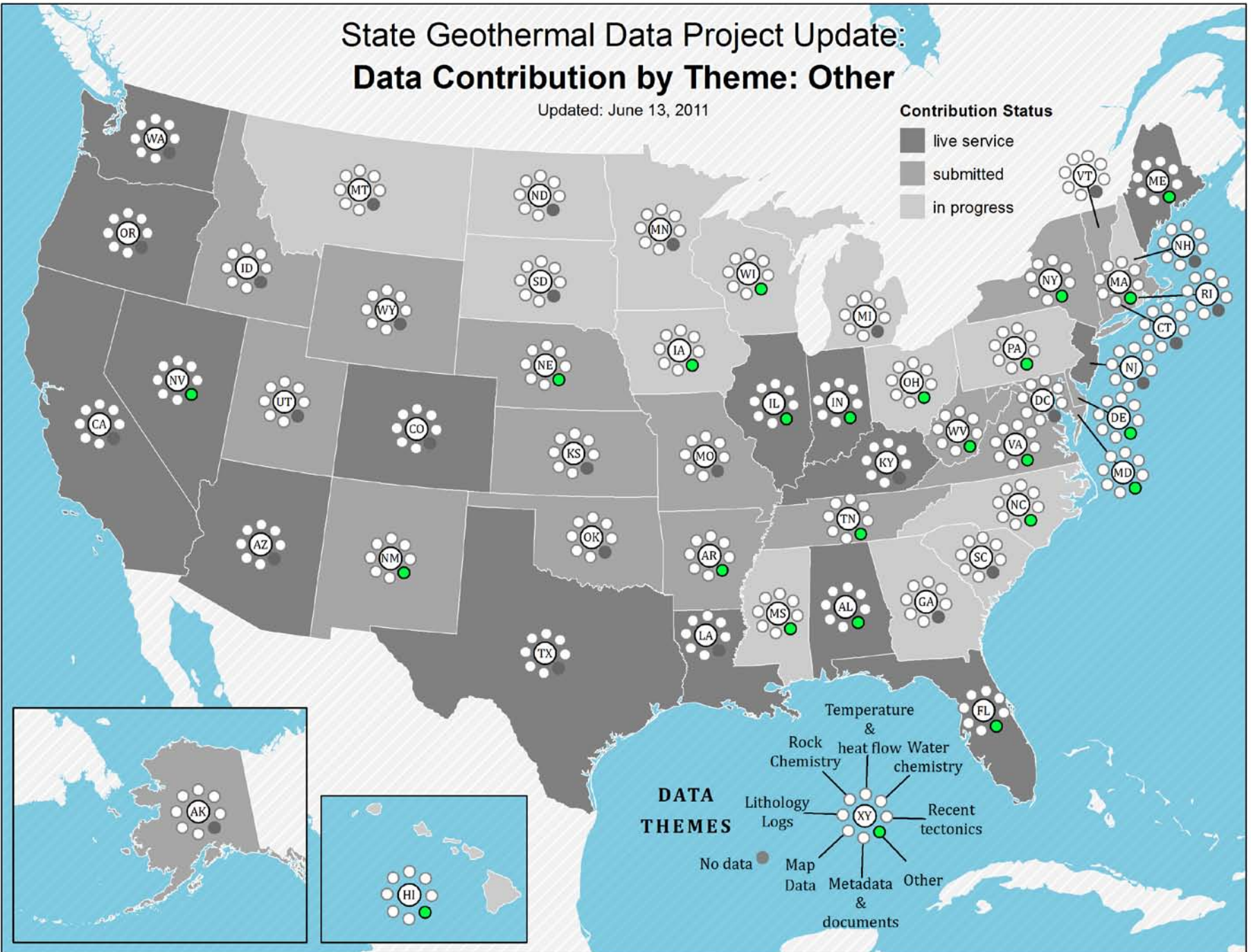


DATA THEMES

- Temperature & heat flow
- Rock Chemistry
- Lithology
- Logs
- Water chemistry
- Recent tectonics
- Other
- Metadata & documents
- Map Data
- No data

State Geothermal Data Project Update: Data Contribution by Theme: Other

Updated: June 13, 2011

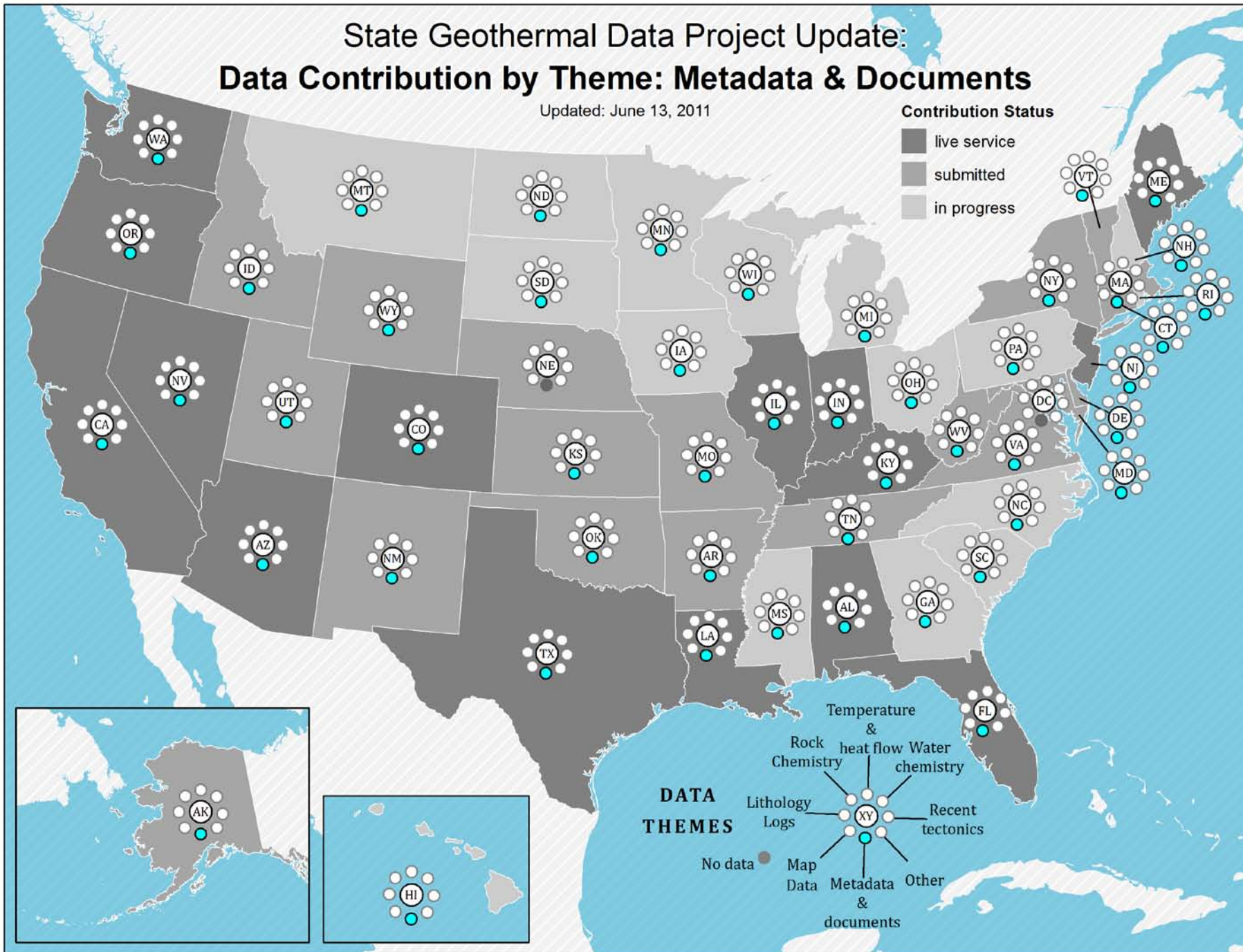


State Geothermal Data Project Update: Data Contribution by Theme: Metadata & Documents

Updated: June 13, 2011

Contribution Status

- live service
- submitted
- in progress

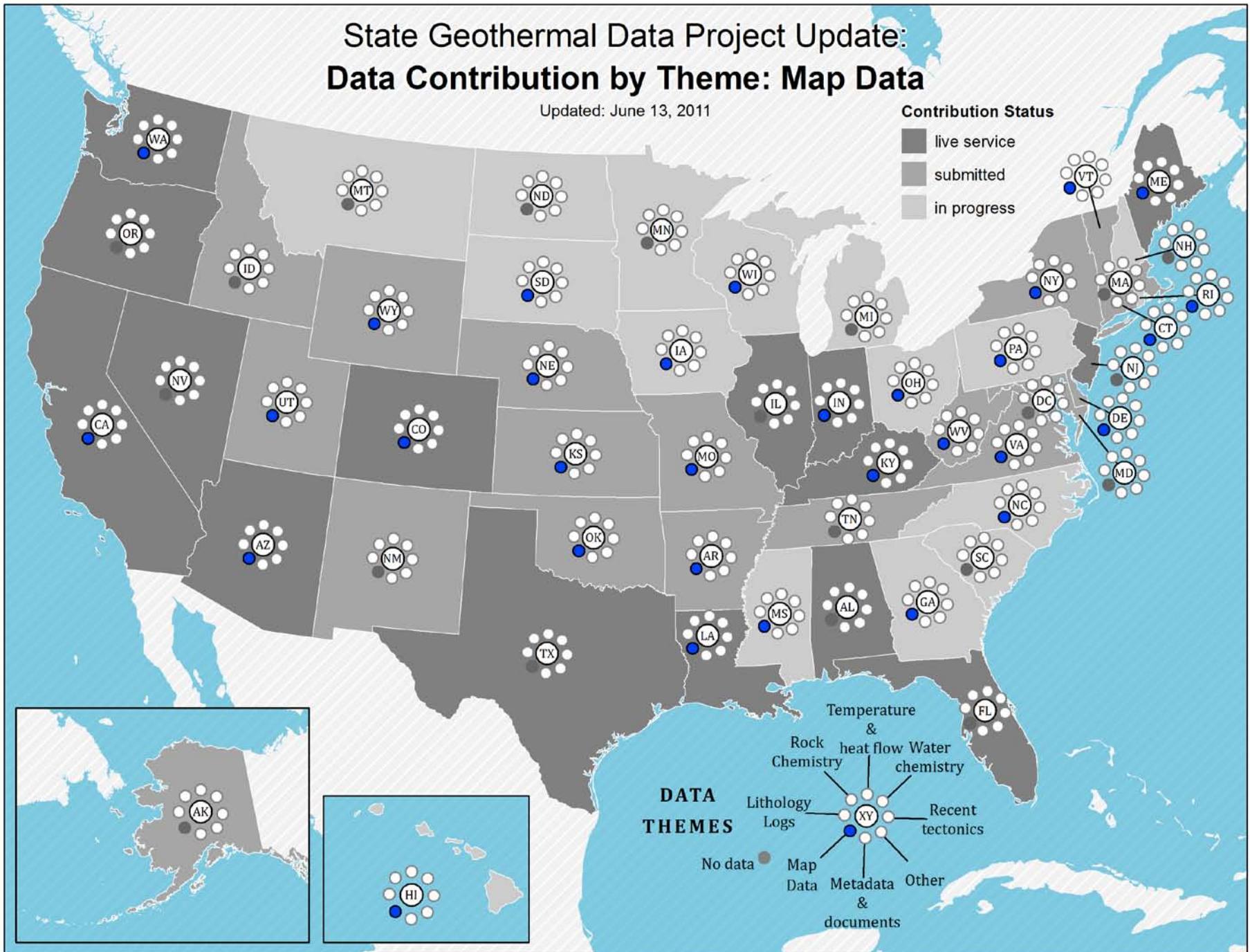


State Geothermal Data Project Update: Data Contribution by Theme: Map Data

Updated: June 13, 2011

Contribution Status

- live service
- submitted
- in progress

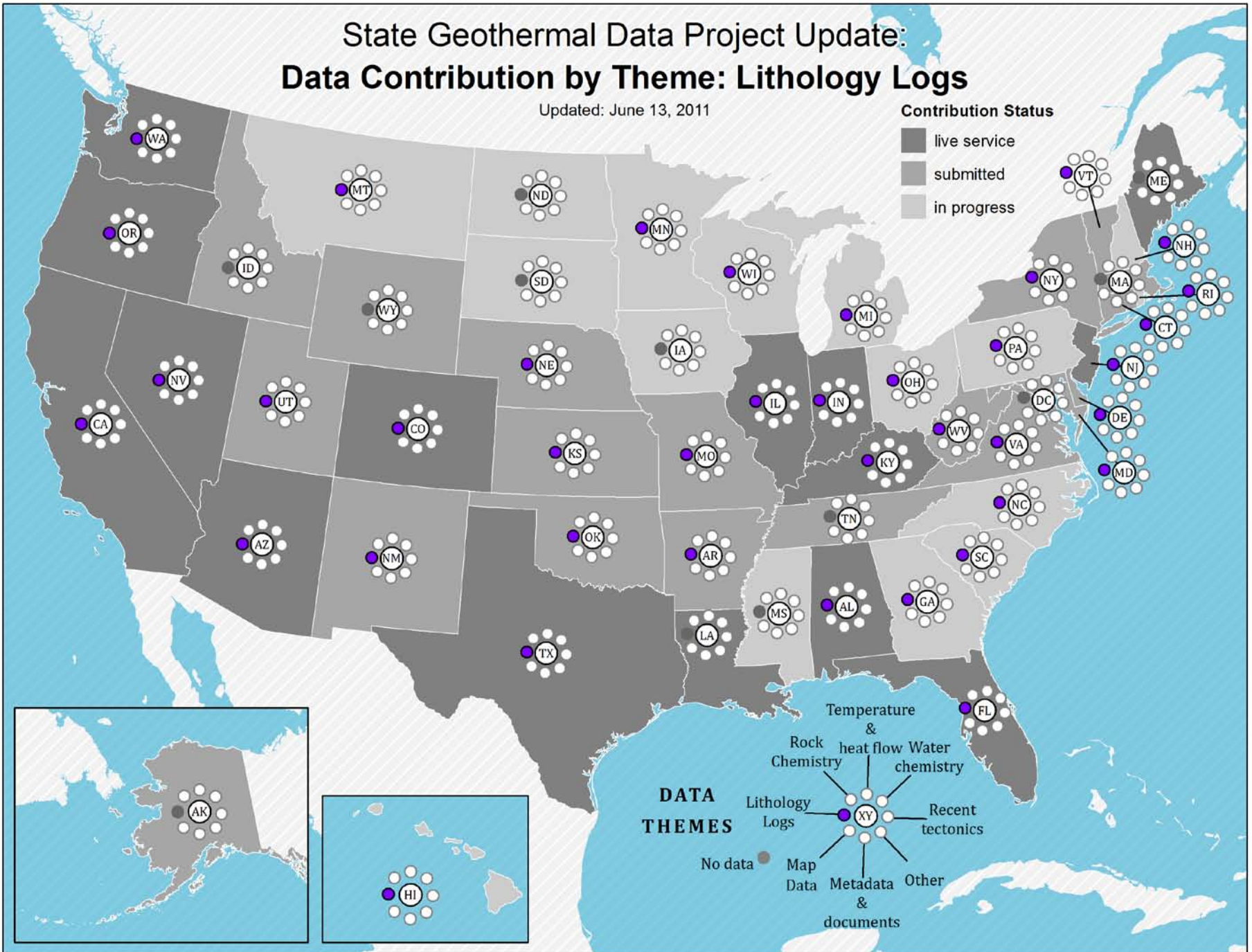


State Geothermal Data Project Update: Data Contribution by Theme: Lithology Logs

Updated: June 13, 2011

Contribution Status

- live service
- submitted
- in progress

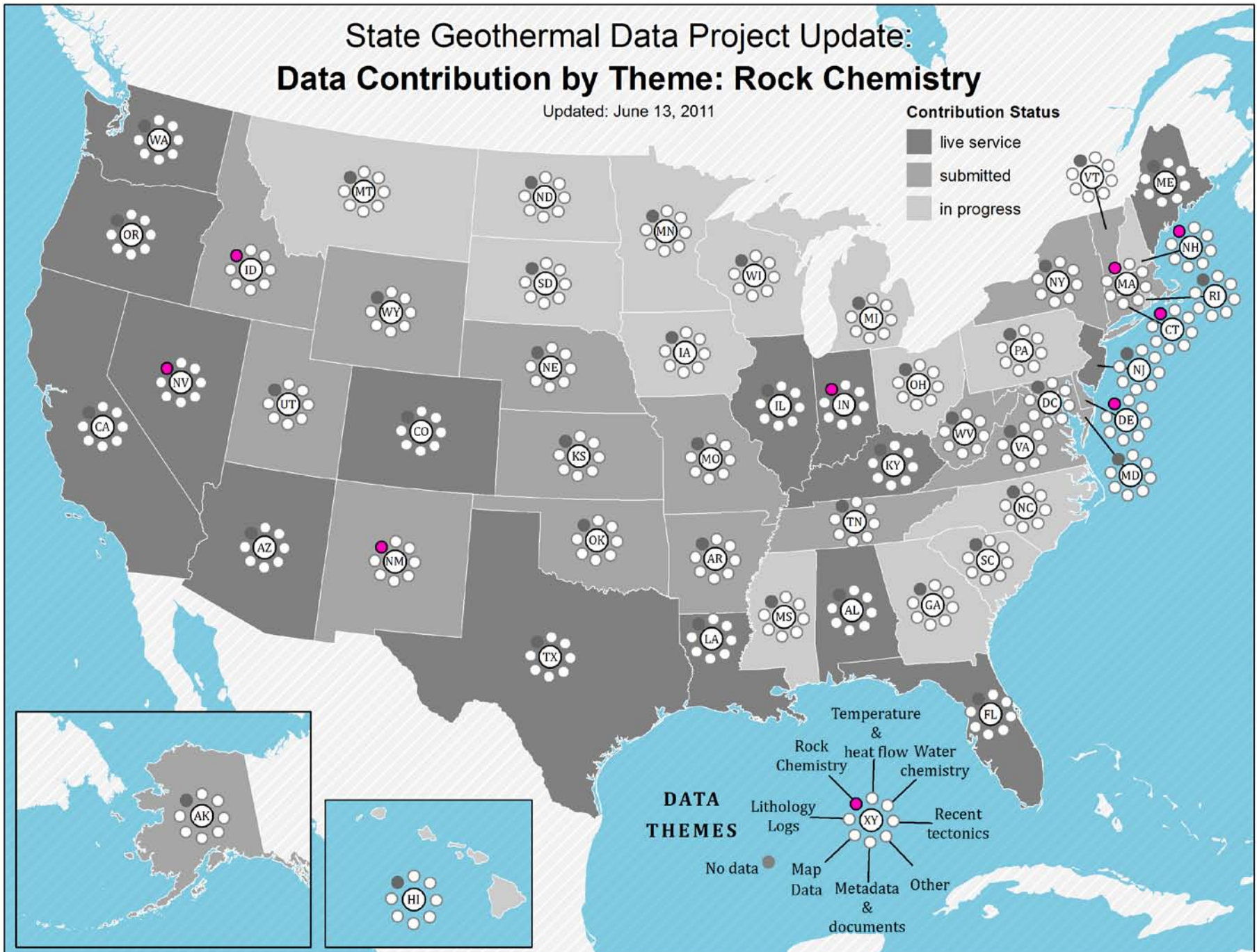


State Geothermal Data Project Update: Data Contribution by Theme: Rock Chemistry

Updated: June 13, 2011

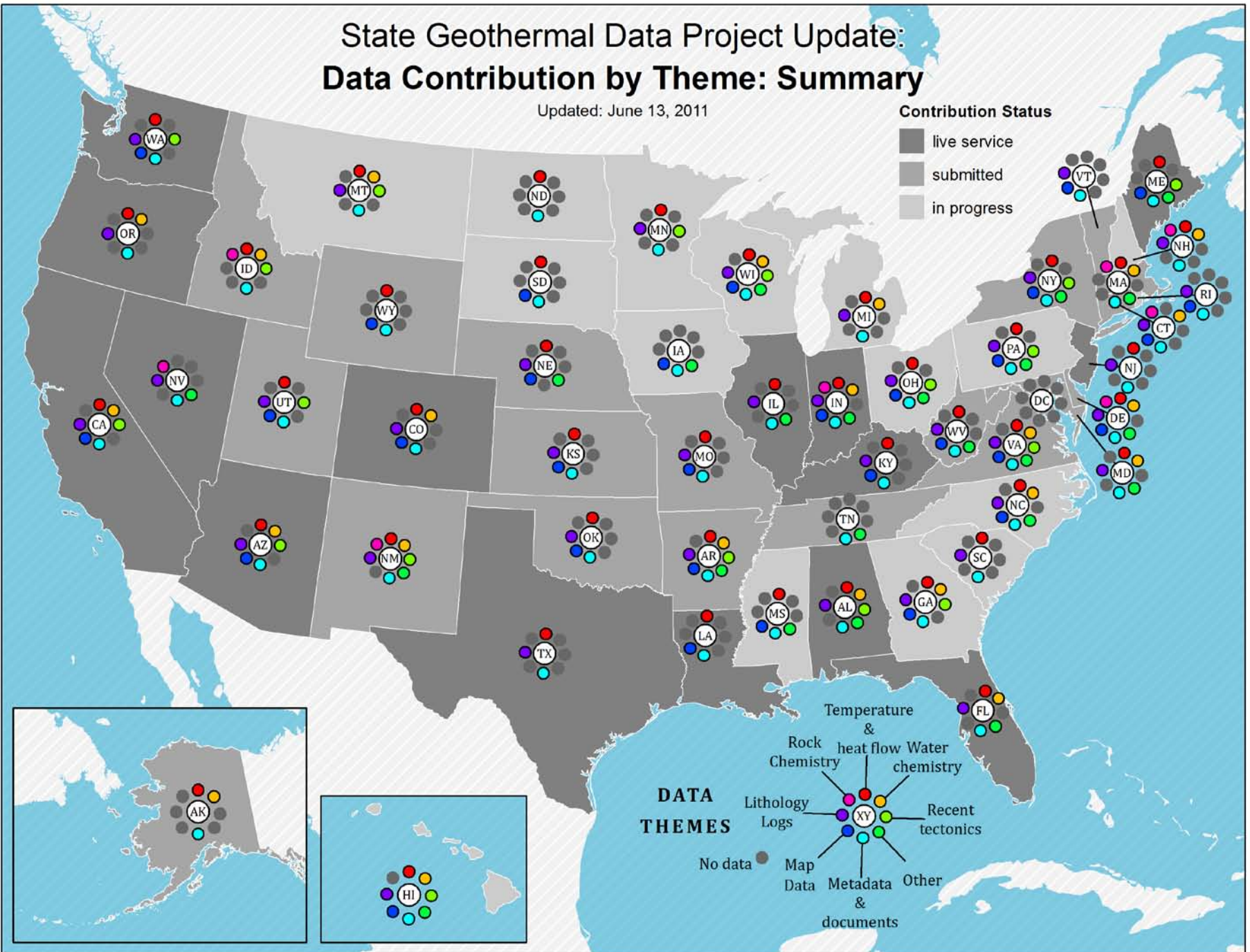
Contribution Status

- live service
- submitted
- in progress



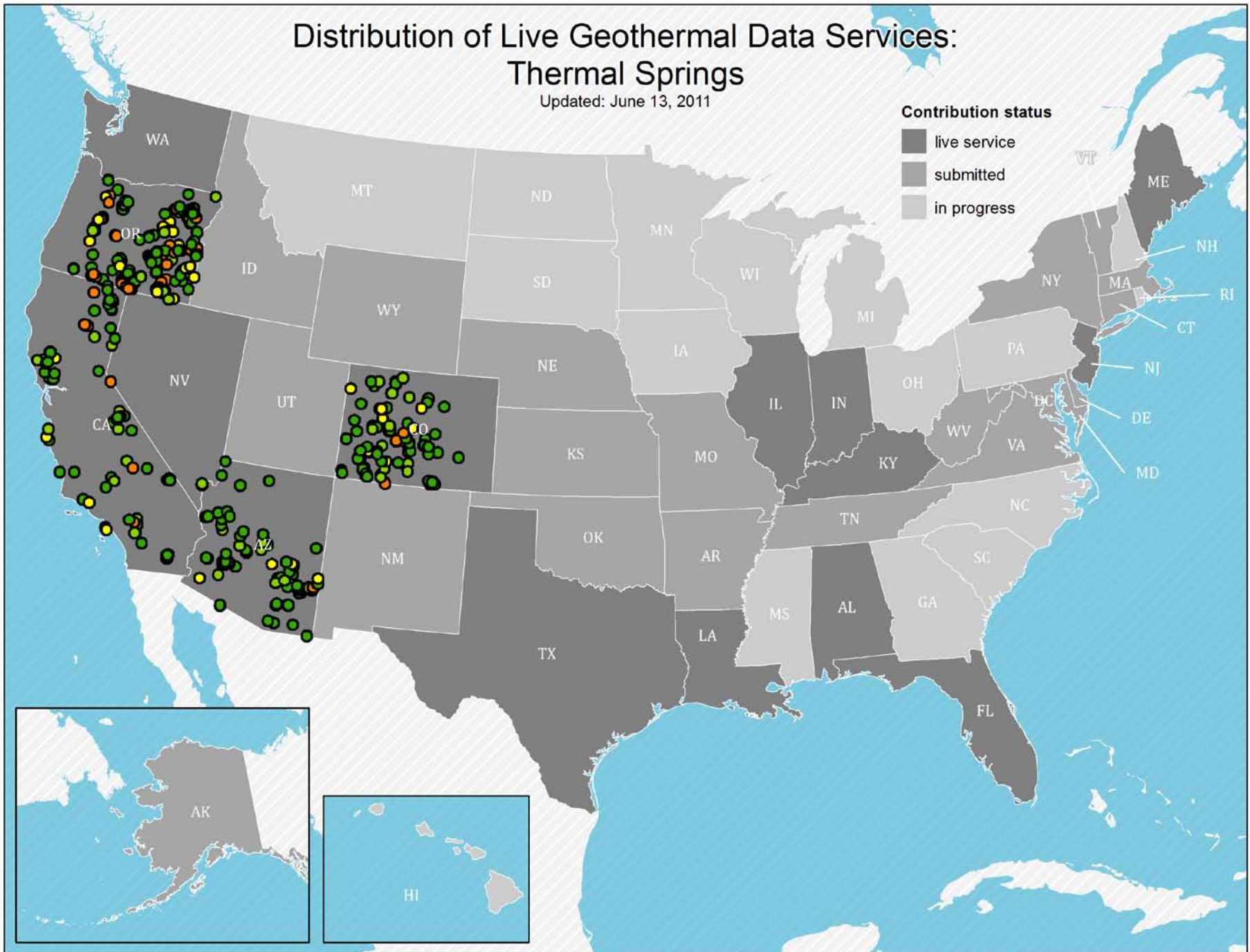
State Geothermal Data Project Update: Data Contribution by Theme: Summary

Updated: June 13, 2011



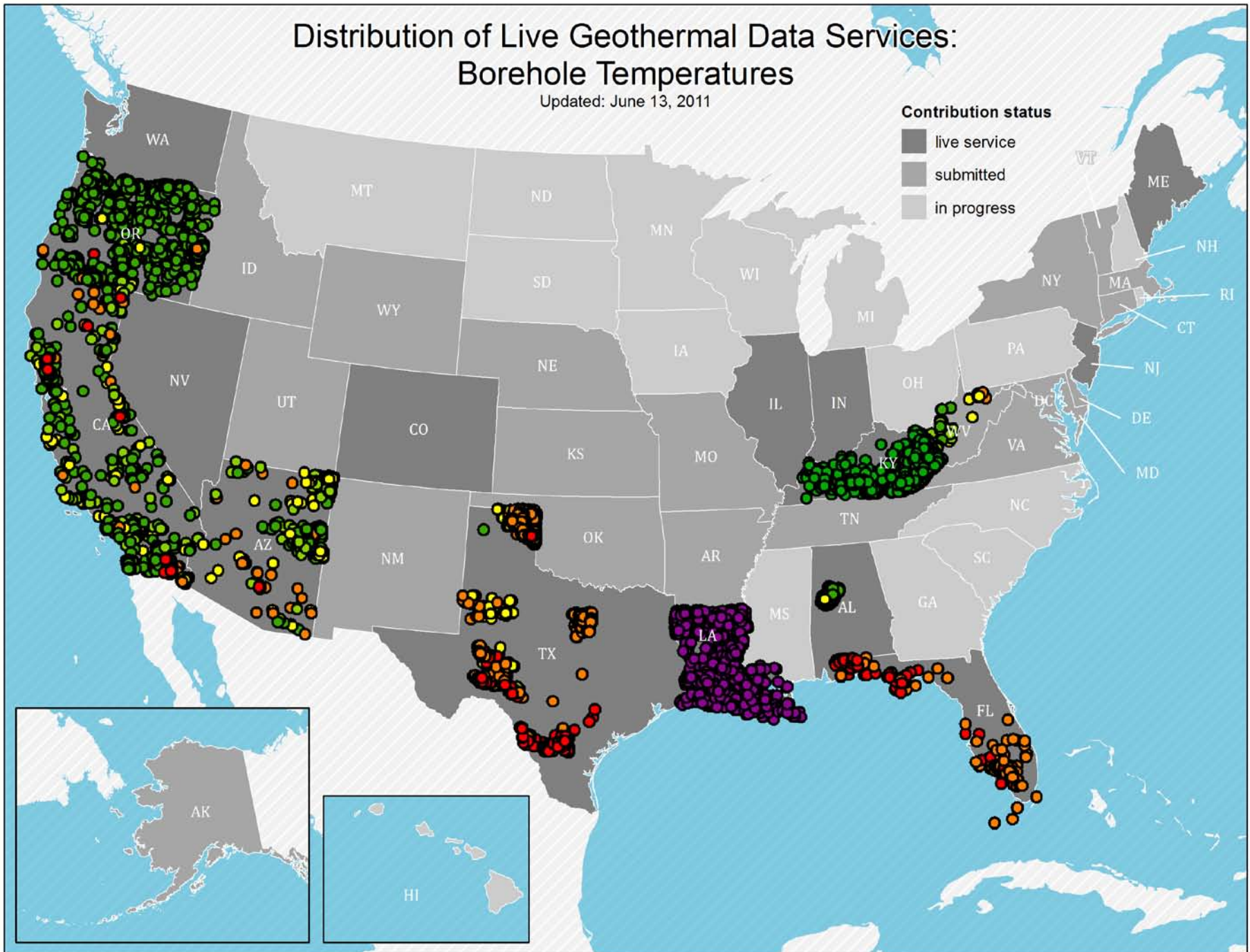
Distribution of Live Geothermal Data Services: Thermal Springs

Updated: June 13, 2011



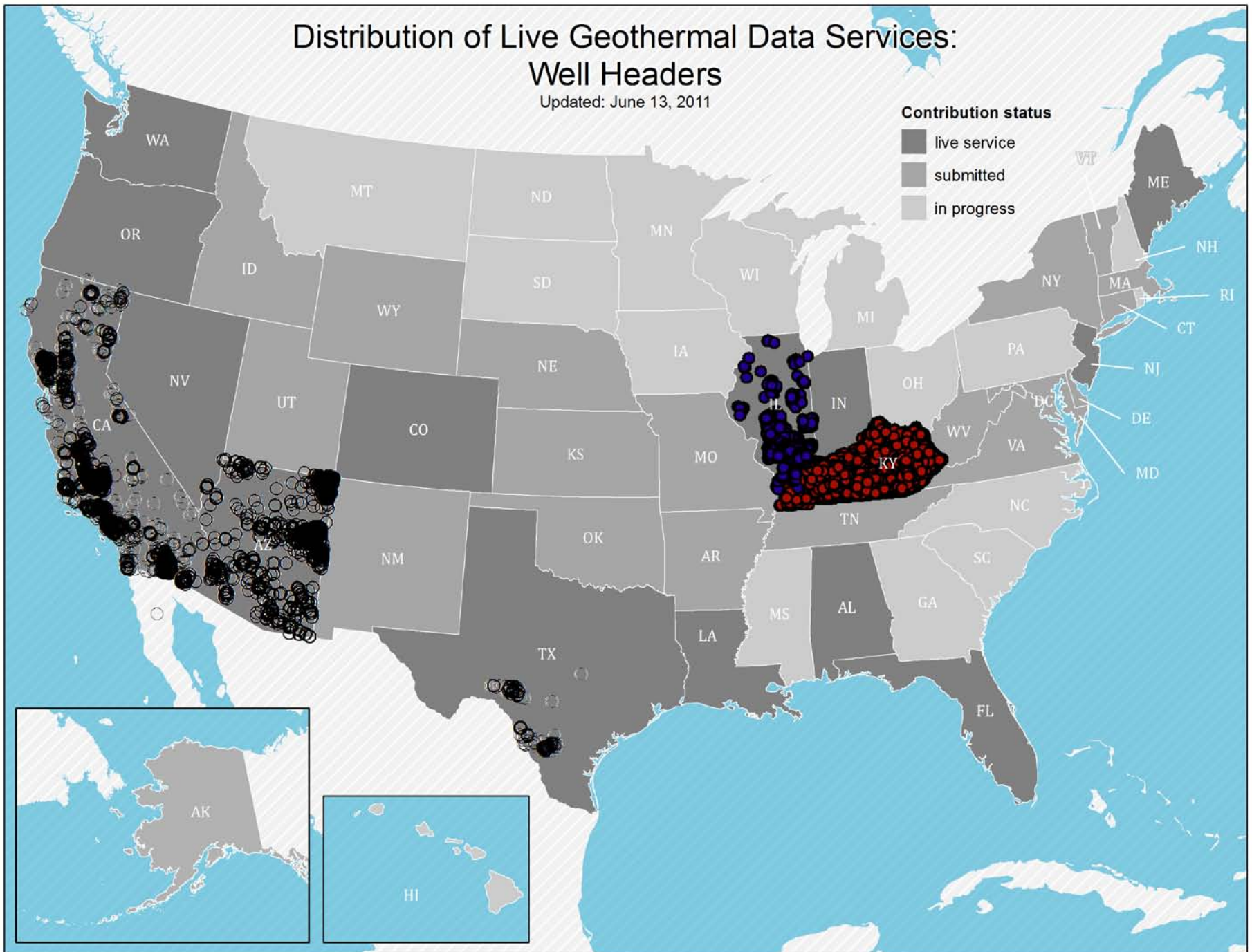
Distribution of Live Geothermal Data Services: Borehole Temperatures

Updated: June 13, 2011



Distribution of Live Geothermal Data Services: Well Headers

Updated: June 13, 2011



Future Direction 2011-2012

- All regional hubs operational
- All states providing data live to the network
- All submitted data described by metadata in catalog system
- Training programs developed & implemented: webinars, videos, guidebooks, online tutorials, short courses
- SAB review of YR-1; evaluate and approve YR-2
- Carry out bulk of new data acquisition, including drilling a minimum of 21 gradient and research holes in 6 states
- Prototype deployment of the system roll out summer 2011



Summary

- Deployment of national distributed network in progress
- Data compilation from all 50 states
- Main system components in place –
 - *Find*: Catalogs – profiles, protocols, document repository
 - *Get*: Services – protocols, interchange formats, servers
 - *Use*: Clients – adopting existing software for desktop applications
- Leveraging additional data and apps from state & federal agencies, academia, and industry
- System adoption exceeds expectations and our ability to meet demands from third parties



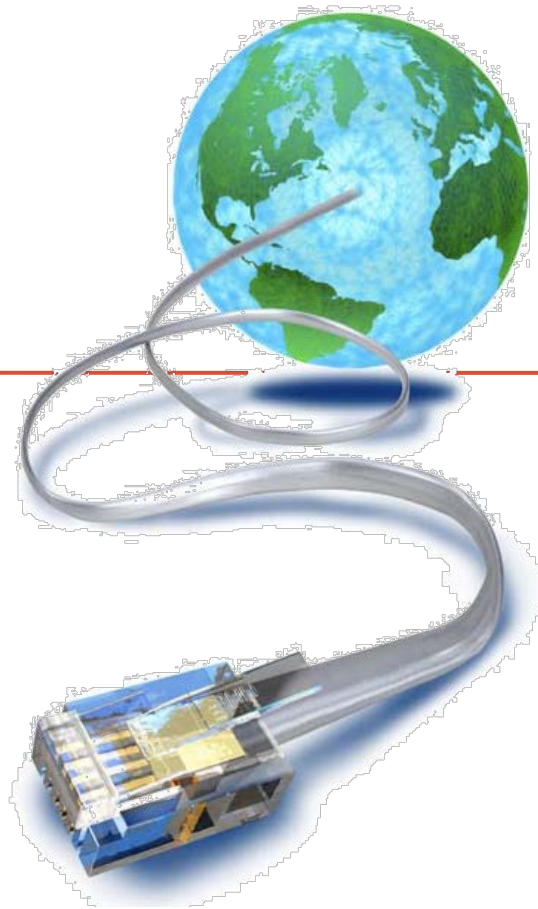
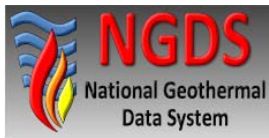
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Supported by award: DE-EE0002850

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Towards a Global Data Network



END

