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Renewing and Rethinking the University of Regina Geothermal Test Well Project of 1979

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Summary

A research team at the University of Regina is proposing to renew a deep geothermal energy demonstration project initiated in 1979, to supply district heating using the Deadwood/Winnipeg aquifer. The economic value of the system is based upon the avoided cost of purchasing natural gas and associated carbon tax. Forecasting suggests by 2023-24 the university could save ~$80,000 per year, while avoiding the annual production of ~1,820 t of CO_2. Back-casting shows had the geothermal project been completed in 1979 the emission of 106,000 t of CO_2 and the purchase of roughly $9.5 million worth of natural gas could have been avoided, To move forward, the Working Group is proposing a project partner feasibility study to advance the completion of the deep geothermal heating project on campus, and to obtain feedback on the viability of integrating additional innovative projects such as municipal solid waste to the energy demonstration project.

Theory

A Working Group research team at the University of Regina, Saskatchewan is proposing to construct a deep geothermal energy demonstration project using heat from the Deadwood/Winnipeg aquifer at the base of the Western Sedimentary Basin. This work is a continuation of research in 1979, when an exploratory geothermal test well was constructed. Resulting studies on the hydrogeology and geothermal productive capacity of the well supported the reliable development of this resource in the greater Regina area, and is well documented by over 40 research papers. The second well required to complete the project was never drilled and the original well was capped in 1999.

Method

Reducing our carbon foot print and exploring alternative energy sources has resulted in renewed interest in the use of geothermal energy on campus; which will provide reliable, base-load heating, is available on demand, has no storage requirements and no direct emission of greenhouse gases. This renewed project will showcase clean, green energy technology and infrastructure, with scientific, social and engineering research components. This energy source will integrate into existing heating infrastructure, and be immediately operational. To complete this project, two 2200 m deep wells will be drilled to the Deadwood/Winnipeg Aquifer beneath the University campus. Hot water from this aquifer will be pumped to the surface via the source well, where the heat will be extracted using a heat exchanger located in the heating plant on campus. The cooled water will be re-injected back into the same aquifer using the second well. The heated surface fluid will be distributed using a district heating system, providing base-load

heating for space and domestic water at Kisik Towers, a new 300,000 ft^2 residence, plus the university pool and for combustion pre-heating at the Central Heating Plant. This load represents approximately 60% of the capacity of this geothermal-doublet system which has a total capacity to provide base load heating for ~1.2 million ft^2 of space similar to Kisik Towers.

Results

The economic value of the system is based upon the avoided cost of purchasing natural gas with its associated carbon tax. Forecasting suggests that by 2023-24 the university could save roughly $80,000 per year, while avoiding the annual production of approximately 1,820 t of CO_2. These values will both increase when new buildings still in the planning stage, utilize a larger portion of the system capacity. The anticipated lifetime avoidance of CO_2 emissions would be roughly 287,000 t. Back-casting shows the savings if the geothermal project had been completed in 1979. Operating at 60% capacity during the heating season (212 days), over 2.1 million GJ of geothermal energy would have been utilized over the 40-year period. The geothermal production would have replaced the purchase of roughly $9.5 million worth of natural gas and avoided the emission of 106,000 t of CO2. As the productive life of the system would have been about 66 years, we could have expected an additional 26 years of performance, ($15 million natural gas, 75,000 t) until roughly 2046 – few infrastructure projects have a life expectancy of over 60 years.

Additive Information

To move the project forward, the Working Group is proposing a project partner feasibility study to advance the completion of the deep geothermal heating project on campus, and to obtain feedback on the viability of integrating additional innovative projects such as municipal solid waste to energy demonstration to the project. As part of the feasibility study we have been conducting focus groups to better understand the barriers to consideration of geothermal energy development in Saskatchewan; and to identify possible differences between the decision-makers (industry & political) and the general public of Saskatchewan regarding green energy sources such as geothermal. Results to date show that financial concerns regarding the cost of the project and how long to pay off the project are the primary concern among all groups. Only one of the student groups showed serious concerns regarding climate issues. All student groups noted the lack of knowledge regarding geothermal systems and recognized that they needed and wanted to know more. Yet groups were split as to the best means to educate the public. There was a real feeling of distrust among university students with the government, journalists and even the experts. Social media was thought to be better than paper products or brochures, yet they do not trust most social media outlets. Among decision-makers concerns about costs, poor business case and long term maintenance. They questioned ownership of the system and who would be responsible for it. They see this as a potential research facility to be turned off when the research was completed. They noted two main barriers to the project; they do not understand why it needs to be done at the University of Regina; and, they do not think the research questions and potential benefits to knowledge are well formulated. This information will be used to help guide our next steps to better promote potential geothermal opportunities in Saskatchewan.


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