FACT SHEET

Tuttle Class V Geothermal Well
Proposed Permit Number: IW-V-26001-OP
Section 11-T09N-R06W-IM
Grady County, Oklahoma

The Department of Environmental Quality's (DEQ) Underground Injection Control (UIC) program is authorized to issue permits for Class V geothermal injection wells governed by its authority under the Oklahoma Environmental Quality Act (27A O.S. § 1-1-101, *et seq.*), the Oklahoma Environmental Quality Code (27A O.S. §2-1-101 *et seq.*), the federal Safe Drinking Water Act (42 U.S.C. §§ 300f-300j-26), and rules promulgated thereunder at 40 Code of Federal Regulations (C.F.R.) Parts 144, 145 and 146, and Oklahoma Administrative Code (OAC) Title 252, Chapters 4 and 652. DEQ incorporates by reference the federal requirements for its UIC program at OAC 252:652-1-3. The DEQ shall determine criteria and issue a permit following the Tier II process that shall include any conditions the DEQ deems necessary or appropriate for protection of the underground sources of drinking (USDW) water quality.

DEQ has prepared a draft permit for Blue Cedar Geothermal, LLC (BCG) to operate, maintain, and monitor a Class V injection well as part of the Tuttle Geothermal Well Project (Project) located in Section 11-T09N-R06W-IM, near the City of Tuttle, in Grady County, Oklahoma. The Project will be an open circuit geothermal recovery project involving the conversion an existing retired oil and gas (O&G) well to an injection well along with conversion of a separate existing retired O&G well, regulated by the Oklahoma Corporation Commission (OCC) to an extraction well for geothermal energy recovery and use at public schools in Tuttle. This non-profit research project to transform / repurpose abandoned and retired O&G wells into geothermal wells to provide direct-use geothermal energy to public schools in Oklahoma is being funded by a Department of Energy Grant (#DEEE0009962) to the University of Oklahoma (OU). The permit application was jointly submitted by OU and Blue Cedar Energy (BC). As the owner of the O&G wells, BCG will be the sole permittee for the injection well. DEQ has determined the proposed injection well is a Class V well that will follow the state Tier II permitting process as well as federal procedures.

The basic Project design involves plugging off the lower oil and gas (O&G) producing zones in the existing wells and recompleting in the shallower non-O&G producing Haskell formation, from which water at elevated temperature will be pumped to the surface and run through a heat exchanger to remove the geothermal energy for use at City of Tuttle public schools, followed by injection of the cooled water back into the Haskell formation reservoir at the same rate as the withdraw rate. The injection well will come under DEQ UIC jurisdiction once the O&G zones are plugged off, while the recovery well will remain under OCC jurisdiction. The Project objective is initially to test the concept followed by full implementation, if feasible.

The workover / recompletion procedures for the injection well will generally consist of: entering the well; pulling the existing pump, tubing and packers, as appropriate, to access the lower O&G

zones in the well; running casing evaluation logs / tools down to the proposed injection zone; setting bridge plug(s) / cement plug(s) below the proposed injection zone to abandon / plug off the lower O&G zones; perforating upper casing at proposed intervals in preparation for cement squeeze; conducting cement squeeze to establish a seal behind the casing across the Haskell formation (the proposed injection zone) and across the upper and lower confining zones; running cement bond log (CBL) and other evaluation tools to confirm the cement seal behind the upper casing; re-perforating the injection / production zones; obtaining samples of formation water and measuring bottom hole pressure (BHP); installing tubing and packer; filling the tubing annulus with non-corrosive fluid; constructing well head with all appropriate valves, taps, and fittings; pressurizing annulus; and running well and reservoir tests: including production test, pressure fall-off test (PFT), and internal and external mechanical integrity tests (MITs).

The location of the Class V injection well is positioned at the following latitude and longitude (Geodetic Coordinates):

Injection Well:

Leon 1-11:	latitude:	35 degrees, 15 minutes, 53.85 seconds, North
	longitude:	97 degrees, 48 minutes, 03.96 seconds, West

The permit will have conditions that require the operator to install a groundwater monitoring well to monitor the lower part of the uppermost underground source of drinking water (USDW) prior to injecting into the Haskell formation geothermal zone. Other pre-injection requirements will be to run internal and external MITs and a PFT of the injection zone, along with other testing, to establish the initial reservoir conditions. Upon attainment of the reservoir conditions from these tests, the maximum allowable injection pressure (MAIP) and the maximum allowable injection rate will be determined. Operating conditions requirements include: continuous monitoring of injection pressure, flow rate, and annulus pressure; monthly sampling of the groundwater monitoring well; conducting annual internal MITs; and reporting of the results.

The Tier II injection well permit application for the Project submitted by OU and BC was received at DEQ April 27, 2023; with revisions submitted on August 2, September 13, and October 23, 2023, in response to notice of deficiencies (NODs). DEQ reviewed the original permit application and all supplemental information for administrative and technical suitability, and established permit conditions to assure it complies with regulatory requirements. An access agreement with the landowner was provided and financial assurance for the final plugging of the injection well will be provided upon permit issuance.

DEQ has tentatively found that the application meets the requirements of Oklahoma Environmental Quality Act (27A O.S. § 1-1-101, *et seq.*), the Oklahoma Environmental Quality Code (27A O.S. § 2-1-101, *et seq.*), the federal Safe Drinking Water Act (42 U.S.C. §§ 300f-300j-26), and rules promulgated thereunder at 40 Code of Federal Regulations (C.F.R.) Parts 144, 145 and 146, and Oklahoma Administrative Code (OAC) Title 252, Chapters 4 and 652. DEQ has determined the geothermal injection well is a Class V underground injection control (UIC) well and has established project criteria that include conditions DEQ deems necessary or appropriate

for protection of the underground source of drinking water (USDW) aquifer quality, and is issuing a draft permit for public review following the Tier II process.

The draft permit establishes site specific conditions for the Class V injection well, Leon 1-11, including a requirement to determine the maximum injection pressure and flow rates based on actual reservoir conditions, continuous monitoring of injection pressure, flow rate and annulus pressure; monitoring, testing and reporting requirements; plugging and abandonment work plan, and financial assurance. Permit conditions in Section A of the draft permit are specific to this facility and address the prohibitions in 40 CFR 144.12 to prevent the movement of fluid containing any contaminants into underground sources of drinking water (USDWs). The site specific operational, monitoring and reporting conditions are required by 40 CFR 144.52. Permit conditions in Section B are required in all Underground Injection Control permits (40 CFR 144.51). The duration of the permit will be 5 years.

The contacts for the Tuttle Class V Geothermal Well project are:

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DEQ will not make a final decision on this permit until the public has had an opportunity to comment and/or request a public meeting. Any person may request a public meeting and/or provide comments to DEQ at the address below within thirty (30) days after the date of the newspaper publication.

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