SUPPLEMENT ANALYSIS FOR THE APPLICATION OF LAKE CHARLES LNG EXPORT COMPANY, LLC AND LAKE CHARLES EXPORTS, LLC TO EXTEND THEIR AUTHORIZED EXPORT TERM THROUGH DECEMBER 31, 2050

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Prepared by the U.S. Department of Energy
Office of Fossil Energy & Carbon Management

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ACRONYMS AND ABBREVIATIONS

CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
DOE	United States Department of Energy
EIA	Energy Information Administration
EIS	Environmental Impact Statement
EO	Executive Order
EPA	United States Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FTA	Free Trade Agreement
GHG	Greenhouse Gas
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Analysis
LNG	Liquefied Natural Gas
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
SA	Supplement Analysis

DOE/EIS-0491-SA-1

Supplement Analysis for the Applications of Lake Charles LNG Export Company, LLC and Lake Charles Exports, LLC to Amend Export Term for Existing Long-Term Authorizations Through December 31, 2050

Introduction

The Department of Energy (DOE) has prepared this supplement analysis (SA) for the Lake Charles Liquefaction Project to evaluate the existing environmental impact statement (EIS) listed below, in light of changes that could have a bearing on the assessment of the potential environmental impacts analyzed in the EIS for this project. The Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) direct agencies to prepare a supplement to either a draft or final EIS when a major Federal action remains to occur and either the "agency makes substantial changes to the proposed action that are relevant to environmental concerns" or there are "significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts." (40 CFR 1502.9(d)(1)(i)–(ii)). DOE's NEPA regulations state that when it "is unclear whether or not an EIS supplement is required, DOE shall prepare a Supplement Analysis." (10 CFR 1021.314(c)). This SA provides sufficient information for DOE to determine whether (1) to supplement an existing EIS, (2) to prepare a new EIS, or (3) no further NEPA documentation is required. (10 CFR 1021.314(c)(2)(i)–(iii)).

- Existing EIS evaluated in this SA: Lake Charles Liquefaction Project Final Environmental Impact Statement (Aug. 2015) (DOE/EIS-0491), https://www.energy.gov/sites/default/files/2015/08/f26/EIS-0491-FEIS-2015.pdf.[1]

Changes to the Proposed Action or New Circumstances or Information[2]

In this SA, DOE is assessing changes to the proposed action or new circumstances or information relevant to environmental concerns, involving applications submitted by Lake Charles LNG Export Company, LLC (LCEC) and Lake Charles Exports, LLC (LCE) (collectively, Lake Charles LNG Export) seeking to amend the terms of their existing export authorizations to extend them to December 31, 2050.

In August 2020, DOE finalized a Policy Statement regarding the extension of long-term liquefied natural gas (LNG) export authorization terms, to countries having no free trade agreement

[1] U.S. Dep't of Energy, Docket Nos. 11-59-LNG and 13-04-LNG, Final Environmental Impact Statement for Lake Charles Liquefaction Project, FERC/EIS-0258F and DOE/EIS-0491 (Aug. 2015) [hereinafter EIS].

[2] Throughout this document, the phrase "changes to the proposed action or new circumstances or information" refers to a substantial change to the proposed action that may be relevant to environmental concerns or significant new circumstances or information that may be relevant to environmental concerns and have bearing on the proposed action or its impacts, consistent with 40 CFR 1502.9(d).

(FTA) with the United States but with which trade is not prohibited by United States law or policy (non-FTA countries), through December 31, 2050.[3] The 2050 Policy Statement did not automatically extend export terms for existing authorization holders but instead invited them to apply for extensions of their authorization terms.

Lake Charles LNG Export holds several long-term authorizations to export LNG to non-FTA countries from liquefaction trains and related facilities at the proposed Lake Charles Terminal in Lake Charles, Calcasieu Parish, Louisiana (Liquefaction Project or Project). Each of the Lake Charles LNG Export entities—LCEC and LCE—is authorized to export the same volume for the same term, but in *non-additive* quantities, such that the entities may export the same total quantity *combined*, not separately. The first orders, issued July 29, 2016, authorize exports of LNG in a volume equivalent to 730 billion cubic feet (Bcf) per year (Bcf/yr) of natural gas to non-FTA countries for a 20-year term.[4] The second orders, issued June 29, 2017, authorize exports of LNG in an additional volume equivalent to 121 Bcf/yr of natural gas to non-FTA countries, also for a 20-year term.[5] In sum, "under all the . . . authorizations granted to LCE and [LCEC] to date, in no event may the export volumes under any combination of authorization holders and/or destination countries exceed the [851 Bcf/yr] maximum production capacity of the Lake Charles Liquefaction Project"[6]—that is, 730 Bcf/yr in the July 2016 orders plus 121 Bcf/yr in the June 2017 orders. Lake Charles LNG Export's authorizations allow export operations to

[3] Extending Natural Gas Export Authorizations to Non-Free Trade Agreement Countries Through the Year 2050; Notice of final policy statement and response to comments, 85 Fed. Reg. 52,237 (Aug. 25, 2020) [hereinafter 2050 Policy Statement].

[4] *Lake Charles LNG Export Co., LLC*, DOE/FE Order No. 3868, Docket No. 13-04-LNG, Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Lake Charles Terminal in Calcasieu Parish, Louisiana, to Non-Free Trade Agreement Nations (July 29, 2016), *amended by* DOE/FE Order No. 3868-A (Oct. 6, 2020) (extending export commencement deadline in non-FTA authorization to December 16, 2025), *requested amendment denied by* DOE/FECM Order No. 3868-B (Apr. 21, 2023) (denying second commencement extension), *reh'g denied*, DOE/FECM Order No. 3868-C (June 21, 2023); *Lake Charles Exports, LLC*, DOE/FE Order No. 3324-A, Docket No. 11-59-LNG, Final Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Lake Charles Terminal in Calcasieu Parish, Louisiana, to Non-Free Trade Agreement Nations (July 29, 2016), *amended by* DOE/FE Order No. 3324-B (Oct. 6, 2020) (extending export commencement deadline in non-FTA authorization to December 16, 2025), *requested amendment denied by* DOE/FECM Order No. 3324-C (Apr. 21, 2023) (denying second commencement extension), *reh'g denied*, DOE/FECM Order No. 3324-D (June 21, 2023). .

[5] *Lake Charles LNG Export Co., LLC*, DOE/FE Order No. 4010, Docket No. 16-109-LNG, Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Lake Charles Terminal in Lake Charles, Louisiana, to Free Trade Agreement and Non-Free Trade Agreement Nations (June 29, 2017), *amended by* DOE/FE Order No. 4010-A (Oct. 6, 2020) (extending export commencement deadline in non-FTA authorization to December 16, 2025), *requested amendment denied by* DOE/FECM Order No. 4010-B (Apr. 21, 2023) (denying second commencement extension), *reh'g denied* DOE/FECM Order No. 4010-C (June 21, 2023); *Lake Charles Exports, LLC*, DOE/FE Order No. 4011, Docket No. 16-110-LNG, Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Lake Charles Terminal in Lake Charles, Louisiana, to Free Trade Agreement and Non-Free Trade Agreement Nations (June 29, 2017), *amended by* DOE/FE Order No. 4011-A (Oct. 6, 2020) (extending export commencement deadline in non-FTA authorization to December 16, 2025), *requested amendment denied by* DOE/FECM Order No. 4011-B (Apr. 21, 2023) (denying second commencement extension), *reh'g denied* DOE/FECM Order No. 4011-C (June 21, 2023).

[6] DOE/FE Order No. 4011 at 56 (Ordering Para. F).

continue for a three-year "make-up period" following the end of the term, during which the authorization holder may continue to export any authorized volumes that it was unable to export during the original term. The orders, as amended, require LNG exports to begin no later than December 16, 2025.[7] Under the existing authorizations, if exports were to begin on that date, the term of each order would run from December 16, 2025 through December 16, 2048 (20 years plus the three-year make-up period).

The Federal Energy Regulatory Commission (FERC) approved the siting, construction, and operation of the Liquefaction Project on December 17, 2015 (FERC order).[8] In accordance with NEPA and during its consideration of the applications related to the Liquefaction Project, FERC issued a draft EIS for the Liquefaction Project and other facility modifications on April 10, 2015, and a final EIS on August 14, 2015. The final EIS recommended 96 additional environmental conditions, and FERC's authorizing order incorporated 95 of the 96 conditions. DOE, a cooperating agency on the EIS, published notice in the *Federal Register* on July 15, 2016, that it had adopted FERC's final EIS.[9] DOE's related orders, described above, include the environmental conditions incorporated in the FERC order.

On May 24, 2022, Lake Charles LNG Export filed applications seeking to amend the export terms in its non-FTA authorizations to extend them to December 31, 2050.[10] If granted, the requested amendments would extend the export term by two years and 15 days.[11]

The proposed action does not include any physical modifications to the Liquefaction Project.

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[7] On June 21, 2022, Lake Charles LNG Export requested an extension of the export commencement deadline for both LCEC and LCE to December 16, 2028. DOE denied the requests on April 21, 2023. *Lake Charles LNG Export Co.*, LLC, DOE/FECM Order Nos. 3868-B and 4010-B, Docket Nos. 13-04-LNG and 16-109-LNG, Order Denying Application for Second Extension of Deadline to Commence Exports of Liquefied Natural Gas to Non-Free Trade Agreement Countries (Apr. 21, 2023); *Lake Charles Exports*, LLC, DOE/FECM Order Nos. 3324-C and 4011-B, Docket Nos. 11-59-LNG and 16-110-LNG, Order Denying Application for Second Extension of Deadline to Commence Exports of Liquefied Natural Gas to Non-Free Trade Agreement Countries (Apr. 21, 2023). On June 21, 2023 DOE denied the requests for rehearing.

[8] *Trunkline Gas Co., LLC, et al.*, Order Granting Section 3 and Section 7 Authorizations and Approving Abandonment, FERC Docket Nos. CP14-119-000 *et al.*, 153 FERC ¶ 61,300 (2015), *reh'g denied*, 155 FERC ¶ 61,328 (2016).

[9] Environmental Impact Statements; Notice of Availability, 81 Fed. Reg. 46,077 (July 15, 2016).

[10] Lake Charles LNG Export Co., LLC, Application to Amend Export Term for Existing Long-Term Authorizations through December 31, 2050, Docket Nos. 13-04-LNG and 16-109-LNG (May 24, 2022); Lake Charles Exports, LLC, Application to Amend Export Term for Existing Long-Term Authorizations through December 31, 2050, Docket Nos. 11-59-LNG and 16-110-LNG (May 24, 2022) [together, hereinafter Extension Applications].

[11] Because Lake Charles LNG Export is authorized to export beginning no later than December 16, 2025 for 20 years plus the three-year make-up period, the latest date its current authorizations can expire is December 16, 2048. The 20-year term begins when exports begin, and that date is not fixed. By contrast, the extension to December 31, 2050 would be to a fixed date, and the term would expire on that date regardless of when exports began, although the required commencement deadline of December 16, 2025 would still apply. Because LNG project development and construction is often a lengthy process, DOE believes it prudent to use the latest possible start date—that is, December 16, 2025—in this analysis.

Background

This Supplement Analysis examines whether the proposed modification—an addition of two years and 15 days to the period of authorized exports—would represent a substantial change to the proposed action or significant new circumstances or information requiring a supplement to the existing EIS.

Resource Areas Not Analyzed in this SA

The following resource areas are not analyzed in this SA because they would not be significantly affected by the changes to the proposed action or new circumstances or information presented:

- Soils
- Water resources
- Wetlands
- Vegetation
- Wildlife and aquatic resources
- Land use, recreation, and visual resources
- Socioeconomics
- Cultural resources
- Reliability and safety

The EIS, prepared by FERC and adopted by DOE, thoroughly addresses potential impacts in each of these resource areas from construction and operation of the Project. An extension of the export authorizations to 2050 would involve no new construction or physical or operational changes; therefore, this SA does not address the resource areas listed above.

Select resource areas are under review solely in the context of the extended export authorization term and intervenor issues raised in this proceeding.

Resource Areas Analyzed in this SA

The following resource areas are analyzed in this SA:

- **Geologic Hazards**
- **Threatened, endangered, and other special status species**
- **Air quality and noise**

Geologic Hazards (Flooding and Storm Damage)

The potential for storm damage is addressed in section 4.1.3 of the EIS, "Geologic Hazards"—specifically in subsection 4.1.3.4.

At the outset of its discussion of geologic hazards, the EIS states that "[i]n general, the potential for geologic hazards to significantly affect construction or operation of the proposed project

facilities is low."[12] Its discussion of flood hazards echoes this point. The analysis cited in the EIS found that the liquefaction facility would be situated in a 100-year floodplain,[13] with appurtenant facilities located in 100-year floodplains, 500-year floodplains, or beyond 500-year floodplains.[14] The EIS notes that "[t]o mitigate the risk of flooding, Lake Charles LNG has committed to constructing critical liquefaction facilities at an elevation above the 500-year floodplain and sensitive aboveground facilities at the liquefaction facility and the compressor and meter stations at a final grade elevation that exceeds the 100-year floodplain."[15] The EIS also acknowledges that "in a given year there is about a 3 percent chance for a major hurricane to make landfall within the general vicinity of the proposed liquefaction facility," but noted that, "because the liquefaction buildings and critical equipment would be constructed at an elevation of 15 feet, the facility would be able to withstand storm surges without damage from a Category 3 hurricane."[16]

Sierra Club, in its motion to intervene and protest in LCEC docket numbers 13-04-LNG and 16-109-LNG,[17] argues that a report by the United Nations Intergovernmental Panel on Climate Change (IPCC) on Impacts, Adaptation, and Vulnerability, issued in February 2022, highlights the increasing climate-related risks to coastal infrastructure, like the Liquefaction Project.[18] Sierra Club states that such climate-related risks, according to the IPCC, are projected to include increasing adverse impacts from flood/storm damages in coastal areas, including to infrastructure, local communities, and key economic sectors, and that the resultant losses will be greater, owing to the "siting of the infrastructure."[19] Sierra Club amplifies the IPCC's finding that actions focused on sectors and risks in isolation and short-term gains could lead to long-term maladaptation.[20]

DOE has considered potential impacts of flood/storm damage on the Liquefaction Project. Consistent with its regulations,[21] DOE used the information in the EIS to make a floodplain

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[12] EIS at 4-4.

[13] An x-year floodplain is a zone in which, based on historical analysis, there is an estimated 1-in-x probability of a flood event in a one-year period. *See* EIS at 4-7. Thus, the probability of a flood event during a one-year period in a 100-year floodplain is estimated to be 1 percent.

[14] *See* EIS at 4-7.

[15] *Id.*

[16] *Id.*

[17] Motion to Intervene and Protest of Sierra Club, Docket Nos. 13-04-LNG and 16-109-LNG (July 6, 2022) [hereinafter Sierra Club Motion or Motion]. Sierra Club did not intervene in the proposed term extension in the LCE proceeding, Docket Nos. 11-59-LNG and 16-110-LNG, and accordingly, is not a party in such proceeding in Docket Nos. 11-59-LNG and 16-110-LNG. Therefore, Sierra Club's arguments in the term extension proceeding in Docket Nos. 13-04-LNG and 16-109-LNG do not apply to the term extension proceeding in Docket Nos. 11-59-LNG and 16-110-LNG.

[18] Sierra Club Motion at 33-35 (citing Climate Change 2022 Impacts, Adaptation and Vulnerability, Summary for Policy Makers, at 8, A.3 (Feb. 2022), https://www.ipcc.ch/report/ar6/wg2/downloads/report/IPCC_AR6_WGII_SummaryForPolicymakers.pdf).

[19] *Id.* at 34-35.

[20] *Id.* at 35.

[21] Compliance with Floodplain and Wetland Environmental Review Requirements, 10 CFR Part 1022.

assessment of the Liquefaction Project site. DOE determined that the placement of some of the components in the Liquefaction Project within floodplains would be unavoidable but that the current design for the liquefaction facility minimizes floodplain impacts to the extent practicable.[22] The IPCC study findings highlighted by Sierra Club are general findings that are not specific to any potential impacts of the proposed extension on the Liquefaction Project. Therefore, based on the information Sierra Club has presented, DOE would not alter its prior storm damage and floodplain analysis for the proposed extension of the authorization term.

Threatened, endangered, and other special status species

According to the EIS, "a total of 28 federally and state-listed threatened and endangered, candidate, and proposed species occur in parishes and/or counties impacted by the [Liquefaction Project]."[23] The EIS "determined that the [Liquefaction Project] would have no effect on 23 of the 28 federally and/or state-listed species, is not likely to cause the jeopardy of 1 proposed species, and would not contribute to the trend toward federal listing for 2 candidate species."[24] As for the remaining two listed species, the EIS "determined that the Liquefaction Project may affect, but is not likely to adversely affect the [federally-listed] red-cockaded woodpecker,"[25] and also found that "the project would not significantly impact the [Louisiana-listed] bald eagle."[26]

Sierra Club's Motion addresses impacts on listed species,[27] which are addressed in section 4.7 of the EIS, "Threatened, Endangered, and Other Special Status Species." DOE notes the following with respect to this statement.

In its Motion, Sierra Club contends that DOE arbitrarily dismissed marine vessel traffic as *de minimis* as a proportion of historic U.S. shipping traffic, overlooking that LNG traffic in the Gulf of Mexico, where many of the impacted species live, is a larger and growing share of the traffic presently and in the future.[28] Sierra Club maintains that the proposed extension could "cause significant impacts to environmentally sensitive resources," such as endangered species vulnerable to ship strikes and noise from vessel traffic which will be increased by the term extension, and must be investigated, even if the significance of the impacts is unclear.[29]

Based on the EIS, DOE finds that an extension of the term through 2050 would not cause

[22] U.S. Dep't of Energy, Record of Decision and Floodplain Statement of Findings for the Lake Charles Exports, LLC Application To Export Liquefied Natural Gas to Non-Free Trade Agreement Countries, 81 Fed. Reg. 51,870, 51,872 (Aug. 5, 2016).
[23] EIS at 4-68.
[24] *Id.*; *see also id.*, table 4.7.1, at 4-69 to 4-73.
[25] *Id.* at 4-74.
[26] *Id.* at 4-75.
[27] Sierra Club raised these listed species arguments in the context of its objections to DOE's reliance on a categorical exclusion for the proposed change. *See* Sierra Club Motion at 24-26. Nonetheless, DOE addresses in this SA the impacts on listed species raised by Sierra Club.
[28] Sierra Club Motion at 26.
[29] *Id.* at 27-28.

significant impacts beyond those previously considered. Moreover, DOE has previously considered LNG vessel impacts on marine species.[30] In the TSD, DOE provided, as an example, a finding where ship strikes from incremental LNG ship transits were unlikely to adversely affect federally listed marine species.[31]

It is not certain whether Project-related ship traffic during the extension period—more than 25 years from now—would be greater or less than the typical number of annual transits under the existing authorizations, or even whether there would be any additional ship transits at all during the extension. However, DOE finds it reasonable to assume that Project-related ship traffic during the proposed extension period would be no greater than the authorized Project-related traffic during the existing authorization period. The maximum authorized volume (amount of LNG per year) would remain fixed throughout the export term, including during the proposed extension, and represents the bounding case for purposes of impact analysis; if the project operates at less than full capacity, there would be fewer shipments at any given point in time. Thus, DOE finds that the EIS evaluation related to endangered species appropriately covers the extension period as well. DOE evaluated impacts to wildlife during marine transport. Sierra Club has not articulated how an extension would lead to any heightened risk for each of the species it identifies, based on the species' physiology, behavioral patterns, ecology/habitat, or other relevant factors that DOE could examine for any heightened risk. For these reasons, DOE finds that no additional environmental review is required for this resource area.

Air quality and noise

Environmental concerns related to GHG emissions are addressed primarily in section 4.11.1 of the EIS, "Air Quality."[32]

The EIS finds that the Project "would minimize potential impacts on air quality due to the operation of liquefaction facility by adhering to applicable federal and state regulations and installing [Best Available Control Technology (BACT)] to minimize emissions."[33] The proposed BACT "includes use of low carbon fuels, combustion equipment (turbines, thermal oxidizers, emergency back-up and firewater pump engines) designed as operational energy efficient in accordance with the [U.S. Environmental Protection Agency's (EPA)] GHG BACT standards, and

[30] *See* U.S. Dep't of Energy, Technical Support Document, Notice of Final Rulemaking, National Environmental Policy Act Implementing Procedures (10 CFR part 1021) (Nov. 2020), https://www.energy.gov/sites/default/files/2021/01/f82/technical-support-document-10-cfr-1021-2020-11.pdf [hereinafter TSD], which is incorporated herein by reference.
[31] *See id.* at 7-8.
[32] In the Intervention portion of its filing, Sierra Club generally references other possible impacts on air quality, such as the emission of ozone precursors. However, Sierra Club fails to provide meaningful detail on these claimed harms that would be caused by the term extension. DOE therefore is not able to evaluate these additional potential impacts.
[33] EIS at 4-131.

a leak detection and repair (LDAR) program for monitoring piping and storage tank components to limit the impact of methane emissions."[34]

The EIS summarizes its findings on the cumulative impact of GHG emissions from the Project as follows:

> "Based on the cumulative modeling analysis and the required emission controls at the various Lake Charles Liquefaction Project facilities, we conclude that there would be no significant cumulative impact on air quality as a result of the operation of these facilities.... The emissions would increase the atmospheric concentration of GHGs, in combination with past and future emissions from all other sources, and contribute incrementally to climate change that produces the impacts described above. However, it cannot be determined whether or not the Lake Charles Liquefaction Project's contribution to cumulative impacts on climate change would be significant."[35]

Sierra Club's Motion raises arguments for why the additional GHG emissions from the proposed Project during the proposed term extension would be significant, as well as why new information that has come to light since preparation of the EIS necessitates additional environmental analysis. As noted above, DOE's evaluation is limited to whether new circumstances or information related to the time period of the term extension warrants supplementation of the EIS.

The following discussion addresses the potential GHG emissions resulting from the proposed export term extension.

Lifecycle GHG Emissions

Sierra Club urges DOE to take a hard look at GHG emissions occurring across the entire LNG life cycle, particularly the environmental impacts of the proposed term extension on gas production and use.[36] Sierra Club asserts that NEPA requires DOE to consider the "worldwide and long-range character of environmental problems,"[37] including the "reasonably foreseeable impacts" of GHG emissions from "upstream impacts relating to the production and supply of the gas that is exported, and downstream impacts relating to transportation and use of exported LNG."[38] Sierra Club adds that impacts from GHG emissions are not "location-dependent"[39] and that it is

[34] *Id.* at 4-239 to 4-240.
[35] *Id.* at 5-21 to 5-22.
[36] Sierra Club Motion at 21.
[37] *Id.* at 22 (quoting 42 U.S.C. § 4332(2)(F)).
[38] *Id.* at 21.
[39] *Id.* at 21-23.

critical to consider "indirect effects, which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."[40]

DOE has taken the requisite hard look at GHG emissions throughout the LNG lifecycle, including those that could take place during a longer period of export authorization. In the 2050 Policy Statement, DOE discontinued its practice of granting a standard 20-year export term for long-term authorizations to export domestically produced natural gas, including LNG, from the lower-48 states to non-FTA countries. On the basis of the record evidence, DOE adopted a term through December 31, 2050, as the standard export term for long-term non-FTA authorizations. DOE implemented this policy change after considering its obligations under NGA section 3(a), the public comments supporting and opposing the proposed 2050 Policy Statement, and a wide range of information bearing on the public interest—including updated environmental analysis entitled Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas From the United States: 2019 Update. (2019 Update). In 2018, DOE's National Energy Technology Laboratory (NETL) conducted this study as a follow-up to its life-cycle analysis (LCA) conducted in 2014. The analysis in the 2019 Update was based on the most current available science, methodology, and data from the U.S. natural gas system to access emissions of GHGs associated with exports of U.S. LNG. The 2019 Update is an extensive "cradle-to-grave" assessment of GHG emissions from LNG exports over 20 and 100 year global warming time horizons. In January 2020, upon review of both the 2019 Update and the public comments received on that study, DOE determined that it saw "no reason to conclude that U.S. LNG exports will increase global GHG emissions in a material or predictable way."[41]

DOE's GHG emissions analysis in the 2019 Update, which was incorporated into the 2050 Policy Statement, applied to all export term extensions through 2050 and occurred after the preparation of the EIS for the Liquefaction Project. Thus, DOE's consideration of the GHG emissions impacts at the time of the EIS has been updated by the 2019 Update as applied to the Lake Charles proceedings. Based on DOE's review of the EIS, as well as additional information presented in the record of the 2050 Policy Statement proceeding, including the 2019 Update, DOE finds that no additional NEPA review of GHG emissions attributable to the proposed term extension is necessary.

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[40] *Id.* at 23 (quoting 40 CFR 1508(g)(2)). In challenging the potential application of the B5.7 categorical exclusion to the proposed action, Sierra Club also argues that the increased exports from such proposed action threatens a violation of the mid-century net zero global emissions goal in Executive Order (E.O.) No. 14,008, *Tackling the Climate Crisis at Home and Abroad*, relying on the International Energy Agency's Net Zero by 2050 report for the premise that the proposed term extension is inconsistent with any plausible trajectory for achieving this goal. *Id.* at 27. We disagree. E.O. 14,008 does not create any concrete requirements for DOE with respect to LNG exports. Indeed, E.O. 14,008 makes the express point that it "shall not be construed to impair or otherwise affect the authority granted by law to an executive department or agency or the head thereof" and is to "be implemented consistent with applicable law." Accordingly, DOE is required to implement E.O. 14,008 in a manner consistent with its authority under the Natural Gas Act.

[41] *See* 2050 Policy Statement, 85 Fed. Reg. at 52,240.

Sierra Club also states that DOE's life cycle analyses[42] only examine the short term by focusing on how U.S.-sourced LNG would compete with coal or non-U.S. gas used in the power sectors in Europe and Asia from a life cycle greenhouse gas perspective. Sierra Club asserts that while LNG may primarily compete with fossil fuels today, this will not be the case in the 2040s, which is the relevant time period for the two-year term extension through 2050.[43] Sierra Club also asserts the inconsistency of further developing long-lived fossil fuel infrastructure in the United States and abroad;[44] the specter of LNG displacing renewables, not coal, in overseas markets; and the need to examine the impacts of increased LNG exports on U.S. domestic emissions.[45]

DOE finds that the energy market comparisons in the 2019 Update continue to be relevant. It is reasonably foreseeable that in the long-term, the use of natural gas will persist in the power sector in Europe and Asia. As DOE has acknowledged,[46] U.S. LNG exports may also compete in the power sector with renewable energy, among other energy resources, in European and Asian markets, particularly during the timeframe concerning the term extension. However, as the U.S. Energy Information Administration noted in the Reference Case of its International Energy Outlook 2023 (IEO 2023)[47], with projections to 2050, natural gas consumption is expected to grow by 29% from 2022 through the end of the forecast period[48] and that "[t]he projected rise in natural gas consumption is most pronounced in the electric power sector, where it replaces retiring coal-fired generation, and the industrial sector, where it primarily

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[42] DOE's 2014 Life Cycle Greenhouse Gas Report (2014 LCA GHG Report) and 2019 Update analyze how U.S.-sourced LNG compares with regional coal and Russian gas in the electric power generation sector of Europe and Asia. *See* 2019 Update, 85 Fed. Reg. at 74. The 2019 Update conducted the same analysis using more current information on upstream natural gas production; unit processes for liquefaction, ocean transport, and regasification; and updated 100-year global warming potential for methane, consistent with the IPCC's 5th Annual Assessment report. *See id*. at 75.

[43] Sierra Club Motion at 29.

[44] *Id.* (citing International Energy Agency, *Net Zero by 2050: A Roadmap for the Global Energy Sector*, at 101-02 (May 2021), https://iea.blob.core.windows.net/assets/deebef5d-0c34-4539-9d0c-10b13d840027/NetZeroby2050-ARoadmapfortheGlobalEnergySector_CORR.pdf [hereinafter Net Zero Report], and IPCC, Special Report, Special Report: Global Warming of 1.5 C, Summary for Policymakers, at 13-17 (May 2019), https://www.ipcc.ch/site/assets/uploads/sites/2/2022/06/SPM_version_report_LR.pdf).

[45] Sierra Club Motion at 29-30. Sierra Club adds that commitments under the Paris Agreement contemplate GHG reductions within national territory and reporting thereon, which would yield more accurate emissions estimates than tracing the lifecycle of fuels combusted in a destination country. *See id.* at 31.

[46] *Magnolia LNG LLC*, DOE/FECM Order No. 3909-C, Docket No. 13-132-LNG, Order Amending Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Nations, at 57-58 (Apr. 27, 2022) ("DOE further acknowledges that regional coal and imported natural gas are not the only fuels with which U.S.-exported LNG will compete. U.S. LNG exports may also compete with renewable energy … and other resources."); *Golden Pass LNG Terminal LLC*, DOE/FECM Order No. 3978-E, Docket No. 12-156-LNG, Order Amending Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Nations, at 44 (Apr. 27, 2022) ("DOE further acknowledges that regional coal and imported natural gas are not the only fuels with which U.S.-exported LNG will compete. U.S. LNG exports may also compete with renewable energy … and other resources.").

[47] *See* U.S. Energy Info. Admin., International Energy Outlook 2023 (Oct. 2023), International Energy Outlook 2023 Narrative (eia.gov) and accompanying data tables at https://www.eia.gov/outlooks/aeo/data/browser/#/?id=1-IEO2023&&sourcekey=0 [hereinafter IEO2023].

[48] From 150.6 trillion cubic feet (Tcf) in 2022 to 194.3 Tcf in 2050.

fuels expanding industrial production. The projection also notes that the "[g]rowth in natural gas consumption is widely distributed regionally, but it is most notable in India, the Other Asia-Pacific region, China, Africa, Russia, the Middle East, and the Other Americas region."[49] The Reference Case also projects that the report's "Europe and Eurasia superregion" will continue "to have a relatively stable amount of fossil fuel-fired generation…."[50] IEO 2023 projects that, absent further policy changes, natural gas imports into Europe will grow during the forecast period, across all sectors, including the electric power sector.[51]

These projections from the IEO 2023 validate the continued relevance through 2050 of DOE's comparison of LNG and coal in the LCA GHG Analyses.

Methane Emissions or Leak Rate

Regarding the emissions or leak rate, Sierra Club argues broadly that DOE's LCA GHG Analyses are factually unsupported and understate emissions, citing studies measuring actual emissions that found a leak rate of roughly 3.5% to 3.7% in the Permian Basin,[52] as compared to the 0.7% used in DOE's 2019 Update to the 2014 LCA GHG Analysis. Conceding it raised this issue in comments on the 2019 Update,[53] Sierra Club defends the greater reliability of the methodology in the 2020 studies it cites, as compared to DOE's "bottom up" estimates in the 2019 Update,[54] and urges DOE to review and respond to this research before approving any further LNG authorizations.

DOE finds that the methane leak rate used in the 2019 Update remains valid, and that the information Sierra Club presents does not represent significant new information that would require additional NEPA review at this time. NETL's bottom-up method provides results that are representative of U.S. natural gas production operations based on inherently variable industry data reported to the Environmental Protection Agency. DOE understands that methane emissions are an important part of assessing emissions from the natural gas supply chain. As a result, DOE uses EPA's Greenhouse Gas Reporting Program (GHGRP) data for modeling GHG emissions (including methane) from all stages of the supply chain. Certain updates have been made to GHGRP data to ensure that emissions from significant sources are

[49] *Id*. at 13.
[50] *Id*. at 37.
[51] *Id*. at 44-45.
[52] Sierra Club Motion at 31-32 (citing Yuzhong Zhang et al., Quantifying methane emissions from the largest oil-producing basin in the United States from space, SCIENCE ADVANCES (Apr. 22, 2020), DOI:10.1126/sciadv.aaz5120, https://advances.sciencemag.org/content/6/17/eaaz5120/tab-pdf [hereinafter Zhang Study]; Environmental Defense Fund, New Data: Permian Oil & Gas Producers Releasing Methane at Three Times National Rate (Apr. 7, 2020), https://www.edf.org/media/new-data-permian-oil-gas-producers-releasing-methane-three-times-national-rate [hereinafter EDF Study, and together with Zhang Study, the "2020 studies"]; Sierra Club, Comment on 2019 Update to Life Cycle Greenhouse Gas Perspective, at 6-8 (Oct. 21, 2019) [Sierra Club 2019 Update Comment], https://fossil.energy.gov/app/DocketIndex/docket/DownloadFile/604).
[53] Sierra Club Motion at 32 n.130 (citing Sierra Club 2019 Update Comment at 6-8).
[54] "Top-down studies measure methane emissions by measuring – through aerial flyovers – atmospheric measurements where oil and natural gas activity is occurring." 2019 Update, 85 Fed. Reg. at 82.

not underestimated. For example, DOE uses updated throughput-normalized methane emissions data from current literature (Zaimes et al. 2019) for accurately modeling emissions from the liquids unloading process.

Mitigation

No changes to mitigation are proposed from the mitigation methods described in the EIS and included as conditions in FERC's orders authorizing the siting, construction, and operation of the Liquefaction Project, and DOE's orders authorizing the export of LNG from the Liquefaction Project to non-FTA countries. All of the mitigation methods discussed in the EIS and included in the authorizing orders remain applicable, and those mitigation methods adopted in the initial export authorization orders would continue to be required in any amended order.

Determination

In accordance with NEPA, as well as CEQ's and DOE's regulations implementing NEPA, DOE prepared this Supplement Analysis to evaluate whether the proposed term extension, in light of the change in the proposed action or new circumstances or information presented, requires supplementing the existing EIS. DOE concludes that the new circumstances or information presented relevant to environmental concerns are not significant and therefore do not require a supplement to the Lake Charles Liquefaction Project Final Environmental Impact Statement (Aug. 2015) (DOE/EIS-0491), consistent with 40 CFR 1502.9(d)(4) and 10 CFR 1021.314(c)(2)(i)–(iii). No further NEPA documentation is required.