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DEEP | EARTH | ENERGY | PRODUCTION

SASKATOON, SASKATCHEWAN – DEEP EARTH ENERGY PRODUCTION CORP. ("DEEP", or the "Company") delivers Natural Resources Canada and SaskPower funded Pre-feasibility Study

DEEP is pleased to announce that the pre-feasibility study for geothermal power production in Southeast Saskatchewan near completion. The report includes engineering and geoscience by Enerpro Engineering Inc., SNC Lavalin Inc., North Rim Exploration Ltd., Magna Electric Corp., GeothermEx, Schlumberger, and data obtained from the Petroleum Technology Research Council.

The project is viable from an economic, legal, environmental, and technical perspective, and with the final testing results from the upcoming proof of concept study, the project will refine the assumptions made on the reservoir for both production and injection, and effectively de-risk this aspect of what will be Saskatchewan's (and Canada's) first geothermal power generation facility.

In addition to revenue from power generation, DEEP is also investigating potential revenue streams from waste heat sales. After the plant has harvested the heat from the hot water for power generation, the waste water will still be at 65°C and available for further utilization prior to re-injection into the subsurface. In other countries, this geothermal waste heat is sold for heating greenhouses, industrial applications, real estate developments, etc., which could also be developed in Southeast Saskatchewan, discounted to the price of natural gas heating.

Summary of the Pre-feasibility Study

Geothermal power is a relatively new endeavor in Canada, where currently there are no operating plants. However, this technology is utilized globally, with the United States as the largest geothermal power producer. DEEP is planning a geothermal plant project that will involve the design of a 10 MW gross geothermal power plant in Southeast Saskatchewan that will have an expected net output of 5 MW. DEEP's planned geothermal generation plant is an ideal 'green energy' producer of baseload electricity. For every 1 MW produced, approximately 1200 houses can be removed from carbon based power generation (gas fired power plants), as well as approximately 5600 tonnes of CO2 is removed from the atmosphere each year.

Geothermal power plants produce power by taking hot brine from a reservoir and passing the brine through a heat exchanger, which superheats and expands a working fluid that spins a generator to produce power. The brine is then re-injected into a reservoir after heating the working fluid. Air coolers cool the working fluid before passing through the heat exchanger again. The electricity produced is then integrated into the power grid.

The hot brine will be produced from the Deadwood and Winnipeg Formations via 3 production wells drilled to a depth of ~3200m. Based on reservoir studies performed during the pre-feasibility stage, the brine is expected to have a density of 1.21 kg/L and a temperature of 120^{o}C at surface. The brine is also expected to have 300,000 mg/L of total dissolved solids (TDS) with no precipitates or salting out effects when cooling down to 20°C.

A well bore profile for the production well was developed using the information from the reservoir studies coupled with a hydrogeological flow model. With a dense brine and relatively low dynamic water level, an electrical submersible pump (ESP) was chosen for this application to bring the hot brine to surface. The ESP will have to be placed lower than the dynamic water level; this results in a well bore profile of 13 5/8" pipe for the first 700 m with 7" production tubing, then 2300 m of 9 5/8" casing with 90 m of 7" production screens in the Deadwood and Winnipeg Formations.

Using the brine characteristics and mass flow rates, the expected gross power produced from the Organic Rankine Cycle (ORC) binary plant is 10 MW. The internal parasitic loads of the power plant is expected to be 2 MW, and with the 3 ESPs anticipated to have a total load of approximately 3 MW, the net power output to the grid is expected to be 5 MW. The ORC will also be required to power the on-site facilities, though the power requirements of the site are negligible compared to the net power output.

This project will be subject to the Saskatchewan Environmental Assessment Act and a Project Proposal must be submitted to the Minister of the Environment to determine whether or not the project is considered a 'development'. If the project has no or relatively minor environmental concerns, the project may proceed without further Environmental Assessment Branch requirements. The Ministerial Approval (determination that a project is not a 'development' or Approval if it is a 'development') is the primary enabling approval required before the project can be constructed. The project will not be subject to a Federal environmental assessment under the Canadian Environmental Assessment Act, 2012. Potential environmental effects are considered very minor and can be mitigated with best practice measures. The majority of effects will occur during the construction stage, including dust, vehicular emissions, noise, increased traffic, stripping of vegetation and topsoil, drilling waste, changes to natural site drainage and potential spills. Operational effects are limited to groundwater extraction (considered a renewable resource), low-level noise, and potential salt water or refrigerant spills.

The longest lead item is the ORC unit at 18 months delivery time, therefore the feasibility study needs to be started as soon as the proof of concept wells are tested and completed to achieve an operational date of 2017. The total time estimated to power generation from the onset of the Proof of Concept study is approximately 2.5 years. The Total Installed Cost per kW (TIC/kW) is approximately $8000 without contingency or overhead. The TIC/kW benchmark for low-grade heat (<150^{o}C) geothermal power generation follows a range of $8000 - $10,000/kW. The 5 MW net output geothermal power plant is assumed to have a utilization rate of 95%. This covers any scheduled and unscheduled maintenance.

The next phase in this project is to drill and test a proof of concept production well and an injection well. The production well will be cored and tested through the Mannville and Deadwood/Winnipeg Formations. The core samples will verify the reservoir characteristics such as permeability and porosity. Brine samples will be analyzed to determine if gas in solution exists, and to verify the TDS content, density and heat capacity of the brine. The wells will be flow tested to determine the dynamic water level and surface temperature of the brine and the injection capacity of the Mannville formation.

Assuming the proof of concept well produces the flow and temperature currently anticipated, the project has the potential to have reasonable returns and stand on its own without continued support from various levels of government or industry. The five plant model has assumed that certain economies of scale are achieved during development in that plants 2 through 5 would enjoy a 10% reduction in capital costs over the initial power plant. However, since the 5 plant model has assumed a 40 year life, a significant amount of sustaining capital has been added in the later years. The above waste heat scenarios assume that power is generated by selling heat from the water prior to re-injection into the ground by removing an additional 20 degrees Celsius from the water. The potential end user would purchase access to the water, discounted to the price of natural gas, for industrial heating or large scale greenhouse development.

A renewable energy source, that is very scalable and provides a reasonable return on investment, will look very attractive compared to non-renewable alternatives in the future. Geothermal power supplies baseload power and is not intermittent like wind and solar. Geothermal power also has zero CO2 emissions and the smallest environmental footprint of the renewables. In addition to these benefits, here are many synergies when developing a renewable power source that utilizes local oil and gas drilling technologies and experience. Completion of this successful demonstration project could establish a brand new Canadian industry.

The Board and management thanks our shareholders, SaskPower and Natural Resources Canada for their support.

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