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June 7, 2016

MEMORANDUM

TO: Power Committee

FROM: Gillian Charles, Energy Policy Analyst

SUBJECT: Geothermal energy potential and the Newberry Geothermal Energy research facility

BACKGROUND:

Presenter: Alain Bonneville, Pacific Northwest National Laboratory (PNNL)
Laura Nofziger, AltaRock Energy
Rebecca O'Neil, PNNL

Summary: Mr. Bonneville, Ms. Nofziger, and Ms. O'Neil will be presenting an overview of geothermal energy as a baseload renewable resource. In particular, they will be discussing what the potential is in the region, the costs and barriers to development, and the advantages and differences between conventional geothermal and enhanced geothermal systems (EGS).

On Monday, June 13 (the day before the Power Committee meeting), several Council members and staff will be taking a tour of the Newberry Geothermal Energy (NEWGEN) research facility near the Newberry Volcano. This site is one of five finalists for the Department of Energy's Frontier Observatory for Research in Geothermal Energy (FORGE). If selected, it will become the dedicated national research facility for scientists and engineers to develop and test new EGS technologies and help further the deployment and commercialization of EGS.

Relevance: The Seventh Power Plan identified conventional geothermal as a potential renewable resource for compliance with state Renewable Portfolio Standards. One advantage geothermal has is that it produces a consistent output similar to a baseload resource like natural gas and coal. Variable energy resources like wind and solar produce energy intermittently, solely dependent on when the wind blows and the sun shines (except when combined with energy storage). To date, development of conventional geothermal resources in the region has been limited due to its high development risk, but the technical potential, particularly in Central/Southern Oregon and Idaho, is significant.

The Seventh Plan identified EGS as an emerging technology that has significant potential in the future Northwest power system. Action item ANLYS-14 directs Council staff to monitor and track development, costs, potential, significant milestones, and early demonstration projects and commercial deployments.

Workplan: Power Division A.4.3 – Implement Seventh Power Plan and related Council priorities – Generation Resources – Track emerging technologies and development trends related to generating resources and utility scale storage.

Background: Conventional geothermal energy requires the simultaneous occurrence of high temperature, permeable rock below the Earth’s surface and the natural presence of a fluid source or hydrothermal reservoir. EGS only requires hot rock – the rest is engineered through fracturing to create permeability and the injection of fluid from an often, but not always, man-made source. While conventional geothermal requires expensive drilling for the right combination of natural occurrences – and often results in “dry” hole wells – EGS manufactures those occurrences and thereby minimizes the risk of high cost exploratory drilling. However, additional risks come with EGS, including issues caused by fracturing the rock (“fracking”) that can sometimes lead to seismic activity or fluid seepage tampering natural bodies of water nearby.

The NEWGEN project is led by PNNL, in partnership with Oregon State University, AltaRock Energy, GE Global Research, and Statoil.

More Info: <http://www.newberrygeothermal.com/>
There is a short video if you scroll down the page – it describes EGS and the proposed research facility at the Newberry volcano. There is also additional information regarding the facility and the process.

Alain Bonneville, Ph.D, PNNL. Dr. Bonneville is a Laboratory Fellow and geophysicist who joined the Pacific Northwest National Laboratory in 2009. He is the principal investigator of a diverse range of projects involving basic and applied research in geological storage of CO₂, geophysical monitoring techniques and geothermal energy. Between 2009

and 2013, he led the PNNL Carbon Sequestration Initiative. Prior to this role, he was a full professor of Geophysics and vice director of the Institut de Physique du Globe de Paris (IPGP). He has made contributions to various domains of Earth sciences, from the study of intra-plate volcanism to marine heat flow and geodesy. During the 1990s, as a professor at the University of French Polynesia, he became a recognized specialist of the geodynamics of the South Pacific and founded the Geodetic Observatory of Tahiti with support from NASA and CNES.

Laura Nofziger, Senior Vice President and Managing Director, AltaRock Energy. Ms. Nofziger has 15 years of energy industry experience in production, reservoir and fracture stimulation engineering and management. Laura previously served as eni Petroleum's Production Manager over their Nikaitchuq asset on the North Slope of Alaska where she was responsible for overall management of Production & Operations activities. As production manager, she managed a team of more than 200 people, a 40,000 BOPD processing facility, over 40 extended-reach horizontal wells, and the asset's operating budget. Prior to her position at eni, Laura was the lead engineer for AltaRock Energy (ARE), where she developed the Stimulation and Well Testing Best Practices for the Geysers demonstration project while being responsible for all production, stimulation, well testing and logging cost estimates, procedures and field execution. Prior to AltaRock Energy, Laura worked as a production engineer for several independent oil and gas companies, overseeing onshore Southern US assets. Laura holds a BS in Petroleum Engineering from The University of Texas.

Rebecca O'Neil, PNNL. Ms. O'Neil is a program manager for Pacific Northwest National Laboratory, serving as the lab relationship manager for the US DOE EERE Wind and Water Technologies portfolio as well as lab initiatives related to regulatory development for energy storage. She joined PNNL in 2015 from the Oregon Department of Energy, where she spent five years representing the agency on water power development; administering the renewable portfolio standard and environmental commodities; emerging technology such as energy storage and regional integration issues; and managing a multi-million dollar portfolio of federal grants ranging from agricultural efficiency to wood stove replacement in air quality limited regions of the state. Before her state service, she managed the multifamily energy efficiency program for a contractor of Energy Trust of Oregon and represented a coalition of river conservation and recreation organizations in federal hydropower dam licensing. She serves on multiple organizational boards and advisory groups related to renewable energy.