Memo: Deep Direct-Use Permitting

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Purpose This document describes the permitting process for the Deep Direct-Use project in East Texas as if it were to move forward. In addition to this written document, there is an accompanying spreadsheet listing the Federal, State, and Local permits to obtain and guidelines to follow along with related contacts, documents, or links to them. Together, they cover the main permits required. There are expected to be changes to the permitting process over time and therefore additional permits or changes in the contact persons should be reviewed by future readers of the information.

Key Definitions In 1974 the Texas Legislature passed a code within the Natural Resources Act (Title 5: GEOTHERMAL ENERGY AND ASSOCIATED RESOURCES Chapter 141, also cited as the Geothermal Resources Act of 1975), defining geothermal resources as a separate mineral right. The purpose of the code was to provide for the rapid and orderly development of geothermal energy and associated resources located within the State of Texas in the interest of the people of the State of Texas. As defined in Chapter 141, "Geothermal energy and associated resources means: (A) products of geothermal processes, embracing indigenous steam, hot water and hot brines, and geopressured water; (B) steam and other gasses, hot water and hot brines resulting from water, gas, or other fluids artificially introduced into geothermal formations; (C) heat or other associated energy found in geothermal formations; and (D) any by-product derived from them. "By-product" means any other element found in a geothermal formation which is brought to the surface, whether or not it is used in geothermal heat or pressure inducing energy generation."

Scope To review the permits required, the SMU Geothermal Laboratory began with the OpenEI Rapid Geothermal website, which provides regulatory and permitting information. The materials on the OpenEI Rapid website are generalized for the entire state of Texas with suggestions for agencies to contact for more details. We also worked with Eastman Chemical's permitting office, local government offices, and related agency personnel to determine the necessary permits. This written document is a discussion of the details related to specifically this Eastman Chemical deep direct-use assessment. Therefore, "local" includes the city of Longview, Texas and the 10 km area surrounding the plant site that overlaps with Harrison, Rusk, Panola, and Gregg counties. Taken into consideration are actions necessary if this project moved to implementation, and as an example for similar future deep direct-use projects. We expect permits will be required for at least two wells drilled, one for production and one for reinjection of fluids used in the direct-use applications, and also for pipe installations to transfer the fluids between the wells and the on-site heat transfer equipment.

Eastman Chemical (EC) manufacturing facility in Longview, Texas includes a natural gas power plant, which generates electricity for EC onsite use, with additional power sold to others via the regional power grid, the Southwest Power Pool (SPP). Thus, there are already existing power purchase agreements between EC and SPP to produce and sell power. It is expected that the existing agreements would be reviewed and updated if more power was made available. To sell

into the ERCOT electrical grid, there would need to be new power lines built to connect the plant to this grid with an additional cost for the project. As of now, we are not including that effort as part of our permitting process review.

The following explanation of the permits follow the OpenEI Rapid Geothermal outline structure for ease of future users of this document. It provides an example of a project most likely on privately owned land, such as EC or an individual land owner. We also include the review of permits for the state and federal lands nearby.

Location

The regional area within a 10 km radius of the Eastman Chemical (EC) power plant was reviewed for surface land ownership. Figure 1 is a picture of the central portion of the main EC site, which depicts the industrial density of their property where their production processes and power plant are located. The power plant is located the northwest corner of the property near Interstate Highway 20 (I-20). EC owns approximately 6,000 acres with both surface and mineral rights for a portion of it. There are existing oil and gas wells on this property. The goal of the project is to use land fully owned (surface and mineral) as the best-case scenario, both to limit the impact on the neighbors and to reduce expenses. Bordering land to the EC property in this SE area is primarily rural land, owned by individuals as homes or ranches (Figure 2).

In reviewing the permitting process for this assessment, we took into consideration that a surface pipe carrying fluids could be installed either on-site or as far out as 10 km (Figure 2). Ten kilometers was used as the maximum possible distance to pipe hot fluids to a project site. Within this 10 km area there are a few main items to contend with for permitting. These include: I-20 to the north adjacent to their property, the City of Longview with high building density to the Northeast, the Sabine River to the South and its related floodplain and wetlands. Further south of the river is a regional airport that the project would not cross based on distance and difficulty obtaining permits. If off-site property must be used, the most realistic well and surface piping location based on permitting is to the east or southeast between the interstate and the river.

Figure 1. Aerial view of Eastman Chemical production process area in Longview Texas. View is from the South looking North. Interstate Highway 20 (I-20) is just to the North of the property. EC owns additional land beyond the lakes, especially to the Southeast on right side. Base image is clipped from Google Maps, January 2019.

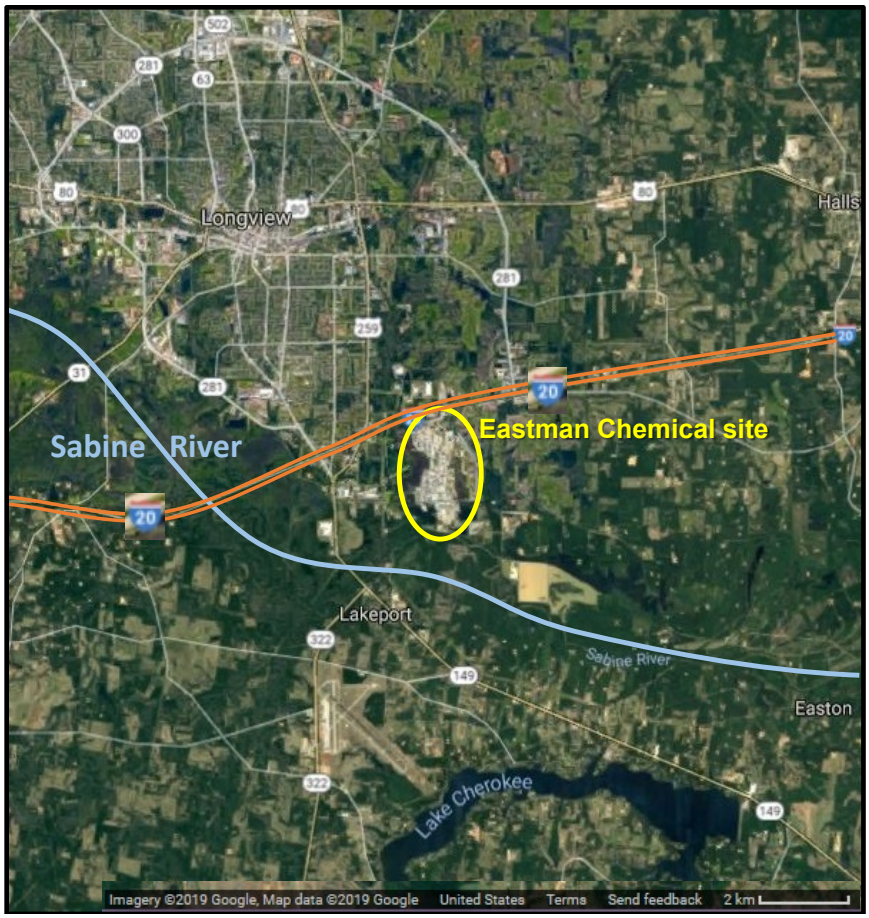

Figure 2. Map of mixed-use activities in the 10 km area surrounding Eastman Chemical production process area shown in Figure 1. A pipeline would cross a portion of this area to reach their power plant located in the NW corner of the yellow circle near I-20. Base map from Google Maps Images January 2019.

Federal and State Regulatory Agencies

Any geothermal deep direct-use project in Texas must comply with the Federal and State environmental protection laws. There are different agencies overseeing the permits/regulations for them. If the project is funded by a government agency such as the Department of Energy, a National Environmental Policy Act (NEPA) review is required to assess the environmental and related social and economic impacts of a project. The Environmental Protection Agency (EPA) regional office in Dallas, Texas would oversee the primary environmental concerns within a NEPA study. Congress has designated the EPA as the federal regulatory body responsible for writing the standards for clean air, clean water, waste disposal, and underground injection control. In addition to the EPA, the Fish and Wildlife Service (for East Texas, regional office is in Albuquerque, New Mexico) oversees the Endangered Species and Migratory Bird Acts.

For the State of Texas, the Texas Commission on Environmental Quality (TCEQ) oversees the site-specific related permits for air emissions, water supply, surface waste disposal, non-hazardous injection of fluids, and the Facility Operating Area (FOA) designation. For example, EC already has a FOA designation associated with their chemical plant facility.

The drilling of wells and the production of the deep non-potable water from them is permitted by the Texas Railroad Commission (RRC). The reinjection of that water is also permitted through the RRC as determined by the TCEQ Underground Injection Control Program to fall within the Class V Injection Well category. This Class V permit covers the reinjection of the produced fluids after they go through the surface processes to make the chilled water for cooling. The main difference between the production fluid and injection fluid is the reduced heat content of the fluid. Due to the high amounts of dissolved minerals expected in the water chemistry, these produced fluids are required to be reinjected into formations below the fresh water aquifers.

Land Access

In Texas the land-use planning process is governed at the municipal level. Under Chapter 213 of the Texas Local Government Code (TLCG), land use planning in Texas is delegated to municipalities. The EC property is located Southeast of the City of Longview, the county seat for Gregg County. However, the main plant is located within Harrison County. Rusk and Panola Counties are also part of the (10 km radius) potential project area. Longview is the closest county seat to the EC power plant, therefore in discussing permitting applications with them, we were able to work through their office. The planning office in Longview works with the county seats in Marshall (Harrison County), in Henderson (Rusk County), and Carthage (Panola County) helping to coordinate the permitting process. If the project moves forward with drilling the wells, then permits are obtained through each of the counties as their location deems necessary.

The placement of the wells determines where a water pipeline is located. The permitting for the pipeline starts with the Railroad Commission (RRC) and local city and county government offices. Once the pipeline is built, the Railroad Commission district office in Kilgore becomes responsible for the pipeline safety oversight.

The permitting process for locating a pipeline from a production well to the EC power plant for use of the fluids, and then piped to an injection well for disposal takes into consideration the land ownership and ease of access to cross it. For this assessment, we took into consideration two planning concerns for permitting as they include public land: 1) crossing Interstate Highway 20, and 2) crossing the Sabine River and floodplain. If the wells for this project are drilled north of Interstate Highway 20, then the United States Department of Transportation and the Texas Department of Transportation (TxDOT) district offices (Fort Worth for this area) would be involved and permits related to the right of way (ROW) are required for the pipeline to cross it. TxDOT district offices protect the state's right of way (ROW) through permits and coordination of the safe and efficient operation of Texas highways. It is expected that multiple ROW permits will be necessary for the pipeline to cross the county and local roads depending on where the production and injection wells are located. Any land crossed by a pipeline will need to have owner approval, leasing agreements, and appropriate permits. Regarding crossing the Sabine River and floodplain, see the discussion below.

The City of Longview also has permits and will assist people with the permitting process. There are requirements locally for land use planning, pipeline leases, and oil and gas operations (which geothermal wells are expected to fall under).

Surface Water

Texas surface water rights and resulting permits are through the Texas Commission on Environmental Quality (TCEQ). This project would use wells below the surface aquifers and not inject water into surface streams or fresh aquifers.

If wells are drilled to the south of the EC property, a pipeline would need to cross the Sabine River and/or floodplain, resulting in the need for a permit from the U.S. Army Corps of Engineers.. The Sabine River crosses into Louisiana and therefore is an interstate river. Depending on who owns the river banks where a pipeline crosses, additional permits will be necessary: from the Texas General Land Office if state owned land, from local county offices if county/city owned, or via leasing permits if private property.

Well Drilling and/or Conversion

The production and injection wells could be existing wells converted for use in this project or new wells drilled to meet the fluid quantity requirements. Either situation will involve the RRC and its oil and gas, and geothermal permits. There are permits for drilling a well, recompletion of well (change in well type with work-over), etc. The RRC Drilling Permits (W-1) User Guide is recommended reading for a full list of permits and understanding of when they are necessary.

Well Maintenance and Oversite

Once the deep direct-use geothermal production wells are flowing fluids, a Production Test Completions Report (GT-1) will be required by the RRC. There will also be an Injection Well Pressure Test Report (H-5). There are additional recurring reports that must be reported to the RRC for monitoring both the well integrity and fluid production and injection. The Kilgore District 6 office assists in getting them initiated and reviews the submissions.

On-Site Power Plant
The primary physical changes that would take place at the surface of the EC power plant include the building of a large storage tank and additional pipes between the tank and the inlet cooling application. These changes will require building permits and construction permits. Working with the local, City of Longview Planning Office and City Engineer will provide the full list of permits and approvals required. As additional power is available to sell with improved efficiency, there may need to be a new or revised purchase power agreement between EC and Southwest Power Pool.

Appendix 1 –Contacts for Permit and Regulations in Longview, Texas

Land Use Planning

Longview Texas
Planning Zones 903-237-1030
Permit/Application 903-237-1074
Public Works Dept. 903-237-1240

Planning & Zoning Department
City of Longview's Engineering Dept.
P.O. Box 1952
Longview, TX 75606
Andrew Fields 903-237-1362

TXDOT-Atlanta District

www.txdot.gov/inside-txdot/district/atlanta.html
Harrison County
701 E Main Street
Atlanta, Texas 75551
Fax 903-799-1229

Director of Maintenance
Jason Dupree, P.E.
Office 903-799-1248
Mobile 512-95-1846

TXDOT-Tyler District

www.txdot.gov
Rusk County/Gregg County
2709 W. Front St.
Tyler, TX 75702

800-558-9368
Fax 903-510-9158

Tyler District Maintenance
903-510-9203

TxDOT Utility Permitting Office
Karen.Gardner@txdot.gov

RRC Railroad Commission of Texas

www.rrc.state.tx.us
Mailing Address
PO Box 12967
Austin, TX 78711-2967

Physical Address
1701 N. Congress
Austin, TX 78701

Main telephone line: 877-228-5740
publicassist@rrc.texas.gov

Environmental Permitting Department
Geothermal Projects
512-463-3840

TCEQ Texas Commission on Environmental Quality

www.tceq.texas.gov
ac@tceq.texas.gov
Engineering Dept. 512-239-6696
Brian Dickey- Plan Review Team
@Water Supply Division
Brian.dickey@tceq.texas.gov
512-239-0963

GLO Texas General Land Office State Lands

Mailing Address
PO Box 12873
Austin, TX 78711-2873
512-463-5001

Physical Address
Energy Resources
1700 N. Congress Avenue
Austin, TX 78701-1495

Colby Eaves
colby.eaves@glo.texas.gov
512-463-5326

Appendix 2 Acronyms and Definitions

(ACEC) Areas of Critical Environmental Concern: "ACEC designations highlight areas where special management attention is needed to protect important historical, cultural, and scenic values, or fish and wildlife or other natural resources. ACECs can also be designated to protect human life and safety from natural hazards. ACECs can only be designated during the land-use planning process." https://www.blm.gov/programs/planning-and-nepa/planning-101/special-planning-designations/acec

(BLM) Bureau of Land Management: "The BLM manages more than 245 million acres of public land located primarily in 12 Western states, including Alaska. The BLM also administers 700 million acres of sub-surface mineral estate throughout the nation. The agency's mission is to sustain the health, diversity, and productivity of America's public lands for the use and enjoyment of present and future generations." www.blm.gov

(BOR) Bureau of Reclamation: Established in 1902, the mission of the BOR is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public. It is best known for the construction of dams, power plants and canals in 17 western states, including the western panhandle of Texas. BOR operates 53 power plants and is the second largest producer of hydroelectric power. They are also the largest wholesaler of water in the nation. At this time, there are no projects within the northeast part of Texas near the study area. https://www.usbr.gov/

(CNN) Certificate of Convenience and Necessity: a certificate granting its holder "exclusive right to provide retail water and/or sewer utility services to an identified geographic area. Chapter 13 of the Texas Water Code requires a CCN holder to provide continuous and adequate service to the area within the boundary of its CCN. Municipalities and districts normally are not required to have a CCN; however some municipalities and districts do have a CCN. A district or municipality may not provide retail water or sewer services within an area for which another utility holds a CCN unless the district or municipality has a CCN for the area." Certificated Service Areas fall into one of three types: Bounded, Facilities +200 feet, and Facilitates Only. See Public Utility of Texas (PUCT) for additional information. http://www.puc.texas.gov/. https://www.puc.texas.gov/industry/water/utilities/gis.aspx

(Corp or The Corps) U.S. Army Corp of Engineers: The organization responsible for environmental engineering for the nation. In addition to support of all branches of the U.S.

military, The Corps owns and operates over 600 dams, 12,000 miles of navigable channels, and maintains

(CWA) Clean Water Act: As described at https://www.epa.gov/laws-regulations/summary-clean-water-act, the Clean Water Act 33 U.S.C. §1251 et seq. (1972) "establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters… Under the CWA, EPA has implemented pollution control programs such as setting wastewater standards for industry. EPA has also developed national water quality criteria recommendations for pollutants in surface waters." It "is the primary federal law governing water pollution." In Texas, the Texas Commission on Environmental Quality, or TCEQ, is responsible for monitoring.

(DOD) Department of Defense

(DOE) Department of Energy

(DOI) Department of Interior

(EIS) Environmental Impact Statement "provides the framework for the USFS to address pending geothermal lease applications"

(EIS) Environmental Impact Statements: A document prepared either by or for the Environmental Protection Agency which identifies and analyzes, in detail, environmental impacts of a proposed action, as required by the National Environmental Policy Act (NEPA). There are very limited examples of EIS for geothermal projects in Texas at the time of this report. The Department of Energy provided an EIS for a DOE sponsored project in western Texas in 2011 that could serve as a document outline, to be adapted for a project in east Texas. https://www.energy.gov/sites/prod/files/EIS-0444-FEIS-Summary-2011.pdf, upon approval from EPA Region 6.

(EPA) Environmental Protection Agency: Federal agency missioned with protection of human health and the environment. This broad mandate includes, in part, ensuring Americans have access to clean air, land and water, that contaminated lands are cleaned, that toxic substances are reviewed, and that environmental stewardship is considered in development of U.S. policy. EPA develops and enforces regulations, such as implementation of the Clean Water Act, the Clean Air Act, and others. East Texas is governed by Region 6.
https://www.epa.gov/aboutepa/our-mission-and-what-we-do

(ERCOT) Electricity Reliability Council of Texas

(FERC) Federal Energy Regulatory Commission

(FLPMA) Federal Land Policy and Management Act of 1976 : Law "designed to provide guidance for future management actions and the development of subsequent, more detailed and limited scope plans for resources and of Land uses."
https://www.blm.gov/or/regulations/files/FLPMA.pdf

(FWS) Fish and Wildlife Service

(GDP) Geothermal Drilling Permit

(GLO) Texas General Land Office

(LT) Land Trade

(LUP) Land Use Plan: It dictates what can and cannot be done on the managed unit of land.

(MFPs) Management Framework Plans

(NEPA) National Environmental Policy Act: Signed into law in 1970, 42 U.S.C. §4321 et seq. (1969) "requires federal agencies to assess the environmental effects of their proposed actions prior to making decisions." It encompasses decisions regarding permit applications, federal land management, and construction public owned facilities, such as highways. Depending upon the decision at hand, multiple federal agencies may be involved. The Office of Federal Activities will coordinate the input of multiple agencies. https://www.epa.gov/nepa and https://www.epa.gov/laws-regulations/summary-national-environmental-policy-act

(NPDES) National Pollutant Discharge Elimination System: the program for discharge control as defined by the Clean Water Act. https://www.epa.gov/npdes/about-npdes. It regulates point sources that discharge pollutants into waters of the United States. Monitoring is principally a state effort, with only four states (ID, NM, MA and NH) and designated Indian Country handled by the EPA. NPDES permits are required for any facility to discharge directly into a U.S. body of water.

(NPSP) Nonpoint Source Pollution

(NRDC) National Resources Defense Council

(OFA) Office of Federal Activities: Responsible for coordination of the EPA's review of all federal Environmental Impact Statements (EIS) prepared by other agencies under NEPA, as well as EPA's compliance with NEPA.

(POU) Plan of Utilization: Completed as part of projects to produce geothermal resources and convert to marketable electricity.

(PSF) Permanent School Fund

(PUCT) Public Utility Commission of Texas

(RA) Relinquishment Act: Mineral rights held by State of Texas and managed under the GLO, who must approve all terms including bonus consideration, royalty rates, and rental amounts, and any additional provisions for any RA lands.

(RCRA) Resource Conservation and Recovery Act: Authorizes the EPA to manage hazardous waste.

(READ-Database) Renewable Energy and Defense Geospatial Database: Department of Defense developed mapping and analytical tool providing geographic information systems data. The objective is to allow renewable energy developers to locate appropriate sites for renewable projects (e.g. utility-scale wind, solar, and geothermal energy) that "are unlikely to interfere with military activities and training, and have the fewest environmental conflicts." Available through the NRDC (National Resources Defense Council) website by submitting a request. https://www.nrdc.org/resources/proactive-planning-tool-renewable-energy-development

(REC) Renewable Energy Credit Program: RECS are issued when one megawatt-hour (MWh) of electricity is generated and delivered to the electricity grid from a renewable energy resource.

(RMP) Resource Management Plan: Applicable Land Use Plan for public lands filled out under the Bureau of Land Management.

(ROD) Record of Decision: A resource management plan submitted to the Federal agency overseeing the land.

(ROW) Right-of-Way

(RRC) Railroad Commission of Texas: "The Railroad Commission of Texas was established in 1891 under a constitutional and legislative mandate to prevent discrimination in railroad charges and establish reasonable tariffs. It is the oldest regulatory agency in the state and one of the oldest of its kind in the nation." Today, its responsibility for regulating all oil and gas drilling and production is a major function. They also regulate drilling and operation of geothermal wells, transportation of geothermal fluids, and other relevant permits and reporting. www.rrc.state.tx.us

(SPP) Southwest Power Pool: Grid operators for the region to the east and north of Longview, Texas. SPP is a member of NERC North American Electric.

(TCEQ) Texas Commission on Environmental Quality

(TLCG) Texas Local Government Code

(TMDLs) Total Maximum Daily Loads

(TPWD) Texas Parks & Wildlife Department

(TSSWCB) Texas State Soil and Water Conservation Board

(UIC) Underground Injection Control Permit

(USFS) United States Forest Service

(UST) Underground Storage Tank