

POWER PLAYS

GEOTHERMAL ENERGY IN OIL AND GAS FIELDS

2015 Conference Summary

Success! *Power Plays*: Geothermal Energy in Oil and Gas Fields

The SMU Geothermal Laboratory conference ***Power Plays*: Geothermal Energy in Oil and Gas Fields** concluded with - worth the effort! During May 19-20 attendees discussed projects covering eastern and western hemispheres and ideas blending together experience from various aspects of the energy industry. As in previous years, the conference included discussion on generating geothermal energy from oil and gas fields, but this year encompassed discussion on topics such as flare gas, desalination, and induced seismicity.

James Wicklund of Credit Suisse discussed the economics of the oil and gas industry, which had to expound on the expectations associated with the decline in oil and gas prices. Wicklund highlighted the geothermal industry's opportunity right now to connect with the energy industry by helping them find increased revenue in the fluids/surface field operations. There is also an opening in the financial markets for geothermal to acquire additional project financing as portfolio advisors are looking for opportunities to generate returns in a down market.

It was emphasized by Wicklund that the geothermal industry is so small, it is hardly even a blip on the radar for both the energy market and even now the subset renewable energy market. In the 1980s many oil companies included a geothermal division because of the overlapping skill sets and technologies. Today companies like AltaRock Energy are using geothermal industry knowledge to teach oil and gas companies new methods for fracturing rocks. Modeling by Jenna McGrath of Georgia Tech University showed how utilizing improved fracturing technology in enhanced geothermal systems (EGS) operations will lead to EGS having a better performance than natural gas a few decades from now. Along the lines of how to improve fracturing techniques, researcher Bruce Marsh of Johns Hopkins University showcased a new EGS design based on a car radiator created with propellant fracturing of the reservoir. The ability to fracture without water could create major changes in the industry.

The Department of Energy discussed where the Play Fairway Analysis and FORGE contracts are exploring new techniques to find resources and methods to use the geothermal fluids. SMU is currently connected to the Appalachian Basin Play Fairway Analysis project using oil and gas reservoir data to find opportunities to use the hot fluids directly for large buildings or commercial development. Utilizing low-temperature (<150°C) fluids becomes increasingly economical when only one borehole is necessary. Ali Ghoreishi of McGill University presented his model showing where decommissioned wells could become profitable for building heating in Canada. On the other side of the Atlantic is a project in Croatia combining geothermal

fluids with a Combined Heat and Power closed loop design for buildings. Bodo von Düring and his son Cedric demonstrated how much the U.S. has still to learn related to using all aspects of the fluid stream, including heat (100°C) and CO₂, through their example project operations for both district heating and electricity production. Cedric's movie of the full project development plan not only livened up the afternoon crowd but also gave an example of how the young professionals of today are able to promote geothermal energy, making what is difficult to grasp, accessible.

High temperatures are an obvious focus for geothermal development, but what became apparent in the talk by Wade Williams of Joule was how many of the wells drilled by the oil and gas industry are in temperatures over 150°C and the need for equipment components for these HOT environments ~300°C! The industry 'detectives' at Blade Energy Partners are researching why wells fail in these high temperature – high pressure environments. Initial explanations for why they fail are often not the actual reason. These are the most expensive wells drilled by any industry and when they fail, the financial loss can destroy the company involved, especially if early on in the exploration process. The TGS correction techniques presented by Ian Deighton improve the use of well log header data for reservoir temperatures, thereby improving exploration for both geothermal and oil/gas industries.

There was little doubt that development of geothermal energy in the oil and gas fields is possible, probable, and happening today in China as discussed by Kewen Li of Stanford. Kevin Shaw of Mayer Brown LLP gave the audience a list of items that must be completed before an oil well can legally be converted to geothermal well. Every state has rulings as to who owns the geothermal lease. As John Furlow highlighted so succinctly, Texas seems to be still in a quandary because 98% of Texas land is privately owned and for much of it the surface and mineral rights have been severed. There is no doubt lack of legal certainty in Texas creates business and investment risk. For Bernie Karl of Chena Hot Springs, risk is what drives him forward and he's currently working to get a project on-line in Columbia to generate power for an Oxy Petroleum field.

Flare gas can be captured and used as shown by the flare-gas project in North Dakota using Hess Corporation wells, Gulf Coast Green Energy - ElectraTherm Inc. technology, with the project coordination/funding through HARC. The timeline for ribbon cutting is late July. Hess Corporation has been working with a technology company to strip and use fluids from the flare gas, so the Gulf Coast Green Energy project will demonstrate on wells that are capable of cascading between multiple technologies.

There is renewed interest in all aspects of energy development related to water. Being able to use the heat in the fluids with GeoTek Energy technology reduces the production parasitic loads. The production fluids usually contain some water and this can now be converted to drinking water or brine for reinjection with STW Water Process & Technologies equipment. A side discussion at the conference was a project in South Texas to take the city owned oil wells and rather than abandon them, produce more water, use the heat for desalination, and put the clean water into the city water supply. The ability to determine where the water zones are located based on drilling logs was explained in the poster by Lincoln Schick of Mogul Energy International.

Students and young professionals who attended provided one of this year's conference highlights. The poster session spotlighted the Mexican contingency from iiDEA Group, National Autonomous University of Mexico and their engineering talent working on desalination, improved efficiency microturbines, and locations for direct use such as greenhouses. New regulations in Mexico are opening up geothermal development opportunities, as well as their energy demand expanding rapidly. There is an update of the geothermal heat flow in Mexico currently underway as part of a large group effort by the Mexican Center for Innovation in Geothermal Energy (CeMIE-Geo). The ability to cross international borders and to learn from each other was also emphasized by technical researcher Kris Pudyastuti from Trisakti University, Jakarta Indonesia discussing wellbore simulators.

Whether it is surface technology being used for geothermal fluids from deep within the Earth or surface fluids, this Power Plays conference updated the attendees on new technologies usable for both situations. It is the ability to "kick the tires" on technology and learn about products just coming into the market that makes the SMU conference unique. This year the Heat-is-Power panel discussion included Jessica Lubetsky of Pew Clean Energy Program, who educated the audience on national issues related to energy bills currently underway. Kevin Kerlin updated us on the Helidyne rotary expander for high pressure gas environments. Over the past three conferences, the Helidyne product was discussed as a concept, then shown as a demo, and is now in production! SMU alumni Jeff Dye and Dexter Jacobs started LoCap Energy, a business to shave peak loads for energy savings. Many attendees gave them suggestions for connecting with industry users. At the opposite side of the market is Turboden s.r.l. out of Italy. Clotilde Rossi di Schio emphasized the opportunities for using oil and gas fields to generate with their technology large loads of > 200 kW to 15 MW of power from water or gas.

Living in Dallas, and working in the SMU Huffington Department of Earth Sciences, we have felt the impact of earthquakes from induced seismicity both physically and by being part of the research team investigating their origin. Talks by Brian Stump (SMU) and Paul Morgan (Colorado Geological Survey) gave perspectives on the relationship between earthquakes in the Barnett Shale – Fort Worth Basin (Texas) and the Raton Basin (Colorado – New Mexico), respectively. There are now more felt earthquakes in Oklahoma and Texas than in California. Marian Higgins research on community perceptions to geothermal energy emphasized the importance of grass-root communication at a community meeting level. Whether it is a concern about earthquakes or water contamination, the fear of the unknown or misinformation is capable of blocking an energy project, even if it is better than the other options.

Thus there is work to be accomplished in the next year! A new project is coming on-line this summer using Continental Resources wells in North Dakota and Calnetix equipment to generate power for the field. Will Gosnold of University of North Dakota, Grand Forks is overseeing this project. U.S. DOE is having a second Direct Use Meeting August 17th in Pittsburg, PA to improve on our ability to use more stored heat. The geothermal community has an opportunity to connect with experienced oil and gas drillers to improve the efficiency and success rate of new completions, for both industries. Grass-root interaction can be across national borders, industries, and neighboring universities. Let's get it done.