BIG energy seminar series

Addressing the scale and complexity of the global energy challenge.

Beowawe to Wairakei: Discovery and Sustainability of Geothermal Resources

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Date: Wednesday, February 5, 2014 at 4:00pm
Location: BESC 180 (Benson Earth Sciences)

Abstract:

The installed capacity for geothermal power production globally exceeds 11,000 MWe, and high-grade resources are found in sub-aerial hydrothermal systems associated with magmatic intrusion and/or zones of crustal extension. Despite considerable experience and success over the last 50 years, discovery and assessment of new resources carries large risk and great uncertainty.

The geological settings of two contrasting geothermal resources, Beowawe and Wairakei, are used to illuminate the geological controls on fluid flow and storage that dictate the size and longevity of a geothermal resource. Beowawe is located in north central Nevada and is representative of Great Basin resources, which are typically located along basin bounding faults and which lack evidence of recent magmatism; power production of 16-17 MWe has remained more or less continuous for close to 30 years, greatly exceeding conservative estimates of resource available from the reservoir. Wairakei is located in the Taupo Volcanic Zone, North Island, New Zealand, and it is typical of volcanic hosted geothermal resources in arc and rift settings; power production of 150-250 MWe has been continuous for >50 years, and development is underway to increase power generation in expectation of an additional 50 years of production. In both examples, the locations, limits, and dimensions of the resources were difficult to determine from surface expressions of the systems and exploration drilling.

While we need to improve understanding of conventional reservoirs, the future of geothermal energy depends on success of proving techniques and methods for energy production at large scale and in areas that are close to consumers. Hot sedimentary basins are one option for near term development. Eventually, however, techniques that permit energy extraction from hot but poorly permeable rocks, with little fluid resource at >3 to 10 km depth are needed to increase the uptake of geothermal energy utilization. This is an enormous untapped and renewable resource, and drivers such as need for oil/gas production from shale is an example of the sort of catalyst that could accelerate technical advancements.

Bio:

Stuart Simmons (Ph.D. Geology, U Minnesota) is a Research Scientist at the Energy & Geoscience Institute (EGI), University of Utah, and he works as a consultant to the geothermal and minerals industries in the exploration and development of new resources in the circum-Pacific region. From 1987 to 2008, he was on the academic staff of the Geothermal Institute at the University of Auckland where he served as Associate Professor and Director. In 2011, he was appointed Research Professor at Colorado School of Mines and in 2013 he joined EGI.

His research focuses on the geological and geochemical controls on hydrothermal fluid chemistry and fluid flow in geothermal systems, with experience in New Zealand, Chile, and the western USA. He has published over 70 papers in scientific journals, including American Journal of Science, Economic Geology, Geothermics Geology, Journal of Geophysical Research, Journal of Volcanology and Geothermal Research, Nature, and Science, and he has given numerous short courses on geothermal resources and epithermal mineralization.

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