Mitigation Action Plan for the

Lake Charles Carbon Capture and Sequestration Project

U. S. Department of Energy

National Energy Technology Laboratory

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INTRODUCTION

The United States (U.S.) Department of Energy (DOE) issued a final environmental impact statement (EIS; DOE/EIS-0464) for the Lake Charles Carbon Capture and Sequestration Project (Lake Charles CCS Project) in November 2013. DOE announced its decision to provide up to $261.4 million in cost-shared funding to Leucadia Energy, LLC (Leucadia) for the proposed project under DOE's Industrial Carbon Capture Sequestration (ICCS) Program in a Record of Decision (ROD) signed on December 28, 2013, and published in the *Federal Register* on January 10, 2014 (79 FR 1854). The ROD identified requirements to mitigate potential adverse impacts associated with the project, as identified and analyzed in the EIS. This Mitigation Action Plan (MAP) briefly describes the mitigation actions and monitoring and reporting requirements the recipient must implement during the design, construction, and demonstration of the project. DOE prepared this MAP in accordance with 10 CFR 1021.331.

DOE prepared the EIS to evaluate the potential environmental impacts associated with DOE's proposed action of providing cost-shared funding for the Lake Charles CCS Project. The EIS also evaluated the impacts associated with construction and operation of Lake Charles Clean Energy, LLC's (LCCE) proposed LCCE Gasification plant as a connected action. The proposed LCCE Gasification plant will not receive co-funding from DOE.

The Lake Charles CCS Project will capture carbon dioxide (CO_2) from the LCCE Gasification plant and transport the CO_2 via a new connector pipeline to the Denbury Onshore LLC (Denbury) existing Green Pipeline where it will be transported to the West Hastings oil field, south of Houston, Texas, for use in enhanced oil recovery (EOR).

PURPOSE

10 CFR 1021.331 of the DOE regulations implementing the National Environmental Policy Act (NEPA) provides that:

(a) Following completion of each EIS and its associated ROD, DOE shall prepare a Mitigation Action Plan that addresses mitigation commitments expressed in the ROD. The Mitigation Action Plan shall explain how the corresponding mitigation measures, designed to mitigate adverse environmental impacts associated with the course of action directed by the ROD, will be planned and implemented. The Mitigation Action Plan shall be prepared before DOE takes any action directed by the ROD that is the subject of a mitigation commitment.

(b) In certain circumstances, as specified in § 1021.322(b)(1), DOE shall also prepare a Mitigation Action Plan for commitments to mitigations that are essential to render the impacts of the proposed action not significant. The Mitigation Action Plan shall address all commitments to such necessary mitigations and explain how mitigation will be planned and implemented. The Mitigation Action Plan shall be prepared before the FONSI is issued and shall be referenced therein.

(c) Each Mitigation Action Plan shall be as complete as possible, commensurate with the information available regarding the course of action either directed by the ROD or the action to be covered by the FONSI, as appropriate. DOE may revise the Plan as more specific and detailed information becomes available.

(d) DOE shall make copies of the Mitigation Action Plans available for inspection in the appropriate DOE public reading room(s) or other appropriate location(s) for a reasonable time. Copies of the Mitigation Action Plans shall also be available upon written request.

Accordingly, the MAP has four main purposes:

1) To specify the environmental impacts subject to mitigation as indicated in the EIS and the ROD;

2) To describe the mitigation measures to be performed;

3) To identify the party or parties accountable for the mitigation measures; and

4) To identify the party or parties responsible for implementing the mitigation measures in the MAP

In addition to the mitigation measures identified in the MAP, all parties must comply with applicable federal, state, and local environmental laws, orders, and regulations. As a result, for purposes of the MAP, such compliance activities are not considered to be mitigation measures subject to DOE control and hence not addressed in detail in this document. DOE will review the final project design to ensure its consistency with the impacts and mitigation measures in the EIS, ROD, and MAP. This MAP may be amended to identify additional mitigation measures needed to minimize any environmental impacts not previously addressed in the EIS or ROD.

BACKGROUND

In Section 703 of the Energy Independence and Security Act of 2007 (Pub. L. 110–140), Congress directed DOE to "carry out a program to demonstrate technologies for the large-scale capture of carbon dioxide from industrial sources." The ICCS Program specifically targets technologies to reduce man-made (anthropogenic) CO_2 emissions from industrial sources. These technologies for carbon capture and sequestration (CCS) have significant potential to reduce CO_2 emissions and thereby mitigate global climate change, while minimizing the economic impacts of the solution.

The purpose for DOE's proposed action is to advance the ICCS Program by providing financial assistance to projects that have the best chance of achieving the program's objectives as established by Congress. The principal need addressed by DOE's proposed action is to satisfy the responsibility Congress imposed on DOE to demonstrate the next generation of technologies that will capture CO_2 emissions from industrial sources and either sequester or beneficially use the CO_2.

A successful demonstration of carbon capture technology at the LCCE Gasification plant with beneficial use of the CO_2 at an existing oil field would generate technical, environmental, and financial data from the design, construction, and integrated operation of the CO_2 capture facility, pipeline, EOR, and CO_2 monitoring facilities at the oil field. These data would be used to evaluate whether the deployed technologies could be effectively and economically implemented at a commercial scale.

PROJECT DESCRIPTION AND LOCATION

Leucadia's Lake Charles CCS project involves the capture and sequestration of CO_2 from the LCCE Gasification plant, a petroleum coke gasification plant to be constructed in Calcasieu Parish, adjacent to the Port of Lake Charles, Louisiana. The primary components of Leucadia's proposed project are:

1. **LCCE Gasification Plant (the Connected Action).** The LCCE Gasification plant would use four General Electric quench gasifiers to convert petroleum coke into syngas. The syngas would be further processed to produce methanol, hydrogen gas, and sulfuric acid, as well as CO_2. The LCCE Gasification plant would provide raw syngas containing CO_2 to the Lake Charles CCS project, where the CO_2 would be separated from the syngas.

2. **Lake Charles CCS CO_2 Capture and Compression.** The CO_2 capture equipment would consist of a Lurgi Rectisol Acid Gas Removal (AGR) unit which processes two gas streams whereinCO_2 is separated from the process gases. The compression equipment would include two compressors that would pressurize the CO_2 to 2,250 pounds per square inch gauge (psig) for transport and geologic sequestration. The Lake Charles CCS project would be designed to capture approximately 5.2 million tons per year of CO_2 from the LCCE Gasification plant.

3. **Lake Charles CCS CO_2 Pipeline.** Denbury, through an affiliate, would construct, own, and operate the proposed 11.9-mile-long CO_2 pipeline connecting to the existing Green Pipeline, which would transport the captured CO_2 to oil fields along the Gulf Coast, including the West Hastings oil field in Brazoria County, Texas. The proposed Lake Charles CCS CO_2 pipeline would begin at the proposed CO_2 meter station located at the fence line of the LCCE Gasification plant and would tie into the existing Green Pipeline at a location west of Buhler, Louisiana.

4. **West Hastings Research MVA Program.** Denbury and the Texas Bureau of Economic Geology (BEG) would jointly implement the West Hastings research MVA program aimed at providing an accurate accounting of approximately 1 million tons of stored CO_2, and a high level of confidence that the CO_2 injected in a portion of West Hastings field during existing EOR operations would remain permanently sequestered. The research MVA activities would supplement Denbury's ongoing commercial monitoring activities and regulatory requirements performed for commercial CO_2 EOR and would provide additional information regarding the movement and confinement of CO_2.

DOE'S PROPOSED ACTION

DOE's proposed action is to provide up to $261.4 million in cost-shared funding through a cooperative agreement with Leucadia for its proposed project. These funds would constitute about 60 percent of the total development and capital cost of the CCS project, which is estimated to be $435.6 million (2010 dollars).

AGENCY DECISION

DOE announced its decision to provide up to $261.4 million in cost-shared funding to Leucadia for the proposed project under DOE's ICCS Program in a Record of Decision signed on December 28, 2013, and published in the *Federal Register* on January 10, 2014 (79 FR 1854). The ROD identified requirements to mitigate potential adverse impacts associated with the project, as identified and analyzed in the EIS.

ROLES AND RESPONSIBILITIES

DOE entered into a cooperative agreement with Leucadia to provide cost-shared funding for the project under the ICCS Program.
As the recipient named in the cooperative agreement, Leucadia is the party responsible for the commitments described in this MAP, either directly or indirectly through its affiliates and contractors. DOE will ensure that Leucadia meets these commitments through management of the cooperative agreement.

MITIGATION

DOE's decision incorporates measures to avoid or minimize adverse environmental impacts during the design, construction and operation of the project. DOE requires that the participants comply with all applicable federal, state, and local environmental laws, orders, and regulations. During project planning, Leucadia incorporated various mitigation measures and anticipated permit requirements, and the analyses completed for the EIS assumed that such measures would be implemented. These measures are identified in Chapter 4 of the EIS and incorporated into the ROD as conditions for DOE's financial assistance under the cooperative agreement between DOE and Leucadia.

Mitigation measures beyond those typically required by regulation or specified in permit conditions are addressed in this MAP. DOE prepared the MAP, which is consistent with 10 CFR 1021.331, to outline how the mitigation measures will be planned, implemented, and monitored. Since the MAP is an adaptive management tool, mitigation conditions could be removed if equivalent conditions are otherwise established by permit, license, or law. Compliance with permit, license or regulatory requirements is not considered mitigation subject to DOE control and therefore not included in the MAP. Tables 1 and 2 list the resource areas; mitigation commitments beyond those established by permit, license, or law; applicable monitoring and reporting requirements; and the party or parties responsible for implementing each of the requirements for both the LCCE Gasification plant (connected action) and the Lake Charles CCS project. Information for the connected action is included in an effort to identify all relevant, reasonable mitigation measures that could improve the project.

DOE will ensure that commitments in the MAP are met through management of its cooperative agreement with Leucadia. The cooperative agreement requires that Leucadia fulfill the monitoring and mitigation requirements specified in the ROD and this MAP. The MAP can be viewed online with the related NEPA documentation for this project at http://www.netl.doe.gov/publications/others/nepa/index.html

MITIGATION PERIOD AND MANAGEMENT

The conditions of the ROD and MAP extend through the end of the demonstration period for the Lake Charles CCS project, as described in the cooperative agreement between DOE and Leucadia.

Table 1. Mitigation, Monitoring and Reporting Requirements

Resource Area	Mitigation	Monitoring	Reporting	Implementing Party
Air Quality	To control fugitive dust, Leucadia must prevent open storage of dry material, install wind fencing as needed, use water trucks to stabilize surfaces, prevent spillage when hauling material and operating equipment, to the extent possible, and limit the speed of vehicles on site to 15 miles per hour (mph) and earth-moving equipment to 10 mph. To control mobile and stationary source emissions, Leucadia must use remote parking with bus transport to the worksite, maintain and tune engines per manufacturer's specifications to perform at EPA certification levels, prevent tampering with engines, and use new equipment where practicable. Leucadia also must limit idling of heavy equipment. EPA recommends limiting idling to less than 5 minutes.	Inspection and oversight by construction manager	Quarterly Report Annual Report	Leucadia
Climate	Leucadia must design and construct the Lake Charles CCS project with the goal of capturing at least 75 percent of the CO_2 from the treated stream, comprising at least 10 percent of CO_2 by volume, which would otherwise be emitted to the atmosphere.	Inspection and oversight by construction manager	Quarterly Report	Leucadia
Geology and Soils	Leucadia must restore surface conditions to their original condition and use following water supply and hydrogen pipeline construction.	Inspection and oversight by construction manager	Quarterly Report	Leucadia

Table 1. Mitigation, Monitoring and Reporting Requirements

Resource Area	Mitigation	Monitoring	Reporting	Implementing Party
Surface Water, Wetlands, and Floodplains	If a water body, wetland, or floodplain is crossed by the water supply and hydrogen pipelines and determined to be a water of the U.S. (jurisdictional) and the construction impacts on wetlands exceed the applicable thresholds, Leucadia must obtain the necessary U.S. Army Corps of Engineers (USACE) permits. If compensatory wetland mitigation becomes necessary as part of any USACE permit, Leucadia must implement additional mitigation as required and described in the permit(s). Leucadia must use horizontal directional drilling (HDD) where appropriate to minimize the environmental impacts of crossing surface waters.	Inspection and oversight by construction manager	Quarterly Report	Leucadia
Biological Resources	Prior to construction of the water supply and hydrogen pipeline, Leucadia must contact Louisiana Department of Wildlife and Fisheries (LDWF) to request another database review to identify any new occurrences of nesting areas for migratory birds or colonial water birds. Leucadia must perform site-specific surveys within 2 weeks of project startup, in accordance with LDWF requirements, to document whether colonial water birds are present and the extent of any nesting colonies. Leucadia must further consult with LDWF if active nesting colonies are found within 400 meters of the project site. Leucadia shall use HDD construction methods, where appropriate, to minimize impacts to biological resources associated with wetland and water bodies along the water supply and hydrogen pipeline routes.	Inspection and oversight by construction manager	Quarterly Report	Leucadia

Table 1. Mitigation, Monitoring and Reporting Requirements

Resource Area	Mitigation	Monitoring	Reporting	Implementing Party
Cultural Resources	Leucadia, in coordination with DOE, must continue consultation with the Louisiana SHPO and the Choctaw Nation of Oklahoma for areas not previously surveyed for cultural resources. This may occur if the currently proposed pipeline route needs to be altered or for other unforeseen areas of ground disturbance not included in the EIS. Leucadia must complete any additional surveys prior to construction in those areas. Leucadia must include a provision in their construction plan(s) for their contractors to immediately notify LCCE if identifiable tribal artifacts or remains are found during construction. If notified, Leucadia must stop work in the affected area and inform the Louisiana State Historic Preservation Officer (SHPO) and the Choctaw Nation of Oklahoma to ensure the artifacts or remains are handled appropriately.	Inspection and oversight by construction manager	Quarterly Report	Leucadia
Land Use	Leucadia must revegetate the rights-of-way (ROWs) and adjacent properties to pre-construction conditions and maintain the ROWs. Leucadia must use best management practices (BMPs) including dust suppression techniques to control the dust generated by construction activities.	Inspection and oversight by construction manager	Quarterly Report	Leucadia

Table 1. Mitigation, Monitoring and Reporting Requirements

Resource Area	Mitigation	Monitoring	Reporting	Implementing Party
Traffic and Transportation	Leucadia must use shuttle buses from the off-site construction parking area to reduce traffic congestion on local roadways. If required, Leucadia must obtain a temporary construction access permit from the Louisiana Department of Transportation and Development (DOTD) for the off-site construction parking area. To the extent practicable, Leucadia shall schedule heavy equipment deliveries during off peak hours, start work shifts at non-peak hours, stagger personnel arrival times at the off-site construction parking area and request that construction personnel use roadways with level of service (LOS) A, B, or C. During construction of the water supply and hydrogen pipelines, Leucadia must ensure adequate notice to landowners and drivers to maintain access to public roads.	Inspection and oversight by construction manager	Quarterly Report	Leucadia

Table 1. Mitigation, Monitoring and Reporting Requirements

Resource Area	Mitigation	Monitoring	Reporting	Implementing Party
Noise	Leucadia will implement engineering design and noise minimization measures to limit the levels such that the combination of noise from full load plant operations and existing ambient noise would not exceed 5 average-weighted decibels (dBA) above existing ambient noise. L90, which indicates the sound level that is exceeded 90% of the time during a sound measurement period, is a commonly used metric for evaluating community noise in residential environments. The ambient noise was measured at an L_{90} of 53 dBA, therefore the L_{90} shall not exceed 58 dBA at the nearest noise sensitive receptor, as determined by modeling during the final design prior to construction of primary noise sources described in the FEIS. During construction of the pipelines, Leucadia shall minimize noise levels by limiting construction activities to daylight hours, as practicable, requiring contractors to minimize construction noise and maintain equipment in good working order, and utilizing temporary sound barriers. If necessary, Leucadia shall obtain a variance from Calcasieu Parish for operating HDD equipment during evening and weekend hours.	Inspection and oversight by construction manager	Quarterly Report	Leucadia
Waste Management	Leucadia shall require construction contractors to develop a Waste Management Plan that would include specifications for handling, containment, and disposal of all wastes generated during construction. Leucadia must implement a program to reduce, reuse, and recycle waste materials to the extent practicable.	Inspection and oversight by construction manager	Quarterly Report	Leucadia