

Texas Workshop Opens Discussion of Major New Area for Geothermal Energy Production – Oil and Gas Fields

In the 1970's and 1980's Oil and Gas companies diversified into geothermal exploration because of the similarities in the industries. Most of these companies left geothermal when the price of oil dropped in the late 1980's or because of failed exploration projects. Today, the Oil and Gas Industry can use a known producing field and not have high exploration costs to expand their portfolio into geothermal. Plus they benefit from the additional years of experience by the Geothermal Industry. To facilitate this happening, the first ever conference titled *Geothermal Energy Generation in Oil and Gas Settings* was held on March 13-14, 2006 at Southern Methodist University, Dallas, Texas.

Dr. David Blackwell and **Maria Richards** of the **SMU Geothermal Lab** hosted the event, which had over 100 attendees from the United States, Europe and New Zealand. There were representatives from the Oil and Gas Industry, Geothermal Industry, State and Federal Government Agencies, Utilities, Investment Banking, and Academia. The conference agenda was designed to discuss concepts and projects focused on the newer geothermal binary plant technologies, for use this with moderate temperature fluids currently produced by oil and gas wells to generate electricity.

The conference goal was to stimulate the development of geothermal energy into new areas utilizing existing oil and gas infrastructure. **Blackwell** states, “we succeeded!” Five locations are currently being reviewed for geothermal energy generation in oil and gas settings – in Wyoming, Louisiana, and multiple locations in Texas. “The Military is committed to developing renewable resources,” responds **Jason McKenna**, with the **Army Corps of Engineers - Engineer Research and Development Center**. “In 2004 the U.S. produced over 5×10^{10} bbl of “waste” water along with the oil and gas production, primarily from the Gulf States with temperatures high enough to produce electricity.” Case studies showcased how the current drilling depths for oil and gas wells have created many new geothermal opportunities. **Susan Petty** of **Black Mountain Technology** discussed Poplar Dome, Montana, with well temperatures between 185°F and 265°F at depths between 5400 ft and 8600 ft. **Will Gosnold**, from **University of North Dakota**, focused on the Williston Basin and concluded that the recoverable geothermal resource in the region exceeds the energy that could be recovered from oil. Continuing to prove that it wasn't just a Gulf State phenomenon, the infamous Tea Pot Dome, Wyoming Field was highlighted by **Mark Milliken** of the **Rocky Mountain Oilfield Testing Center**, which is expecting to be a geothermal demonstration site.

The other case study was the Department of Energy Geopressure Demonstration Site at Pleasant Bayou, Texas, which was built sixteen years ago. Bringing up the past was rewarding for the Pleasant Bayou Geopressure Power Plant designer, **Richard Campbell** of **The Industrial Company**. “This plant had been all but forgotten by everyone,” he said, “this is first presentation about it I've done.” The demonstration plant had generated a total of 980 kW of electricity during January - May of 1990 from the high temperature fluid, pressure and gas when it was deemed a successful demonstration and shut down. **Joel Renner** of the **Idaho National Lab** discussed the modeling of the geopressure reservoir, by **Mike Shook** of **Chevron/Texaco**, and projected it to be capable of producing for at least 10 years. Two oil company participants left curious about their interests in South Texas and are reviewing them for geopressure possibilities.

For a well or field to be considered, it needs temperatures ranging from a minimum of 200°F to 250°F at depths less than 15,000 feet, and at least 500 gpm of fluid. This occurs in oil and gas fields in many areas in the United States and throughout the world. According to **Blackwell**, several thousand MW of electricity could be produced using only the present rate of waste fluid production in the U.S. Today, electrical energy production based on the Earth uses the newest geothermal technology designed for smaller installations, such as the lower temperature oil and gas wells with high fluid volumes. As **Greg Mines** of **Idaho National Laboratory** pointed out, the Earth doesn't shut down, so electrical production is available 24 hours a day, 95⁺% of the year, if maintenance is factored in.

Representatives from **Ormat Inc.**, **United Technology - Carrier**, and **Encore Clean Energy** were at the conference showing the diversity of this new binary technology. These systems can be as small as 200 kW and can be used for generating electricity for rural communities, schools, hospitals, eco-hotels, etc. **Chena Hot Springs Resort** owner,

Bernie Karl, captivated the conference attendees attention with his enthusiasm for his ammonium adsorption geothermal system that uses the water's heat to make ice for his illustrious Ice Hotel.

“Utility companies purchase the electrical energy produced from geothermal sources as a renewable base load source” according to **Mark Kapner** of **Austin Energy**. The Oil and Gas Industry could benefit by producing the energy needed for their pumping costs, and where higher water flows and/or temperatures occur, by selling the excess electricity to the grid. For utility companies needing to expand their electrical production, risk is an important factor in determining the energy sources for building new utilities. **Roger Hill**, of **Sandia National Lab**, pointed out from a 2003 study that the risk factor for new geothermal development was a standard deviation of approximately 0.12, new gas 0.17, new nuclear is 0.14, new coal 0.13, and new wind 0.04. For a utility portfolio to maximize its cost and risk, renewables such as wind and geothermal are important energy sources. The ability to create and sell RECs - renewable energy credits (1 REC = 1 MWe hour)- was the topic of an instructive talk by **Tim Smith** of **Element Markets Inc**. He emphasized the additional value that renewably generated electricity has in the renewable market as a viable commodity. Many states now have a Renewable Portfolio Standard; **Russel Smith**, **TREIA Executive Director**, helped establish and expand the Texas Renewable Portfolio Standard. He pointed out the encouragement for further diversification of renewable energy projects provided by the inclusion of a 500 MW target for non-wind renewables in SB 20, which was passed by the Texas Legislature in 2005.

Oil and gas advances were also discussed along with geothermal ones. **Lance Hays** of **Energent Corporation** discussed how using oil and gas well two-phase and three-phase technology maximized power production and well flows increased about 1 MW/MM-lb-hr for brine temperatures of 280°F. Improved well integrity designs through the use of foamed cements were highlighted by **Prentice Creel** of **Halliburton**. It was emphasized that the conversion of oil and gas wells to geothermal wells, once the oil and gas is depleted, may extend well productivity beyond their original design time. With new casing and cementing technology, wells will have improved longevity. **Louis Capuano**, of **ThermaSource, Inc.** focused on major differences between geothermal and oil and gas wells; mentioning the potential for corrosive gases in geothermal waters. **Dick Benoit**, of **Sustainable Solutions**, quickly explained how the Geothermal Industry now deals with the issue of corrosives and well scaling, which has been an Oil and Gas Industry concern. The **Department of Energy, Geothermal Program Technology Manager, Raymond LaSala**, explained different advancements in drill bits, air-cooled condenser enhancement, and low-Cost Coating Material. Both the Oil and Gas Industry and the Geothermal Industry members present were excited about these findings. Combining these technologies will increase energy output for both industries.

Dub Taylor, of the **Texas State Energy Conservation Office**, started by discussing the potential of all renewables in Texas, and then showed the immense need: Texas is the 5th largest energy user in the world (according to population base) and only two percent of that energy currently comes from renewable resources. The Energy Flow Chart, presented by **John Ziagos** of **Lawrence Livermore National Lab**, emphasized the need not just for Texas but all of the United States for renewable energy development. The demand driven charts quickly displayed the energy sources, the consumer side need and the chokepoints for new technology / energy types/ and synergies to be created. **Ziagos** stressed in concluding that “besides competing with other renewables to de-carbonize the electrical system (as the conference focused on) — we must have massive application (i.e., geothermal heat pumps) of passive geothermal by 2050 in order to provide a significant contribution towards a carbonless energy system.”

Richard Erdlac, of the **UTP-CEED**, summed it up in his presentation on Constraints and Best Use Practices, “The development of Texas geothermal energy will change the future of both the Oil and Gas and the Geothermal Industries,” **Erdlac** said, “and not just for Texas.” With the numerous Oil and Gas companies in Texas and the existing infrastructure it's a perfect state to show how green the industry can become. **Doug Johnson** reported the **Texas Railroad Commission** has reviewed its geothermal licensing procedures, anticipating many new requests.

As these two industries shared ideas once again, the participants of the conference felt hopeful that in the next year, multiple demonstration sites will be completed, and within a decade, the new technology will become current practice. If you are interested in becoming a demonstration site please contact the **SMU Geothermal Lab**. **David Blackwell** can be contacted at blackwel@smu.edu or 214-768-2745. If you would like more details, all conference presentations are available online. Contact **Maria Richards** for assistance and questions at 214-768-1975 or mrichard@smu.edu.

