

Study on Identification of Potential Abandoned oil Wells in Red River Formation for Integration of Low-temperature Organic Rankine Cycle in North Dakota

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Abstract

In the United States, there is an increasing concern over abandoned oil wells. The Environmental Protection Agency (EPA) estimates that there are 2.1 million abandoned oil and gas wells in the country, many of which are found in areas where oil and gas production has a lengthy history. As the country transitions to a cleaner energy economy, the number of abandoned oil wells is likely to increase, making it increasingly important to find ways to mitigate their environmental and financial impacts. The Covid-19 pandemic situation where oil production was stopped for several months and the oil firms are less financially able to create new bonds which in turn puts the wells in the orphaned category if the well is orphaned for more than one year it is considered to be abandoned oil wells. As the number of abandoned well continues to grow, repurposing these wells for clean energy production such as Geothermal energy can effectively mitigate the environmental impact of abandoned wells. This study investigates the potential for repurposing abandoned oil and gas wells that reach the Red River formation in the Williston basin for geothermal energy production using the Low-temperature Organic Rankine cycle (ORC). This research collects data on the abandoned wells in the Red River formation and calculates their temperature and temperature gradients across each formation. Finally, the Overall heat transfer coefficients are calculated using the well parameters to identify potential wells that can be retrofitted for electricity production using Low-temperature ORC. The conclusions of this study will help us identify the potential abandoned wells in the red River formation which can provide a low to medium-temperature heat output that can maintain the required Temperature differential between the evaporator and condenser to efficiently run the ORC. The significance of this study has important implications for the energy industry, as repurposing abandoned wells provide a reliable and sustainable energy source while reducing the environmental impact of abandoned wells and reducing the commissioning cost of a new Geothermal plant by 50% since drilling is not required.