



Geothermal Assesses Its Potential

By David Wagman, Chief Editor, Renewable Energy World North America | May 20, 2011

The Geothermal Energy Association's annual report, issued in April, identified 3,633 to 4,050 MW of confirmed new geothermal power plant capacity under development in the United States.

Tulsa, OK, USA -- The annual report counts 15 states with projects currently under consideration or development: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Louisiana, Mississippi, Nevada, New Mexico, Oregon, Texas, Utah, Washington and Wyoming. Between confirmed and unconfirmed projects there are a total of 146 geothermal projects in development, the report said.

The Association's geothermal reporting terms and definitions categorize projects for each state by one of five phases.

- Phase I: Resource Procurement and Identification (identifying resource, secures rights to resource, pre-drilling exploration, internal transmission analysis complete).
- Phase II: Resource Exploration and Confirmation (exploration and/or drilling permits approved, exploration drilling conducted/in progress, transmission feasibility studies underway).
- Phase III: Permitting and Initial Development (securing power purchase agreements and final permits, full-size wells drilled, financing secured for portion of project construction, interconnection feasibility study complete).
- Phase IV: Resource Production and Power Plant Construction (plant permit approved, facility in construction, production and injection drilling underway, interconnection agreement signed).
- Unconfirmed: Project information obtained by the Association from publicly available sources but not verified by the project developer.

Alaska:

Installed Capacity, **0.73 MW**

Estimated Resource Capacity in Development, **95 MW**

Estimated Planned Capacity Addition in Development, **50.4 MW**

Number of Projects in Development, **7**

The first geothermal power plant in Alaska was installed in 2006 at Chena Hot Springs. It is a small-scale unit, using organic rankine cycle (ORC) technology to produce 225 kW from a low-temperature resource (165 F). Subsequent 225 and 280 kW units have been installed, bringing total capacity to 730 kW.

In June 2010 the State of Alaska enacted legislation to promote the development of geothermal energy by significantly reducing royalty payments from geothermal projects on state lands and streamlining geothermal permitting and regulatory processes with state agencies. Seven different geothermal companies, resort, utilities and Native American entities are developing up to 95 MW of geothermal resources in Alaska for potential electricity production. Additionally, the SW Alaska Geothermal Energy and Pilgrim Hot Springs projects received funding awards from the Department of Energy via the American Recovery and Reinvestment Act of 2009 (ARRA).

Arizona:

Installed Capacity, **0 MW**

Estimated Resource Capacity in Development, **N/A**

Number of Projects in Development, **1**

Arizona has one confirmed project being developed by GreenFire Energy. This project is intended to use CO₂ as an energy carrier from the subsurface geothermal resource to the power plant and has received a \$2 million FY 2010 annual appropriation from DOE.

California:

Installed Capacity, **2,565.4 MW**

Estimated Resource Capacity in Development, **1,212 to 1,358 MW**

Estimated Planned Capacity Addition in Development, **712 to 738 MW**

Number of Projects in Development, **30**

U.S. geothermal online capacity remains concentrated in California. In 2010, California alone had more installed geothermal capacity than any other country in the world, except the U.S. In 2007, 4.5 percent of California's electric energy generation came from geothermal power plants, amounting to a net total of 13,439 GWh. California currently has approximately 2,565.5 MW of installed capacity.

Development of geothermal resources continues to move forward in California. The Association's annual report identifies 30 projects being developed by nine different companies. These projects account for around 1,358 MW of geothermal resource development.

Of the federal funding provided to the geothermal industry via ARRA, \$32.3 million was allocated to 12 research and development and demonstration projects in California. Additionally, two companies-the Modoc Contracting Co. and Oski Energy-received a combined total of \$4 million in fy 2010 appropriations from DOE.

Colorado:

Installed Capacity, **0 MW**

Estimated Resource Capacity in Development, **N/A**

Estimated Planned Capacity Addition in Development, **10 MW**

Number of Projects in Development, **1**

Colorado currently has one geothermal project in an unconfirmed phase of development. Of the federal funding provided to the geothermal industry via ARRA, \$18 million was allocated to 10 research and development and demonstration projects.

Hawaii:

Installed Capacity, **35 MW**

Estimated Resource Capacity in Development, **N/A**

Estimated Planned Capacity Addition in Development, **8 MW**

Number of Projects in Development, **2.**

One geothermal power plant operates on the Big Island of Hawaii. The plant, Puna Geothermal Venture, delivers an average of 25 to 30 MW of electricity to the grid, supplying around 20 percent of the total electricity needs. Two additional projects are being developed on the island of Maui and the Big Island by Ormat Technologies.

In addition to the two geothermal projects already under development, Ormat Technologies holds a prospective geothermal project in Hawaii known as Kula.

Idaho:

Installed Capacity, **15.8 MW**
Estimated Resource Capacity in Development, **703 to 778 MW**
Estimated Planned Capacity Addition in Development, **26 MW**
Number of Projects in Development, **11**

In January 2008 the first geothermal power plant came online in Idaho, Raft River, a binary plant that uses a 300 F resource and has a nameplate production capacity of 15.8 MW. Currently, net electrical power output is around 11.5 MW. An expansion to this plant and nine other projects is underway.

In addition to the 11 geothermal projects in development, five geothermal prospects with potential for power production have been identified by developers in Idaho.

Louisiana:

Installed Capacity, **0 MW**
Estimated Resource Capacity in Development, **5.25 MW**
Estimated Planned Capacity Addition in Development, **0.05 MW**
Number of Projects in Development, **2**

Louisiana currently hosts two known developing geothermal projects. One is a planned geothermal hydrocarbon co-production unit at a producing gas field. Another project, which has been awarded \$5 million of ARRA funding from the DOE Geothermal Technologies Program, will develop geopressed resources at an oil and gas field. In addition to ARRA funding, Louisiana Geothermal received \$4 million in fy 2010 allocations from DOE to conduct an economic feasibility study of geopressed resources.

Mississippi:

Installed Capacity, **0 MW**
Estimated Resource Capacity in Development, **N/A**
Estimated Planned Capacity Addition in Development, **0.03 MW**
Number of Projects in Development, **1**

Mississippi's first developing geothermal project is a planned geothermal hydrocarbon coproduction unit at a producing field. The oil coproduction project, which is being developed by Gulf Coast Green Energy, also received \$1.6 million in ARRA funding in 2009.

Nevada:

Installed Capacity, **441.8 MW**
Estimated Resource Capacity in Development, **2,132 to 2,408 MW**
Estimated Planned Capacity Addition in Development, **638.05 to 648.05 MW**
Number of Projects in Development, **65**

There are currently 21 operating geothermal power plants in Nevada with a total operating capacity of 441.8 MW. In 2010 Ormat Technologies brought its Jersey Valley power plant online, adding 15 MW to Nevada's geothermal capacity. With more developing projects than any other state, it is expected that Nevada's geothermal generating capacity will increase significantly in the future.

In addition to the 65 geothermal projects in development, 26 geothermal prospects with potential for power production have been identified.

New Mexico:

Installed Capacity, **0.24 MW**
Estimated Resource Capacity in Development, **N/A**
Estimated Planned Capacity Addition in Development, **15 MW**
Number of Projects in Development, **2**

In July 2008, a 0.24 MW pilot installation project went online in New Mexico. The full project, Lightning Dock, is being developed by Provo, Utah-based Raser Technologies and is currently expected to produce 15 MW. A second plant is planned for completion at the same site at a later date.

Oregon:

Installed Capacity, **0.28 MW**

Estimated Resource Capacity in Development, **225 to 250 MW**

Estimated Planned Capacity Addition in Development, **110.5 MW**

Number of Projects in Development, **9**

In August 2009, a 0.28 MW geothermal unit began producing electricity at the Oregon Institute of Technology's Klamath Falls campus. Currently, nine known geothermal projects are in development with the potential of providing up to 250 MW to Oregon's electricity grid.

In addition to the nine geothermal projects in development, two geothermal prospects with potential for power production have been identified by developers in Oregon.

Texas:

Installed Capacity, **0 MW**

Estimated Resource Capacity in Development, **N/A**

Estimated Planned Capacity Addition in Development, **0.8 MW**

Number of Projects in Development, **1**

Texas's first developing geothermal project is a planned geothermal hydrocarbon coproduction unit in Goliad County. Of the federal funding provided to the geothermal industry via ARRA, \$25.5 million was allocated to nine research and development and demonstration projects in Texas.

Utah:

Installed Capacity, **42 MW**

Estimated Resource Capacity in Development, **90 to 160 MW**

Estimated Planned Capacity Addition in Development, **40 to 55 MW**

Number of Projects in Development, **12**

A number of geothermal power plants operate in Utah, including Unit 1 of the Blundess power plant (with an installed capacity of 23 MW) and Unit 2 with a capacity of 9 MW. In April 2009 the low-temperature 10 MW Hatch Geothermal Power Plant in Beaver County began delivery power to Anaheim, Calif.

Washington:

Installed Capacity, **0 MW**

Estimated Resource Capacity in Development, **100 MW**

Estimated Planned Capacity Addition in Development, **N/A**

Number of Projects in Development, **1**

Washington currently hosts no geothermal power plant, however one company-Gradient Resources-is in the early stages of developing its Mt. Baker project.

Wyoming:

Installed Capacity, **0.25 MW**

Estimated Resource Capacity in Development, **N/A**

Estimated Planned Capacity Addition in Development, **0.28 MW**

Number of Projects in Development, **1**

In August 2008, a 0.25 MW geothermal hydrocarbon coproduction unit was installed at the DOE's

Rocky Mountain Oil Test Center near Casper. The unit, built by Ormat Technologies was operated for around one year when it was shut down for maintenance. The unit has since resumed operation and the Test Center is developing another site for the installation of a 0.28 MW unit.

California Projects in Development (Table 1)					
			Capacity Estimate (MW)		
Phase	Project	Developer	Resource	Planned Capacity Addition	Project Type*
Phase 1					
	El Centro/ Superstition Hills	Navy Geothermal Program	5 to 25	TBD	CH Unproduced
	China Lake South Range	Navy Geothermal Program	5 to 15	TBD	CH Unproduced
	Orita 2	Ram Power	150	49.9	CH Produced
	Orita 3	Ram Power	150	49.9	CH Produced
Phase 2					
	Canby Cascaded Project	Canby Geothermal	5	2	CH Unproduced
	El Centro/ Superstition Mt.	Navy Geothermal Program	12 to 35	TBD	CH Unproduced
	Yuma Chocolate Mt.	Navy Geothermal Program	12 to 30	TBD	CH Expansion
	Bald Mountain	Oski Energy	20	TBD	CH Unproduced
	HV	Oski Energy	70 to 100	TBD	CH Unproduced
	KN	Oski Energy	70 to 100	TBD	CH Unproduced
	KS	Oski Energy	75 to 100	TBD	CH Unproduced

	Wendel	Oski Energy	5	TBD	CH Expansion
	Keystone	Ram Power	100	50	CH Unproduced
	New River	Ram Power	50	50	CH Unproduced

Phase 3

	Black Rock I	CalEnergy	N/A	53	CH Unproduced
	Black Rock II	CalEnergy	N/A	53	CH Unproduced
	Black Rock III	CalEnergy	N/A	53	CH Produced
	CD4	Ormat	N/A	32 to 38	CH Unproduced
	Wister I	Ormat	N/A	30	CH Unproduced
	Geysers Project	Ram Power	33	26	CH Produced
	Orita I	Ram Power	150	49.9	CH Unproduced

Phase 4

	Hudson Ranch I	Energy Source	150	49.9	CH Unproduced
	Mammoth Repower	Ormat	N/A	3	CH Expansion

Unconfirmed

	Buckeye	Calpine	N/A	30	CH Produced
	Four Mile Hill	Calpine	50	N/A	CH Unproduced
	Telephone Flat	Calpine	50	N/A	CH Unproduced
	Unnamed Glass Mountain	Calpine	320	N/A	CH Unproduced
	Unnamed				

	Orinamed North Geysers	Calpine	N/A	100	CH Produced
	Wildhorse- North Geysers	Calpine	N/A	30 to 50	CH Produced
	Surprise Valley	Enel	20	N/A	CH Unproduced

* CH Unproduced: Conventional hydrothermal (unproduced) resource

CH Produced: Conventional hydrothermal (produced) resource

CH Expansion: Conventional hydrothermal expansion

<http://www.renewableenergyworld.com/rea/news/article/2011/05/geothermal-geothermal-assesses-its-potential>

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