Proceedings World Geothermal Congress 2010
Bali, Indonesia, 25-29 April 2010

United States Geothermal Support and the International Partnership for Geothermal Technology

Ed Wall

Geothermal Technologies Program EE-2C, U.S. Department of Energy, 1000 Independence Ave SW, Washington DC, USA 20585

Ed.wall@ee.doe.gov

Keywords: United States Department of Energy; International Partnership for Geothermal Technology; International Collaboration; Iceland; Australia; EGS

ABSTRACT

The geothermal industry in the United States currently enjoys an unprecedented level of support from Congress and President Obama's Administration. The American Reinvestment and Recovery Act of 2009 (The Recovery Act) allocated $400 million to the Department of Energy's Geothermal Technologies Program. The allocation exemplifies the belief that geothermal energy is indispensible in improving the state of domestic energy in the U.S., as well as a commitment to grow and foster a strong geothermal industry. In addition to its domestic program, the U.S. is a member country, along with Iceland and Australia, in the International Partnership for Geothermal Technology (IPGT), an international collaboration of scientists, industry representatives, and geothermal experts. As of October, 2009, the IPGT Steering Committee narrowed the Partnership's focus to six broad topic areas: lower-cost drilling, zonal isolation, high-temperature tools, stimulation procedures, modeling, and exploration technologies. The Steering Committee identified working group conveners for each topic, who are charged with building international working groups on the topic, developing authoritative white papers and research plans, and identifying potential areas for international collaboration. The IPGT stresses substantive, collaborative activities rather than focusing solely on information sharing in order to avoid blind alleys, limit unnecessary duplication, and accelerate the development of geothermal technologies.

1. U.S. GEOTHERMAL PROGRAM

Geothermal energy is an important baseload component in the worldwide renewable energy mix. In the United States, this is an especially exciting time for geothermal energy; the country currently has the largest installed capacity of geothermal power in the world. As of September 2009, 3152.72 MW of geothermal power were online, distributed amongst 8 U.S. states. (Jennejohn, 2009). When geothermal plants in development and construction phases are taken into account, this number rises to 6442.9 MW in 14 states. (Jennejohn, 2009). As of November 2009, 151 additional geothermal projects have been initiated, which have the combined potential to add another 594 MW to the national grid. (Jennejohn, 2009).

Although the installed capacity in the United States is impressive, it represents only a small percentage of the county's geothermal resource, which the U.S. Geological Survey (USGS) estimates at 30,033MWe (mean undiscovered hydrothermal resource). (Williams, 2008). There is still a significant amount of work to be done, both in developing the undeveloped hydrothermal resources and in transforming enhanced geothermal system (EGS) technology from theory to practice.

The geothermal industry in the United States currently enjoys an unprecedented level of support from Congress and President Obama's Administration. The American Reinvestment and Recovery Act of 2009 (The Recovery Act) allocated $400 million to the Department of Energy's (DOE) Geothermal Technologies Program. The allocation exemplifies the belief that geothermal energy is indispensible in improving the state of domestic energy in the U.S., as well as a commitment to grow and foster a strong geothermal industry. The investment in geothermal technology benefits not only the domestic geothermal community, but also exemplifies the goals of The Recovery Act: to create new jobs and save existing ones; to spur economic activity and invest in long-term economic growth; and, lastly, to foster unprecedented levels of accountability and transparency in government spending. The geothermal industry does all three.

In May, 2009 DOE issued competitive Funding Opportunity Announcements (FOAs) for the Recovery Act funds, and selected 123 projects in six major topic areas: Innovative Exploration and Drilling Projects; Coproduced, Geopressured, and Low-Temperature Projects; EGS Demonstrations; EGS Components Research & Development/Analysis; Geothermal Data Development, Collection and Maintenance; and Ground Source Heat Pump Demonstrations. Additionally, Recovery Act money funded 26 projects at National Laboratories; an updated, comprehensive, resource assessment by USGS, and Boise State University to design, develop and test the architecture for a National Geothermal Data System.

The Recovery Act FOAs received a record number of proposals each of which underwent a competitive review process that evaluated technical merit and how well they fit into DOE's broad programmatic goals. Award recipients included 45 academic institutions, 29 small businesses, and 2 Native American tribes. Counting partner organizations involved with awarded projects, Recovery Act funding was distributed to over 300 entities. Once online, projects will be operational in 39 states. The U.S. hopes that the results of the initiative will galvanize support for geothermal energy and technology throughout the nation and that success will spread worldwide.

A significant portion of U.S. funding for geothermal energy in recent years has supported an ambitious program to demonstrate the viability of EGS. The enormous amount of thermal energy available for EGS development (estimated by USGS at 517,800 MWe for the western states) suggests that EGS could harness much more energy than a conventional hydrothermal system due to the higher temperature and deeper resource base. Additionally, while hydrothermal resources are concentrated primarily in the western third of the U.S., EGS has the potential to be a

ubiquitous, baseload resource. To promote EGS development and to subsidize the extremely high costs of EGS drilling and construction, DOE is investing in EGS R&D and demonstration projects across the country. 21 new EGS projects were undertaken with Fiscal Year 2008 and 2009 funds. Four of these projects are EGS Demonstrations taking place in geothermal fields in the western United States, while the remaining 17 fall into the category of Component R&D, in subtopics covering High-Temperature Tools; Imaging Fluid Flow; Tracers; and Fracture Characterization. These projects are all currently underway.

The last three years have been extremely active for the U.S. geothermal industry, with respect to development and testing of innovative technologies that take advantage of short-term geothermal production opportunities. At the 2009 Geothermal Resources Council meeting in Reno, Nevada, Chena Hot Springs and Pratt & Whitney Power, in partnership with DOE, successfully demonstrated a mobile low-temperature power generation unit at the Peppermill Hotel & Resort. Additionally, the DOE Rocky Mountain Oil & Gas Test Center in Wyoming demonstrated power generation using fluids co-produced with oil and gas.

In recognition of the importance of collaboration of geothermal ideas, DOE established the Geothermal Strategic Planning and Analysis Working Group, which holds quarterly Geothermal Analysis Forums. In an effort to strengthen relationships with other U.S. Government agencies and institutions, DOE also instituted the Interagency Geothermal Working Group, which generated the National Geothermal Action Plan to address institutional barriers to geothermal development. Finally, in 2009, the first ever Geothermal Research Opportunity for undergraduate students was solicited through the National Science Foundation. This endeavor is significant step forward in the realm of geothermal education and outreach.

Looking forward, the U.S. plans to continue the development of EGS as well as conventional hydrothermal resources. DOE has near-term goals to find 30GW of undiscovered hydrothermal resource using advanced remote sensing techniques, as well as to validate that development of 5MW of EGS is technically feasible by 2015 and sustainable for at least five additional years. In the longer term, the U.S. hopes to prove out USGS estimates of up to 100GW of low-temperature and co-produced resources accessible by 2030, and more than 500GW of thermal resources accessible by 2050. (Williams, 2009).

In addition to strong government support, the U.S has a vibrant industry buoyed by an improving business environment that benefits from financial incentives including production and manufacturing tax credits, loan guarantees, and a “grants in lieu of tax credits” program. The geothermal industry in the U.S. has grown significantly over the last three years. Anecdotally, this growth can be tracked through the increased participation in major geothermal conferences. The Geothermal Resource Council reports the number of registrants for their conference and the concurrent trade show (organized by the Geothermal Energy Association) has more doubled from 2007-2009, to over 2300 people. (Robinson, 2009; Gawell, 2009).

2. INTERNATIONAL PARTNERSHIP FOR GEOTHERMAL TECHNOLOGY

The U.S. recognizes, however, that the successful development and commercialization of EGS technology is a monumental task best accomplished through collaboration of geothermal experts worldwide. The U.S. participates in several international geothermal collaborations, one of which is the International Partnership for Geothermal Technology (IPGT).

The IPGT signifies the commitment of three of the world’s geothermal energy leaders to advance the energy through the continued development of new technologies. The IPGT provides a forum for government and industry leaders to coordinate their efforts and collaborate on projects. Partners share information, results, and best practices to limit unnecessary duplication and accelerate the development of geothermal technologies. EGS is in an early stage of development and groups throughout the world are working to develop effective methodologies and practices. Given the threat of global climate change and the world’s current energy security concerns, from the need for a reliable, domestic source of baseload renewable energy is universal. Of the existing renewable energy technologies, geothermal has the most significant potential to fill this role. The IPGT is working to advance geothermal power-producing technology to a level where it is a viable option for societies throughout the world, irrespective of their hydrothermal resources.

The IPGT has three founding members: Iceland, Australia and the United States, and operates through a Steering Committee comprised of government and industry representatives from the member countries. Sharyn Minahan, Australian Ambassador to Denmark and Iceland; Ossur Skarphedinsson, Iceland's Minister of Industry, Energy and Tourism; and Katharine Fredriksen, U.S. Acting Assistant Secretary of Energy for Policy and International Affairs signed the Charter Agreement for the IPGT on August 28, 2008 in Keflavik, Iceland. Since that time, the IPGT Steering Committee has been working to identify high-priority topic areas and choose projects on which to collaborate. As of October, 2009, the Steering Committee narrowed the IPGT’s initial focus to six broad topic areas: lower-cost drilling, zonal isolation, high-temperature tools, stimulation procedures, modeling, and exploration technologies. The Steering Committee identified three working group conveners for each topic (one from each country), who are charged with building international working groups on the topic, developing authoritative white papers and research plans, and identifying potential areas for international collaboration. Several projects are under discussion between the members and the Steering Committee anticipates that two or more projects will be underway by April of 2010

The IPGT has also sponsored two workshops, both in Iceland. The first took place August 27-28, 2008, coincident with the signing of the IPGT Charter Agreement. It outlined the state of technology in each of the three initial member countries, identified priorities and helped to give the partnership direction. Based on the success of the first workshop, the IPGT held a second set of workshops on exploration technologies and stimulation procedures in May 2009. In addition to providing the IPGT with valuable information about the needs of the international community in these topic areas, workshops also provided a framework for substantive collaborative projects between industry, academia and research institutions in the member countries.

The IPGT strives to be inclusive, and is open to new member countries that are able and committed to further the development of advanced geothermal technologies. In order to formally request membership to the IPGT and Steering Committee, a country should submit a letter to the

Secretariat outlining how it meets the membership criteria and what tangible benefit it would add to the IPGT. The requirements for membership are active (1) government and (2) private-sector involvement in advanced geothermal technologies. Additionally, countries must be willing to share information and lessons learned from research with the other IPGT member countries. Membership to the official Partnership is not necessary to participate in its projects.

Support for geothermal energy in the United States has been reenergized by an influx of funding and enthusiasm. Similarly, the IPGT is off to a promising start. However, in both cases, the eventual effects on the industry are not yet known. Efforts must be made to ensure that The Recovery Act funding results in substantive and sustained growth, and that the Partnership realizes its goal of developing meaningful projects. Nevertheless, the geothermal community has an exceptional opportunity to further geothermal energy and technology development worldwide.

REFERENCES

Gawell, K., 2009. Personal Communication. Geothermal Energy Association.

International Partnership for Geothermal Technology, 2009. About IPGT: http://internationalgeothermal.org/IPGT.html.

Jennejohn, D., 2009. U.S. Geothermal Power Production and Development Update, September 2009. Geothermal Energy Association, Washington, D.C.

Robinson, C., 2009. Personal Communication. Geothermal Resource Council.

Williams, C.F. et al., 2008. Assessment of Moderate- and High-Temperature Geothermal Resources of the United States. United States Geological Survey.