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FE Dkt. 11-161-LNG

**IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT**

SIERRA CLUB,

Petitioner,

v.

DEPARTMENT OF ENERGY,

Respondent.

No.

PETITION FOR REVIEW

Pursuant to Natural Gas Act § 19(b), 15 U.S.C. §717r(b), and Fed. R. App. P. 15(a), Sierra Club hereby petitions the Court for review of:

1. the Department of Energy, Office of Fossil Energy Order No. 3357-B entered on November 14, 2014 and titled "Final Opinion and Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas, to Non-Free Trade Agreement Nations"; and

2. the Respondent's denial of Petitioner's Request for Rehearing of the order above, found at Order No. 3357-C entered on December 4, 2015 and titled "Opinion and Order Denying Request for Rehearing of Orders Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas, to Non-Free Trade Agreement Nations."

These two Orders were entered in the Department of Energy, Office of Fossil Energy docket *Freeport LNG Expansion L.P., et al.*, FE Docket No. 11-161-LNG. Copies of both orders are attached.

Respectfully submitted on December 22, 2015.

By:



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CORPORATE DISCLOSURE STATEMENT

Sierra Club, a corporation organized and existing under the laws of the State of California, is a national nonprofit organization dedicated to the protection and enjoyment of the environment. Sierra Club has no parent corporation, and no publicly held corporation owns any of its stock.

Respectfully submitted on December 22, 2015.

By:



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CERTIFICATE OF SERVICE

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December 22, 2015.


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UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY

OFFICE OF FOSSIL ENERGY

FREEPORT LNG EXPANSION, L.P.,
FLNG LIQUEFACTION, LLC,
FLNG LIQUEFACTION 2, LLC, AND
FLNG LIQUEFACTION 3, LLC

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FE DOCKET NO. 11-161-LNG

FINAL OPINION AND ORDER GRANTING LONG-TERM
MULTI-CONTRACT AUTHORIZATION TO EXPORT
LIQUEFIED NATURAL GAS BY VESSEL
FROM THE FREEPORT LNG TERMINAL ON QUINTANA ISLAND, TEXAS,
TO NON-FREE TRADE AGREEMENT NATIONS

DOE/FE ORDER NO. 3357-B

NOVEMBER 14, 2014

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FREQUENTLY USED ACRONYMS

AEO	Annual Energy Outlook
APGA	American Public Gas Association
API	American Petroleum Institute
Bcf/d	Billion Cubic Feet per Day
Bcf/yr	Billion Cubic Feet per Year
CEQ	The Council on Environmental Quality
CH ₄	Methane
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalents
DOE	U.S. Department of Energy
EIA	U.S. Energy Information Administration
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
EUR	Estimated Ultimate Recovery
FE	Office of Fossil Energy, U.S. Department of Energy
FERC	Federal Energy Regulatory Commission
FLEX	Freeport LNG Expansion, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC
FTA	Free Trade Agreement
GHG	Greenhouse Gas
GWP	Global Warming Potential
HAP	Hazardous Air Pollutant
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilowatt-Hour
LCA	Life Cycle Analysis
LNG	Liquefied Natural Gas
LTA	Liquefaction Tolling Agreement
Mcf	Thousand Cubic Feet
MMBtu	Million British Thermal Units
mtpa	Million Metric Tons per Annum
MWh	Megawatt-Hour
NEPA	National Environmental Policy Act
NERA	NERA Economic Consulting
NETL	National Energy Technology Laboratory
NGA	Natural Gas Act
PM	Particulate Matter
ROD	Record of Decision
Tcf/yr	Trillion Cubic Feet per Year
VOC	Volatile Organic Compound

I. INTRODUCTION

On November 15, 2013, the Office of Fossil Energy of the Department of Energy (DOE/FE) issued Order No. 3357 (FLEX II Conditional Order)¹ to Freeport LNG Expansion, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC (collectively, FLEX) pursuant to section 3(a) of the Natural Gas Act (NGA).² As discussed below, DOE/FE subsequently amended Order No. 3357 to clarify the terms of the Conditional Order.³

In the FLEX II Conditional Order, DOE/FE conditionally granted FLEX's Application⁴ in FE Docket No. 11-161-LNG for long-term, multi-contract authority to export domestically produced liquefied natural gas (LNG) by vessel to nations with which the United States has not entered into a free trade agreement providing for national treatment for trade in natural gas (non-FTA nations). DOE/FE conditionally authorized FLEX to export LNG in a volume equivalent to 146 billion cubic feet per year (Bcf/yr) of natural gas (0.4 Bcf per day (Bcf/d))⁵ for a term of 20 years. The authorization term was to commence on the earlier of the date of first commercial export or seven years from the date the order was issued (November 15, 2020). The proposed exports will originate from the existing Freeport Terminal, located on Quintana Island, southeast of the City of Freeport in Brazoria County, Texas, from liquefaction and related facilities to be

¹ *Freeport LNG Expansion L.P. and FLNG Liquefaction, LLC*, DOE/FE Order No. 3357, FE Docket No. 11-161-LNG, Order Conditionally Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas to Non-Free Trade Agreement Nations (Nov. 15, 2013).

² 15 U.S.C. § 717b(a). This authority is delegated to the Assistant Secretary for Fossil Energy pursuant to Redelegation Order No. 00-002.04F (July 11, 2013).

³ On November 15, 2013, DOE/FE issued Order No. 3357-A to clarify, among other things, the date the export term commences. Collectively, these two FLEX orders are referred to herein as the FLEX II Conditional Order.

⁴ Application of Freeport LNG Expansion L.P., *et al.*, for Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries, FE Docket No. 11-161-LNG (Dec. 19, 2011) [hereinafter FLEX II App.].

⁵ This volume was a portion of the LNG export volume requested by FLEX in the Application, which was 1.4 Bcf/d of natural gas (511 Bcf/yr). DOE/FE's rationale for not granting the requested volume is set forth in the FLEX II Conditional Order and summarized below. *See* FLEX II Conditional Order at 12-13, 15-17; *infra* Section IV.C.

constructed by FLEX (Liquefaction Project). DOE/FE authorized FLEX to export this LNG on its own behalf and as an agent for other entities that hold title to the LNG, after registering each such entity with DOE/FE.⁶

In addition to the FLEX II Conditional Order, DOE/FE has issued three other long-term LNG export authorizations to FLEX: (i) two orders each authorizing exports of domestically produced LNG by vessel from the Freeport Terminal in a volume equivalent to 511 Bcf/yr of natural gas (1.4 Bcf/d), to countries with which the United States has, or in the future enters into, a FTA requiring national treatment for trade in natural gas (FTA countries), issued in FE Docket Nos. 10-160-LNG⁷ and 12-06-LNG,⁸ respectively; and (ii) a conditional non-FTA order issued prior to the FLEX II Conditional Order, authorizing exports of domestically produced LNG by vessel from the Freeport Terminal in a volume equivalent to 511 Bcf/yr of natural gas (1.4 Bcf/d) for a term of 20 years, issued in FE Docket No. 10-161-LNG (FLEX I Conditional Order).⁹

Concurrently with this Order, DOE/FE is granting FLEX's first conditional non-FTA authorization in a separate final order, Order No. 3282-C (FLEX I Order).¹⁰ Although the volume of LNG exports authorized in the two non-FTA orders are additive to one another—for

⁶ The FLEX II Conditional Order contained numerous terms and conditions, which we are adopting in this Order. *See infra* Sections XI, XIII.

⁷ *Freeport LNG Expansion L.P. et al.*, DOE/FE Order No. 2913, FE Docket No. 10-160-LNG, Order Granting Long-Term Authorization to Export Liquefied Natural Gas from Freeport LNG Terminal to Free Trade Nations (Feb. 10, 2011). On February 7, 2014, DOE/FE issued Order No. 2913-A, which amended Order No. 2913 to add FLNG Liquefaction 2, LLC and FLNG Liquefaction 3, LLC as applicants and authorization holders.

⁸ *Freeport LNG Expansion L.P. et al.*, DOE/FE Order No. 3066, FE Docket No. 12-06-LNG, Order Granting Long-Term Authorization to Export Liquefied Natural Gas from Freeport LNG Terminal to Free Trade Nations (Feb. 10, 2012). On February 7, 2014, DOE/FE issued Order No. 3066-A, which amended Order No. 3066 to add FLNG Liquefaction 2, LLC and FLNG Liquefaction 3, LLC as applicants and authorization holders.

⁹ *Freeport LNG Expansion L.P., et al.*, DOE/FE Order No. 3282, FE Docket No. 10-161-LNG, Order Conditionally Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas to Non-Free Trade Agreement Nations (May 17, 2013) [hereinafter FLEX I Conditional Order].

¹⁰ *Freeport LNG Expansion, L.P., et al.*, DOE/FE Order No. 3282-C, FE Docket No. 10-161-LNG, Final Opinion and Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas, to Non-Free Trade Agreement Nations (Nov. 14, 2014) [hereinafter FLEX I Order]. FLEX's two FTA orders are final and thus are not subject to further review.

a total non-FTA export volume of 657 Bcf/yr of natural gas (1.8 Bcf/d)—they are not additive to the FTA export volumes, which together total 1022 Bcf/yr of natural gas (2.8 Bcf/d). Additional detail about FLEX’s authorizations is set forth below. *See infra* Section IV.C.

In August 2012, FLEX filed a separate application with the Federal Energy Regulatory Commission (FERC) to site, construct, and operate the Liquefaction Project under NGA section 3.¹¹ At the time that DOE/FE issued the FLEX II Conditional Order, FLEX’s application to FERC was still pending in FERC Docket CP12-509-000. Accordingly, the FLEX II Conditional Order addressed the record evidence and entered findings on all non-environmental issues considered under NGA section 3(a), including the economic impacts, international impacts, and security of gas supply associated with FLEX’s proposed exports. *See infra* Section III (public interest standard). Because DOE/FE must also consider environmental issues, DOE/FE conditioned its authorization on the satisfactory completion of the environmental review process under the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. § 4321 *et seq.*, and on DOE/FE’s issuance of a finding of no significant impact or a record of decision (ROD).¹² DOE/FE stated that it “intends to complete its NEPA review as a cooperating agency in FERC’s review of the Liquefaction Project,” and explained that the Conditional Order “indicates ... DOE/FE’s determination at this time on all but the environmental issues in this proceeding.”¹³

FERC reviewed FLEX’s application for the Liquefaction Project in FERC Docket No. CP12-509-000 in conjunction with FLEX’s application in FERC Docket No. CP12-29-000 to modify FLEX’s previously authorized LNG facilities to facilitate the import and export of LNG

¹¹ Freeport LNG Development, L.P., *et al.*, Application for Authorization Under Section 3 of the Natural Gas Act, FERC Docket CP-12-509 (Aug. 31, 2012) [hereinafter FLEX FERC App.].

¹² *See* FLEX II Conditional Order at 165 (Ordering Para. F).

¹³ *Id.* at 163-64 (Terms and Conditions § H) (stating that “DOE/FE’s participation as a cooperating agency ... is intended to avoid duplication of effort by agencies with overlapping environmental review responsibilities, to achieve early coordination among agencies, and to concentrate public participation in a single forum.”).

at the Freeport Terminal. *See infra* Section IV.A. In accordance with NEPA, FERC issued a draft Environmental Impact Statement (EIS) for the proposed Liquefaction Project and other facilities modifications on March 14, 2014,¹⁴ and a final EIS on June 16, 2014.¹⁵ The final EIS recommended that FERC subject any approval of FLEX's proposed Liquefaction Project to 83 environmental conditions. Accordingly, on July 30, 2014, FERC issued an Order Granting Authorization Under Section 3 of the Natural Gas Act (FERC Order), which authorized FLEX to site, construct, and operate the Liquefaction Project and other facilities modifications subject to the 83 environmental conditions contained in Appendix A of that order.¹⁶ Details of the FERC Order are discussed below. *See infra* Section VI.

Sierra Club intervened in FLEX's proceeding before FERC, challenging the adequacy of the draft EIS.¹⁷ Sierra Club asserted, in part, that the draft EIS failed to consider: (i) the cumulative impacts from all proposed export terminals, including the LNG export applications already approved by or pending before DOE/FE and FERC;¹⁸ and (ii) the indirect effects of induced natural gas production associated with the proposed Liquefaction Project.¹⁹ In its Order, FERC rejected those arguments.

¹⁴ *See* Freeport LNG Development, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC; Notice of Availability of the Draft Environmental Impact Statement for the Proposed Phase II Modification and Liquefaction Projects, 79 Fed. Reg. 15,989 (March 24, 2014).

¹⁵ *See* Freeport LNG Development, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC; Notice of Availability of the Final Environmental Impact Statement for the Proposed Phase II Modification and Liquefaction Projects, 79 Fed. Reg. 35,345 (June 20, 2014). *See also* *Freeport LNG Development, L.P., et al.*, Freeport LNG Liquefaction Project, Phase II Modification Project, Final Environmental Impact Statement, FERC/EIS-0250F (June 2014) [hereinafter Final EIS].

¹⁶ *Freeport LNG Development, L.P., et al.*, Order Granting Authorizations Under Section 3 of the Natural Gas Act, 148 FERC ¶ 61,076 (July 30, 2014) [hereinafter FERC Order].

¹⁷ In addition to Sierra Club, intervenors included Tres Palacios Gas Storage LLC, ConocoPhillips Company, Galveston Baykeeper, among others. *See id.* at 7.

¹⁸ *See* FERC Order at 20-21.

¹⁹ *See id.* at 21-22.

First, as to Sierra Club’s argument for a cumulative environmental impact analysis, FERC found that Sierra Club was, in fact, seeking a programmatic EIS when there was no “program” before FERC that required such action under NEPA.²⁰ Second, FERC found that Sierra Club had not demonstrated that the Liquefaction Project would induce additional natural gas production and, even assuming that the Liquefaction Project would do so, such production is not “reasonably foreseeable” within the meaning of the Council on Environmental Quality’s (CEQ) regulations implementing NEPA.²¹ FERC concluded that the Liquefaction Project, if built and operated consonant with the specified environmental conditions, would be an “environmentally acceptable action.”²² Sierra Club sought rehearing of the FERC Order, but FERC denied that request on November 13, 2014.²³

On October 3, 2014, after an independent review, DOE/FE adopted FERC’s final EIS for the FLEX Liquefaction Project (DOE/EIS-0487), and the U.S. Environmental Protection Agency (EPA) published a notice of the adoption on October 10, 2014.²⁴ Concurrently with this Order, DOE/FE is issuing a ROD for FLEX’s proposed Liquefaction Project and other related facilities modifications.²⁵ The condition imposed by DOE/FE in the FLEX II Conditional Order having been met, DOE/FE will now issue this final opinion and order (Order). As discussed below, this Order is conditioned on FLEX’s compliance with the 83 environmental conditions adopted in the FERC Order.

²⁰ *Id.* (citing 40 C.F.R. § 1508.18(b)(3)).

²¹ *Id.* at 21-22 (quoting 40 C.F.R. § 1508.8(b)).

²² FERC Order at 23.

²³ *Freeport LNG Development, L.P., et al.*, Order Denying Rehearing and Clarification, 149 FERC ¶ 61,119 (Nov. 13, 2014).

²⁴ U.S. Env’tl. Prot. Agency, Environmental Impact Statements; Notice of Availability, 79 Fed. Reg. 61,303, 61,304 (Oct. 10, 2014) (providing notice that DOE/FE adopted FERC’s final EIS for the FLEX Liquefaction Project).

²⁵ In the ROD, DOE/FE is concurrently issuing a Floodplain Statement of Findings, as required by 10 C.F.R. Part 1022 (Floodplain and Wetland Environmental Review Requirements).

In connection with this and other LNG export proceedings, on June 4, 2014, DOE/FE issued two notices in the *Federal Register* proposing to evaluate different environmental aspects of the LNG production and export chain. First, DOE/FE announced that it had conducted a review of existing literature on potential environmental issues associated with unconventional gas production in the lower-48 states. The purpose of this review was to provide additional information to the public concerning the potential environmental impacts of unconventional natural gas exploration and production activities, including hydraulic fracturing. DOE/FE published its draft report for public review and comment, entitled *Draft Addendum to Environmental Review Documents Concerning Exports of Natural Gas From the United States* (Draft Addendum).²⁶ As detailed below, DOE/FE received comments on the Draft Addendum and, on August 15, 2014, issued the final Addendum (hereinafter Addendum) with its response to the public comments contained in Appendix B.²⁷

Second, DOE/FE commissioned the National Energy Technology Laboratory (NETL), a DOE applied research laboratory, to conduct an analysis calculating the life cycle greenhouse gas (GHG) emissions for LNG exported from the United States. The purpose of this analysis was to determine: (i) how domestically-produced LNG exported from the United States compares with regional coal (or other LNG sources) for electric power generation in Europe and Asia from a life cycle GHG perspective, and (ii) how those results compare with natural gas sourced from Russia and delivered to the same markets via pipeline. DOE/FE published NETL's report entitled, *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas From the*

²⁶ Dep't of Energy, Draft Addendum to Environmental Review Documents Concerning Exports of Natural Gas From the United States, 79 Fed. Reg. 32,258 (June 4, 2014). DOE/FE announced the availability of the Draft Addendum on its website on May 29, 2014.

²⁷ Dep't of Energy, Addendum to Environmental Review Documents Concerning Exports of Natural Gas From the United States, 79 Fed. Reg. 48,132 (Aug. 15, 2014).

United States (LCA GHG Report).²⁸ DOE/FE also received public comment on the LCA GHG Report, and provides its response to those comments in this Order. *See infra* Section IX.B.

With respect to both the Addendum and the LCA GHG Report, DOE/FE has taken all public comments into consideration in this decision and has made those comments, as well as the underlying studies, part of the record in this proceeding.²⁹ As explained below, neither the Addendum nor the LCA GHG Report are required by NEPA, but DOE/FE believes that these documents will inform its review of the public interest under NGA section 3(a), and are responsive to concerns previously raised in this proceeding. Below, we discuss these documents, as well as other environmental issues evaluated as part of our public interest review.

II. SUMMARY OF FINDINGS AND CONCLUSIONS

As noted above, the FLEX II Conditional Order presented DOE/FE's findings and conclusions on the non-environmental issues associated with FLEX's proposed exports. DOE/FE compiled an administrative record based on submissions by persons who intervened in, protested, and/or commented on FLEX's Application. DOE/FE also considered the LNG Export Study described below.³⁰ Based on that record, DOE/FE reviewed a number of public interest considerations and determined that the three intervenor-protestors in this proceeding—American Public Gas Association (APGA), Sierra Club, and the Gulf Coast Environmental Labor Coalition

²⁸ Dep't of Energy, Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas From the United States, 79 Fed. Reg. 32,260 (June 4, 2014) [hereinafter LCA GHG Report]. DOE/FE announced the availability of the LCA GHG Report on its website on May 29, 2014.

²⁹ By electronic mail, DOE/FE notified all parties to this proceeding of the issuance of both the draft Addendum and the LCA GHG Report, as well as the opportunity to submit comments on those documents.

³⁰ *See* 2012 LNG Export Study, 77 Fed. Reg. 73,627 (Dec. 11, 2012), *available at* http://energy.gov/sites/prod/files/2013/04/f0/fr_notice_two_part_study.pdf (Federal Register Notice of Availability of the LNG Export Study); LNG Export Study – Related Documents, *available at* <http://energy.gov/fe/downloads/lng-export-study-related-documents> (EIA Analysis (Study - Part 1) & (NERA Economic Consulting Analysis (Study - Part 2))).

(GCELC)—had not demonstrated that the requested authorization would be inconsistent with the public interest, as would be required to deny FLEX’s Application under NGA section 3(a).³¹

This Order adopts the key findings, terms, and conditions of the FLEX II Conditional Order, and focuses on the remaining issue: the potential environmental impacts of FLEX’s proposed exports. Based on a review of the record in this proceeding—including the final EIS on the proposed Liquefaction Project, the FERC Order granting authorization for FLEX to site, construct, and operate the Liquefaction Project, as well as the Addendum and LCA GHG Report—DOE/FE finds that the proposed exports have not been shown to be inconsistent with the public interest.

On this basis, DOE/FE grants final authorization for FLEX’s proposed exports of domestically produced LNG from the Freeport Terminal. FLEX’s exports are authorized in a volume equivalent to 146 Bcf/yr of natural gas. *See infra* Section XI.H. This authorization is subject to the Terms and Conditions and Ordering Paragraphs discussed below, which incorporate by reference the 83 environmental conditions imposed by FERC. *See infra* Sections XI-XIII.

III. PUBLIC INTEREST STANDARD

Section 3(a) of the NGA sets forth the standard for review of FLEX’s Application:

[N]o person shall export any natural gas from the United States to a foreign country or import any natural gas from a foreign country without first having secured an order of the [Secretary of Energy³²] authorizing it to do so. The [Secretary] shall issue such order upon application, unless after opportunity for hearing, [he] finds that the proposed exportation or importation will not be consistent with the public interest. The [Secretary] may by [the Secretary’s] order

³¹ *See* FLEX Conditional Order at 109-14.

³² The Secretary’s authority was established by the Department of Energy Organization Act, 42 U.S.C. § 7172, which transferred jurisdiction over imports and export authorizations from the Federal Power Commission to the Secretary of Energy.

grant such application, in whole or part, with such modification and upon such terms and conditions as the [Secretary] may find necessary or appropriate.

15 U.S.C. § 717b(a). This provision creates a rebuttable presumption that a proposed export of natural gas is in the public interest. DOE/FE must grant such an application unless opponents of the application overcome that presumption by making an affirmative showing of inconsistency with the public interest.³³

While section 3(a) establishes a broad public interest standard and a presumption favoring export authorizations, the statute does not define “public interest” or identify criteria that must be considered. In prior decisions, however, DOE/FE has identified a range of factors that it evaluates when reviewing an application for export authorization. These factors include economic impacts, international impacts, security of natural gas supply, and environmental impacts, among others. To conduct this review, DOE/FE looks to record evidence developed in the application proceeding.³⁴

DOE/FE’s prior decisions have also looked to certain principles established in its 1984 Policy Guidelines.³⁵ The goals of the Policy Guidelines are to minimize federal control and involvement in energy markets and to promote a balanced and mixed energy resource system.

The Guidelines provide that:

³³ See, e.g., *Sabine Pass Liquefaction, LLC*, DOE/FE Order No. 2961, FE Docket No. 10-111-LNG, Opinion and Order Conditionally Granting Long-Term Authorization to Export Liquefied Natural Gas From Sabine Pass LNG Terminal to Non-Free Trade Agreement Nations, at 28 (May 20, 2011) [hereinafter *Sabine Pass*]; see also *Phillips Alaska Natural Gas Corp. & Marathon Oil Co.*, DOE/FE Order No. 1473, FE Docket No. 96-99-LNG, Order Extending Authorization to Export Liquefied Natural Gas from Alaska, at 13 (April 2, 1999) [hereinafter *Phillips Alaska Natural Gas*], citing *Panhandle Producers & Royalty Owners Ass’n v. ERA*, 822 F.2d 1105, 1111 (D.C. Cir. 1987).

³⁴ See, e.g., *Sabine Pass*, DOE/FE Order No. 2961, at 28-42 (reviewing record evidence in issuing conditional authorization); *LNG Devel. Co., LLC (d/b/a/ Oregon LNG)*, DOE/FE Order No. 3465, FE Docket No. 12-77-LNG, Order Conditionally Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Oregon LNG Terminal in Warrenton, Clatsop County, Oregon to Non-Free Trade Agreement Nations (July 31, 2014), at 8-28, 132-43 (same) [hereinafter *Oregon LNG*].

³⁵ New Policy Guidelines and Delegations Order Relating to Regulation of Imported Natural Gas, 49 Fed. Reg. 6684 (Feb. 22, 1984) [hereinafter 1984 Policy Guidelines].

The market, not government, should determine the price and other contract terms of imported [or exported] natural gas The federal government's primary responsibility in authorizing imports [or exports] will be to evaluate the need for the gas and whether the import [or export] arrangement will provide the gas on a competitively priced basis for the duration of the contract while minimizing regulatory impediments to a freely operating market.³⁶

While nominally applicable to natural gas import cases, DOE/FE subsequently held in Order No. 1473 that the same policies should be applied to natural gas export applications.³⁷

In Order No. 1473, DOE/FE stated that it was guided by DOE Delegation Order No. 0204-111. That delegation order, which authorized the Administrator of the Economic Regulatory Administration to exercise the agency's review authority under NGA section 3, directed the Administrator to regulate exports "based on a consideration of the domestic need for the gas to be exported and such other matters as the Administrator finds in the circumstances of a particular case to be appropriate."³⁸ In February 1989, the Assistant Secretary for Fossil Energy assumed the delegated responsibilities of the Administrator of ERA.³⁹

Although DOE Delegation Order No. 0204-111 is no longer in effect, DOE/FE's review of export applications has continued to focus on: (i) the domestic need for the natural gas proposed to be exported, (ii) whether the proposed exports pose a threat to the security of domestic natural gas supplies, (iii) whether the arrangement is consistent with DOE/FE's policy of promoting market competition, and (iv) any other factors bearing on the public interest described herein.

³⁶ *Id.* at 6685.

³⁷ *Phillips Alaska Natural Gas*, DOE/FE Order No. 1473, at 14 (citing *Yukon Pacific Corp.*, DOE/FE Order No. 350, Order Granting Authorization to Export Liquefied Natural Gas from Alaska, 1 FE ¶ 70,259, at 71,128 (1989)).

³⁸ DOE Delegation Order No. 0204-111, at 1; *see also* 49 Fed. Reg. 6684, 6690 (Feb. 22, 1984).

³⁹ *See Applications for Authorization to Construct, Operate, or Modify Facilities Used for the Export or Import of Natural Gas*, 62 Fed. Reg. 30,435, 30,437 n.15 (June 4, 1997) (citing DOE Delegation Order No. 0204-127, 54 Fed. Reg. 11,436 (Mar. 20, 1989)).

IV. DESCRIPTION OF REQUEST

In its Application, FLEX requests long-term, multi-contract authorization to export, on its own behalf or as agent for others, domestically produced LNG up to the equivalent of 511 Bcf/yr (1.4 Bcf/d) of natural gas by vessel from the Freeport Terminal to non-FTA countries for a 25-year term. The requested 1.4 Bcf/d export volume would be in addition to the 1.4 Bcf/d export volume granted by DOE/FE in FLEX's first non-FTA authorization (DOE/FE No. 3282-C), and thus—if granted in full—effectively would double FLEX's non-FTA export volume. Taking into account the size of FLEX's proposed Liquefaction Project, however, DOE/FE conditionally granted FLEX's Application in the reduced volume of 146 Bcf/yr of natural gas (0.4 Bcf/d). DOE/FE granted this request for a 20-year term commencing on the earlier of the date of first commercial export or seven years from the date of issuance of the requested authorization.

A. Description of Applicant and Facility

FLEX is comprised of four entities:

- (1) Freeport LNG Expansion L.P., a Delaware limited partnership and a wholly owned subsidiary of Freeport LNG Development, L.P.;
- (2) FLNG Liquefaction, LLC (also called FLNG Liquefaction 1), a Delaware limited liability company and a wholly owned subsidiary of Freeport LNG Expansion, L.P.;
- (3) FLNG Liquefaction 2, LLC, a wholly owned subsidiary of Freeport LNG Expansion, L.P.; and
- (4) FLNG Liquefaction 3, LLC, a wholly owned subsidiary of Freeport LNG Expansion, L.P.

All have their principal place of business in Houston, Texas. The ultimate FLEX parent company, Freeport LNG Development, L.P., is a Delaware limited partnership. It owns and operates the Freeport Terminal.

Only the first two entities (Freeport LNG Expansion L.P. and FLNG Liquefaction, LLC) were the original FLEX applicants in this proceeding but, as described below, FLEX later requested that DOE/FE amend the FLEX II Conditional Order (as well as its other pending applications and export authorizations) to add FLNG Liquefaction 2, LLC and FLNG Liquefaction 3, LLC as applicants and authorization holders. DOE/FE granted that amendment in this docket on June 6, 2014, as described below.

Most recently, in a submission to DOE/FE dated September 26, 2014,⁴⁰ FLEX stated that the management of its ultimate parent company, Freeport LNG Development, L.P., is vested entirely in its sole General Partner, Freeport LNG-GP, Inc. (or FLNG-GP, Inc.). FLNG-GP, Inc. is a Delaware corporation currently owned 50 percent by one individual, Michael S. Smith, and 50 percent by ConocoPhillips Company—although, as discussed below, FLEX has indicated that ConocoPhillips Company will soon transfer its interest to Michael Smith.⁴¹

According to FLEX, FLNG-GP, Inc. has no economic interest in Freeport LNG Development, L.P. or its subsidiaries, because all economic benefits are vested in Freeport LNG Development, L.P.'s limited partners. Additional information about FLEX's corporate ownership structure is discussed below.

Phase I Development. FLEX states that, in June 2004, FERC issued an order authorizing Freeport LNG Development, L.P. to site, construct, and operate what is now known as Phase I of the Freeport Terminal.⁴² FLEX completed the Phase I facilities in June 2008. They

⁴⁰ FLEX Notification & Statement of Change Pursuant to DOE/FE September 26, 2014 Notice of Procedures, Letter from L. Lo Baugh, counsel for FLEX, to J. Anderson, DOE/FE (Sept. 26, 2014) [hereinafter FLEX Notification & Statement of Change].

⁴¹ See *id.* at 2.

⁴² *Freeport LNG Development, L.P.*, 107 FERC ¶ 61,278 (2004) (order granting authorization under NGA section 3); 108 FERC ¶ 61,253 (2004) (order granting rehearing and clarification); 112 FERC ¶ 61,194 (2005) (order amending NGA section 3 authorization).

include an LNG ship marine terminal and unloading dock, LNG transfer lines and storage tanks, high-pressure vaporizers, and a 9.6-mile send-out pipeline extending to the Stratton Ridge meter station.

Phase II Development. FLEX states that, on September 26, 2006, FERC issued an order authorizing the Phase II expansion of the Freeport LNG Terminal, which included an expansion of the Freeport Terminal's send-out capacity.⁴³ In December 2011, Freeport LNG Development, L.P. applied for an amendment to FERC's September 26, 2006 order. In the amendment, FLEX requested authority to reorient the marine berthing dock, eliminate one of the four authorized LNG unloading arms, and eliminate the authorized vaporization facilities, among other modifications.

B. Liquefaction Project

Application. FLEX states that the Liquefaction Project facilities will be integrated into the existing Freeport Terminal, which consists of a marine berth, two 160,000 m³ full containment LNG storage tanks, LNG vaporization systems, associated utilities, and a 9.6-mile pipeline and meter station. According to FLEX, the proposed improvements to the Liquefaction Project will include facilities previously authorized by FERC in its September 26, 2006 order, including a second marine berthing dock, a third LNG storage tank, and transfer pipelines between the second marine dock and LNG storage tanks. They will be contained within the previously authorized operational area of the Freeport Terminal. FLEX states that the expanded facility will be designed so that the addition of liquefaction capability will not preclude the Freeport Terminal from operating in vaporization and send-out mode. FLEX further asserts that, when operating at full capacity, the Liquefaction Project will consume approximately 0.1 Bcf/d

⁴³ *Freeport LNG Development, L.P.*, 116 FERC ¶ 61,290 (2006).

of natural gas to power the liquefaction facilities, resulting in a total natural gas volume requirement of 1.5 Bcf/d.

FERC Application and Revised Project Capacity. In its application filed with FERC, FLEX described the Liquefaction Project as having “three propane pre-cooled mixed refrigerant trains, each with a nominal nameplate capacity of 4.4 [mtpa] of LNG ... for export, which equates to *a total liquefaction capacity of approximately 1.8 billion cubic feet per day ... of natural gas.*”⁴⁴ In a footnote, FLEX reiterated that the Liquefaction Project’s “[n]ameplate production is based on feed of 1.97 Bcf/d of pretreated natural gas, of which 1.8 Bcf/d is converted to LNG available for export.”⁴⁵ Based on these statements to FERC, DOE/FE has found that the planned liquefaction capacity of the Project is 1.8 Bcf/d of natural gas. *See infra* Section IV.C.

C. Procedural History

Pertinent aspects of FLEX’s procedural history with DOE/FE are summarized as follows:

FTA Order in FE Docket No. 10-160-LNG (DOE/FE Order No. 2913-A). On February 10, 2011, in Order No. 2913 (later amended in Order No. 2913-A), DOE/FE granted FLEX’s request to export domestically produced LNG from the Freeport Terminal to FTA countries.⁴⁶ Pursuant to that order, FLEX is authorized to export LNG, on its own behalf and as agent for other entities, in a volume equivalent to 511 Bcf/yr of natural gas (1.4 Bcf/d) for a 25-year term commencing on the earlier of the date of first export or five years from the date the authorization was issued (February 10, 2016).

⁴⁴ FLEX FERC App., Resource Report 1 (Aug. 2012), at 1-1 (emphasis added).

⁴⁵ *Id.* n.1.

⁴⁶ *See Freeport LNG Expansion L.P., et al.*, DOE/FE Order No. 2913.

FTA Order in FE Docket No. 12-06-LNG (DOE/FE Order No. 3066-A). On February 10, 2012, in Order No. 3066 (later amended in Order No. 3066-A), DOE/FE granted FLEX's second application to export domestically produced LNG from the Freeport Terminal to FTA countries in an identical volume as FTA Order No. 2913-A.⁴⁷ Pursuant to that order, FLEX is authorized to export LNG, on its own behalf and as agent for other entities, in a volume equivalent to 511 Bcf/yr of natural gas (1.4 Bcf/d) for a 25-year term commencing on the earlier of the date of first export or eight years from the date the authorization was issued (February 10, 2020), for a combined total FTA authorization of 1022 Bcf/yr of natural gas under both orders.

FLEX I Non-FTA Conditional Order in FE Docket No. 10-160-LNG (DOE/FE Order No. 3282-B). As described above, DOE/FE issued the FLEX I Conditional Order on May 17, 2013, in Order No. 3282 (later amended in Order Nos. 3282-A and 3282-B). Concurrently with this Order, DOE/FE is issuing this non-FTA authorization in a separate final order, captioned DOE/FE Order No. 3282-C.

FLEX II Non-FTA Conditional Order in FE Docket No. 11-161-LNG (DOE/FE Order No. 3357-A). On November 15, 2013, DOE/FE conditionally granted a second non-FTA authorization to FLEX in DOE/FE Order No. 3357 (later amended in Order No. 3357-A). In support of its request for additional export volumes, FLEX explained that, “[d]emand for liquefaction capacity has been significant since FLEX filed its initial export applications a year ago, and FLEX expects to secure long-term contracts for the liquefaction and export of an additional 1.4 Bcf/d.”⁴⁸ Therefore, FLEX sought the second non-FTA authorization (as well as

⁴⁷ See *Freeport LNG Expansion L.P., et al.*, DOE/FE Order No. 3066.

⁴⁸ Application of Freeport LNG Expansion L.P., *et al.*, for Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries, FE Docket No. 11-161-LNG, at 5 (Dec. 19, 2011) [hereinafter FLEX II App.].

the second FTA authorization) “[t]o support the commercialization and financing necessary ... to build facilities to meet that demand”⁴⁹

As described herein, DOE/FE did not conditionally authorize FLEX to export the full volume requested. Rather, taking into account FLEX’s statements to FERC concerning the planned 1.8 Bcf/d capacity of the Liquefaction Project and the fact that the NEPA review led by FERC studied a project with a capacity of 1.8 Bcf/d,⁵⁰ DOE/FE conditionally authorized FLEX to export LNG in a reduced volume equivalent to 146 Bcf/yr of natural gas (0.4 Bcf/d) for a 20-year term commencing on the earlier of the date of first export or seven years from the date the authorization was issued (November 15, 2020). Although not additive to either of FLEX’s FTA authorizations, this second conditional non-FTA authorization of 0.4 Bcf/d of natural gas was additive to the 1.4 Bcf/d of natural gas conditionally authorized for export in the FLEX I Conditional Order.

The 1.4 Bcf/d authorized in FLEX I (DOE/FE Order No. 3282-C), together with the 0.4 Bcf/d of natural gas authorized for export in FLEX II, brings FLEX’s total combined non-FTA export volume to 1.8 Bcf/d of natural gas (657 Bcf/yr), which mirrors the known liquefaction capacity of the Liquefaction Project. This combined non-FTA export volume is not additive to FLEX’s FTA authorizations.

Notice of Long-Term Contracts. FLEX filed letters on April 12 and October 25, 2013, in each of its four long-term docket proceedings providing information to DOE/FE as to the

⁴⁹ *Id.* at 5-6.

⁵⁰ *See* Final EIS at ES-2 (“The Liquefaction Plant would consist of three propane pre-cooled mixed refrigerant liquefaction trains, ... [having] a total liquefaction capacity of approximately 1.8 billion cubic feet per day of natural gas.”).

contracts it had executed to date.⁵¹ FLEX informed DOE/FE that one or more of its subsidiaries have executed a long-term Liquefaction Tolling Agreement (LTA)⁵² with the following five customers as follows:

- Chubu Electric Power Co., Inc., for a volume of natural gas totaling approximately 115,000,000 million BTUs of LNG per contract year, for 20 contract years beginning from completion of FLEX's first liquefaction train;
- Osaka Gas Co., Ltd., for a volume of natural gas totaling approximately 115,000,000 million BTUs of LNG per contract year, for 20 contract years beginning from completion of FLEX's first liquefaction train;
- BP Energy Company, for a volume of natural gas totaling approximately 230,000,000 million BTUs of LNG per contract year, for 20 contract years beginning from completion of FLEX's second liquefaction train;
- SK E&S LNG, LLC, for a volume of natural gas totaling approximately 115,000,000 million BTUs of LNG per contract year, for 20 contract years beginning upon completion of construction and commencement of commercial operations of FLEX's third liquefaction train; and
- Toshiba Corporation, for a volume of natural gas totaling approximately 115,000,000 million BTUs of LNG per contract year, plus one-third of the production quantity available from FLEX's liquefaction facility in excess of the annual nameplate design production of 690,000,000 million BTUs, up to an additional 5,250,000 million BTUs of LNG per contract year, for 20 contract years beginning upon completion of construction and commencement of commercial operations of FLEX's third liquefaction train.

DOE/FE has previously noted that any production in excess of the authorization granted in this Order and in FLEX's second non-FTA authorization (DOE/FE Order No. 3357, as amended) would require an additional authorization from DOE and FERC.

Procedural Order (DOE/FE Order Nos. 2913-A, 3066-A, and 3282-A). As noted above, FLEX filed an Amendment and Supplement to its Application in September 2013, asking

⁵¹ Letter from John B. Tobola to J. Anderson, Long-Term Contracts, Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG (Apr. 12, 2013); Letter from L. Lo Baugh to J. Anderson, Long-Term Contracts, Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG (Oct. 25, 2013).

⁵² References to LTAs and long-term contracts are synonymous for purposes of this Order.

DOE/FE to include FLNG Liquefaction 2, LLC and FLNG Liquefaction 3, LLC as applicants in this proceeding.⁵³ FLEX stated that it originally contemplated that FLNG Liquefaction, LLC would own the three liquefaction trains to be developed as part of the Liquefaction Project. Subsequently, however, FLEX determined that each liquefaction train must be a separate legal entity for purposes of development, financing, and construction.

In support of its request, FLEX stated that FLNG Liquefaction, LLC will own the first liquefaction train; FLNG Liquefaction 2, LLC will own the second train; and FLNG Liquefaction 3, LLC will own the third. Notwithstanding the separate ownership structure, FLEX stated that the three liquefaction trains will be integrated with the regasification and import facility, such that the Liquefaction Project will be operated as a single integrated liquefaction, regasification, LNG export, and LNG import facility. FLEX further stated that Freeport LNG Expansion, L.P. will coordinate all exports under FLEX's orders, and will act as agent for other entities, as stated in the Application. On February 7, 2014, DOE/FE granted the requested relief in this docket and in the other docket proceedings.⁵⁴

Procedural Order (DOE/FE Order Nos. 3282-B and 3357-A). On June 6, 2014, in response to FLEX's Request for Clarification or Amendment of DOE/FE Order No. 3357 in DOE/FE Docket No. 11-161-LNG (among other filings), DOE/FE issued an order clarifying the

⁵³ FLEX Amendment at 5. FLEX filed an analogous amendment and supplement in each of its three other long-term docket proceedings.

⁵⁴ *Freeport LNG Expansion, L.P., et al.*, DOE/FE Order Nos. 2913-A, 3066-A, & 3282-A, FE Docket Nos. 10-160-LNG, 10-161-LNG, 11-161-LNG, & 12-06-LNG, Order Amending Applications in Docket Nos. 10-160-LNG, 10-161-LNG, 11-161-LNG, and 12-06-LNG and Granting Request in Docket No. 11-161-LNG to Add FLNG Liquefaction 2, LLC and FLNG Liquefaction 3, LLC as Applicants and Authorization Holders (Feb. 7, 2014).

terms of both the FLEX I Conditional Order and the FLEX II Conditional Order (DOE/FE Order No. 3357) in various respects, all of which are integrated into this final Order.⁵⁵

Change in Control Order (DOE/FE Order No. 3495). On July 3, 2014, FLEX filed an application with DOE/FE requesting approval to transfer indirect control of the four LNG export authorizations that it currently holds due to proposed changes in the upstream ownership structure of FLNG Liquefaction, LLC and FLNG Liquefaction 2, LLC. FLEX sought DOE/FE’s approval of this proposed transaction pursuant to DOE/FE regulations (10 C.F.R. § 590.405)⁵⁶ and the FLEX II Conditional Order (as well as its other FTA and non-FTA orders).⁵⁷

The specifics of the proposed changes in control are described in the notice of application⁵⁸ and in DOE/FE’s Order Approving Change in Control of Export Authorizations.⁵⁹

Briefly, under the proposed transactions, Osaka Gas and Chubu Electric will take an ownership interest in FLNG Liquefaction, LLC’s parent company (FLIQ1 Holdings, LLC) through their wholly owned U.S. subsidiaries—which, at the time of the filing, had not yet been formed.⁶⁰

Additionally, IFM Global Infrastructure Fund, a global infrastructure investment fund advised by IFM Investors, will take an ownership interest in FLNG Liquefaction 2, LLC’s parent company

⁵⁵ *Freeport LNG Expansion, L.P., et al.*, DOE/FE Order Nos. 3282-B & 3357-A, FE Docket Nos. 10-161-LNG & 11-161-LNG, Order Amending DOE/FE Order Nos. 3282 & 3357 (June 6, 2014).

⁵⁶ “Authorizations by the Assistant Secretary to import or export natural gas shall not be transferable or assignable, unless specifically authorized by the Assistant Secretary.” 10 C.F.R. § 590.405.

⁵⁷ FLEX Conditional Order at 125 (Ordering Para. N, requiring DOE/FE approval prior to any change in control of the authorization holder).

⁵⁸ *Freeport LNG Expansion, L.P.*; FLNG Liquefaction, LLC; FLNG Liquefaction 2, LLC; and FLNG Liquefaction 3, LLC; Request for Change in Control, 79 Fed. Reg. 47,446 (Aug. 13, 2014).

⁵⁹ *See Freeport LNG Expansion, L.P., et al.*, DOE/FE Order No. 3495, FE Docket Nos. 14-005-CIC, *et al.*, Order Approving Change in Control of Export Authorizations (Sept. 23, 2014).

⁶⁰ On September 26 and October 14, 2014, respectively, FLEX notified DOE/FE that the wholly owned U.S. subsidiaries of Osaka Gas and Chubu Electric had been formed. The new entities, Osaka Gas Liquefaction USA Corp. and Chubu Electric Power Company Freeport, Inc., are both Delaware corporations with their principal place of business in Houston, Texas. *See* Ltr. Filing of Freeport LNG Expansion, L.P., *et al.*, FE Docket Nos. 10-161-LNG, *et al.* (Sept. 26, 2014); Ltr. Filing of Freeport LNG Expansion, L.P., *et al.*, FE Docket Nos. 10-161-LNG, *et al.* (Oct. 14, 2014).

(FLIQ2 Holdings, LLC). The IFM entity that will hold the ownership interest in FLIQ2 Holdings, LLC will be IFM FLIQ Holding GP, a general partnership under Delaware law.

According to FLEX, the proposed changes in ownership interest are necessary components of the financing of the FLEX liquefaction project. The four entities comprising FLEX will continue to hold jointly the FTA and non-FTA authorizations. Finally, FLEX stated that the changes in control will not affect the Freeport Terminal or modify the proposed Liquefaction Project. On this basis, DOE/FE granted FLEX's application and approved the proposed changes in control on September 23, 2014, in DOE/FE Order No. 3495.

Notification and Statement of Change. On September 29, 2014, FLEX submitted a Notification and Statement of Change in this docket and its three other docket proceedings, pursuant to DOE/FE's recently-issued Procedures for Changes in Control Affecting Applications and Authorizations to Import or Export Natural Gas (hereinafter DOE/FE Procedures for Changes in Control).⁶¹ As noted above, in that submission, FLEX informed DOE/FE about certain changes anticipated to occur in the upstream ownership structure of its parent company, Freeport LNG Development, L.P., which FLEX refers to as the "transfer event."⁶² The anticipated change in the ownership structure concerns Freeport LNG Development, L.P.'s General Partner, FLNG-GP, Inc.

Specifically, FLEX states that ConocoPhillips Company intends to transfer its existing 50% interest in FLNG-GP, Inc., to Michael Smith, bringing Mr. Smith's ownership interest in FLNG-GP, Inc. to 100%. Further, FLNG-GP, Inc. is managed by a six-member Board of Directors, with each of Michael Smith and ConocoPhillips Company having the right to appoint

⁶¹ See U.S. Dep't of Energy, Procedures for Changes in Control Affecting Applications and Authorizations to Import or Export Natural Gas, 79 Fed. Reg. 65,641 (Nov. 5, 2014) (effective Sept. 26, 2014).

⁶² FLEX Notification & Statement of Change, at 2.

three of the six members. FLEX states that, by contractual arrangement, ConocoPhillips Company is excluded from decision-making with respect to the management, operations, or other activities of Freeport LNG Development, L.P. or FLEX related to the Liquefaction Project.

FLEX asserts that the transfer event will not involve the transfer of any direct or indirect power to control the management or policy of FLEX, the FLEX export authorizations issued by DOE/FE (including this Order), or the FLEX Liquefaction Project. The transferee of ConocoPhillips Company's interest, Michael Smith, is and will remain the only person who may direct any action on the part of FLNG-GP, Inc. as it relates to the FLEX Liquefaction Project. Finally, FLEX states that Freeport LNG Expansion, L.P. will remain the single point of contact with DOE/FE with respect to reporting and administration under this Order (and FLEX's other export authorizations).

Notice, Amendment, and Statement of Change. On October 14, 2014, FLEX submitted a Notification, Amendment, and Statement of Change in this docket and its three other docket proceedings, pursuant to DOE/FE's Procedures for Changes in Control. In that submission, FLEX informed DOE/FE about two separate, but related, prospective transactions which FLEX expects to occur "upstream of the Applicants" in the various dockets.⁶³

In the first set of transactions, FLEX states that GIP II FLNG Holding Partnership, L.P. (GIP II FLNG) will acquire ZHA FLNG, LLC from a consortium of institutional investors managed by Hasting Funds Management (USA) Inc. and Zachary American Infrastructure LLC (ZHA)—collectively, the Sellers. FLEX states that GIP II FLNG is a Delaware limited partnership ultimately owned by Global Infrastructures Partners (GIP), a leading independent

⁶³ Freeport LNG Expansion, L.P., *et al.*, Notification, Amendment, & Statement of Change Pursuant to DOE/FE September 26, 2014 Notice of Procedures Change, FE Docket Nos. 10-161-LNG, *et al.*, at 1 (Oct. 1, 2014) [hereinafter FLEX Notification, Amendment, & Statement of Change].

global infrastructure investor headquartered in New York. FLEX further asserts that, after the conclusion of these transactions, GIP II FLNG will have acquired an indirect interest in excess of 10%, but less than a majority of the limited partner interests, in Freeport LNG Development, L.P.

In the second transaction, FLEX states that the balance of the Sellers' interest would be acquired by Michael Smith and his family trusts. According to FLEX, Sellers will have no further ownership interest at closing. FLEX states that it will notify DOE when these transactions are completed.

As a result of these transactions, FLEX asserts that: (1) Michael Smith and his family trusts will own and control a majority of the limited partner interests in Freeport LNG Development, L.P.; and (2) ZHA FLNG Purchaser, LLC will retain a minority, but greater than 10%, of the limited partnership interests in Freeport LNG Development, L.P., with GIP II FLNG having acquired ZHA FLNG, LLC from the Sellers. Thus, according to FLEX, GIP II FLNG will indirectly hold a minority limited interest in Freeport LNG Development, L.P. Additional detail about these two anticipated transactions is set forth in FLEX's Notice, Amendment, and Statement of Change.

FLEX states that, after completion of these transactions, the operation and maintenance of the Freeport LNG facilities (both regasification and liquefaction) will continue to be under the control of the existing owner/operator of the facility, Freeport LNG Development, L.P., through various contractual arrangements with and among FLIQ1, FLIQ2, and FLIQ3. FLEX states that Freeport LNG Expansion, L.P. will remain the single point of contact with DOE/FE with respect to reporting and administration under this Order (and FLEX's other export authorizations).

D. Business Model

FLEX states that, rather than enter into long-term natural gas supply or LNG export contracts, it expects that its business model will be based primarily on LTAs. Individual customers who hold title to natural gas will have the right to deliver that gas to FLEX and receive LNG. FLEX states that, like long-term supply contracts, LTAs will provide stable commercial arrangements between companies involved in natural gas services.

FLEX proposes to export LNG on its own behalf or as agent for others. FLEX anticipates that the title holder at the point of export⁶⁴ may be: (i) FLEX, (ii) one of FLEX's LTA customers, or (iii) another party that has purchased LNG from an LTA customer pursuant to a long-term contract. FLEX requests authorization to register as agent for each LNG title holder for whom FLEX seeks to export LNG. FLEX proposes that this registration include a written statement by the title holder acknowledging and agreeing to comply with all applicable requirements included in FLEX's export authorization, and to insert those requirements in any subsequent purchase or sale agreement entered into by that title holder. FLEX further proposes to file under seal with DOE/FE any relevant long-term commercial agreements between FLEX and an LNG title holder, including LTAs, once those agreements have been executed.

At the time it submitted its Application, FLEX had not yet entered into any long-term LTAs for the LNG it proposes to export. As noted above, however, FLEX subsequently notified DOE/FE that it has executed long-term LTAs with Osaka Gas Company, Ltd., Chubu Electric Power Company, Inc., BP Energy Company, SK E&S LNG, LLC, and Toshiba Corporation. These five LTAs in total will permit the export of 690 million MMBtu of natural gas per year,

⁶⁴ Export occurs when the LNG is delivered to the flange of the LNG export vessel. *See Dow Chem. Co.*, DOE/FE Order No. 2859, FE Docket No. 10-57-LNG, Order Granting Blanket Authorization to Export Liquefied Natural Gas (Oct. 5, 2010).

representing approximately 1.8 Bcf/d. This contracted amount represents 100 percent of the total combined non-FTA export volume authorized for FLEX in this Order and in the FLEX II Order (DOE/FE Order No. 3357-B, issued concurrently with this Order).⁶⁵

E. Source of Natural Gas

FLEX anticipates that each LTA customer will rely on its own sources for natural gas. FLEX further anticipates that the source of natural gas for its proposed exports will come primarily from the Texas market, but may draw from the interconnected U.S. natural gas market. FLEX asserts that the Texas natural gas market is one of the largest in the world, and is highly liquid because it is connected to other major U.S. markets through a vast pipeline network. FLEX states that, although some of the proposed export supply may be secured through long-term contracts, it expects to draw large volumes of natural gas for itself and for its LTA customers from the spot market. In support of its requested authorization, FLEX cites the size, liquidity, and expanding development of the natural gas markets in close proximity to the Freeport Terminal, as well as the growth in domestic pipeline capacity both within Texas and in the United States generally.

V. 2012 LNG EXPORT STUDY

DOE/FE's public interest analysis in the FLEX II Conditional Order relied in significant part on the two-part LNG Export Study, commenced in 2011 and published in 2012.

On May 20, 2011, several months after FLEX filed its Application, DOE/FE issued *Sabine Pass Liquefaction, LLC*, DOE/FE Order No. 2961 (*Sabine Pass*), the Department's first order conditionally granting a long-term authorization to export LNG produced in the lower-48

⁶⁵ DOE/FE estimates are based on annual data used by EIA in AEO 2013, which show that, in 2011, the gross heat content of domestic dry natural gas consumption was estimated at 1,022 Btu per cubic foot. See *EIA Natural Gas Annual*, Table B2 for 2011, available at http://www.eia.gov/naturalgas/annual/pdf/appendix_b.pdf.

states to non-FTA countries.⁶⁶ In August 2011, with other non-FTA applications pending before it, DOE/FE determined that study of the cumulative economic impact of LNG exports was warranted to better inform its public interest review under section 3 of the NGA.⁶⁷ Accordingly, DOE/FE engaged the U.S. Energy Information Administration (EIA) and NERA Economic Consulting (NERA) to conduct a two-part study of the economic impacts of LNG exports.⁶⁸

First, DOE/FE requested that EIA assess how prescribed levels of natural gas exports above baseline cases could affect domestic energy markets. EIA examined the impact of two DOE/FE-prescribed levels of assumed natural gas exports (6 Bcf/d and 12 Bcf/d) under numerous scenarios and cases based on projections from EIA's 2011 *Annual Energy Outlook* (AEO 2011), the most recent EIA projections available at that time.⁶⁹ EIA published its study, *Effect of Increased Natural Gas Exports on Domestic Energy Markets*, in January 2012 (2012 EIA Study).⁷⁰ As detailed in the FLEX II Conditional Order, EIA generally found that LNG exports will lead to higher domestic natural gas prices, increased domestic natural gas

⁶⁶ *Sabine Pass*, DOE/FE Order No. 2961. In August 2012, DOE/FE granted Sabine Pass's final authorization. *Sabine Pass Liquefaction, LLC*, DOE/FE Order No. 2961-A, FE Docket No. 10-111-LNG, Final Opinion and Order Granting Long-Term Authorization to Export Liquefied Natural Gas From Sabine Pass LNG Terminal to Non-Free Trade Agreement Nations (Aug. 7, 2012). See also *Sabine Pass Liquefaction, LLC*, DOE/FE Order No. 2961-B, FE Docket No. 10-111-LNG, Opinion and Order Denying Request for Rehearing of Order Denying Motion for Late Intervention, Dismissing Request for Rehearing of Order No. 2961-A, and Dismissing Motion for a Stay Pendente Lite (Jan. 25, 2013).

⁶⁷ See *Sabine Pass*, DOE/FE Order No. 2961, at 33 (DOE/FE "will evaluate the cumulative impact of the [Sabine Pass] authorization and any future authorizations for export authority when considering any subsequent application for such authority.").

⁶⁸ See 2012 LNG Export Study, 77 Fed. Reg. 73,627 (Dec. 11, 2012), available at http://energy.gov/sites/prod/files/2013/04/f0/fr_notice_two_part_study.pdf (Federal Register Notice of Availability of the LNG Export Study).

⁶⁹ The Annual Energy Outlook (AEO) presents long-term projections of energy supply, demand, and prices. It is based on results from EIA's National Energy Modeling System (NEMS) model.

⁷⁰ See LNG Export Study – Related Documents, available at <http://energy.gov/fe/downloads/lng-export-study-related-documents> (EIA Analysis (Study - Part 1)).

production, reduced domestic natural gas consumption, and increased natural gas imports from Canada via pipeline.⁷¹

Second, DOE contracted with NERA to assess the potential macroeconomic impact of LNG exports. Building on the EIA Study, NERA analyzed the potential macroeconomic impacts of LNG exports under a range of global natural gas supply and demand scenarios, including scenarios with unlimited LNG exports. DOE published the NERA study, *Macroeconomic Impacts of LNG Exports from the United States*, in December 2012.⁷² Among its key findings, NERA projected that the United States would gain net economic benefits from allowing LNG exports. For every market scenario examined, net economic benefits increased as the level of LNG exports increased.⁷³

On December 11, 2012, DOE/FE published a Notice of Availability of the EIA and NERA studies (collectively, the LNG Export Study).⁷⁴ DOE/FE invited public comment on the LNG Export Study, and stated that its disposition of FLEX's Application and 14 other LNG export applications then pending would be informed by the Study and the comments received in response thereto.⁷⁵

As discussed in the FLEX II Conditional Order, DOE/FE received more than 188,000 initial comments and over 2,700 reply comments, of which approximately 800 were unique.⁷⁶

DOE/FE extensively reviewed and responded to these public comments in the Conditional

⁷¹ See FLEX II Conditional Order at 32-40 (2012 EIA Study).

⁷² See LNG Export Study – Related Documents, available at <http://energy.gov/fe/downloads/lng-export-study-related-documents> (NERA Economic Consulting Analysis (Study - Part 2)).

⁷³ See FLEX II Conditional Order at 40-57 (NERA Study).

⁷⁴ 77 Fed. Reg. at 73,627.

⁷⁵ *Id.* at 73,628. DOE/FE specifically invited comment on “the impact of LNG exports on: domestic energy consumption, production, and prices, and particularly the macroeconomic factors identified in the NERA analysis, including Gross Domestic Product (GDP), welfare analysis, consumption, U.S. economic sector analysis, and ... any other factors included in the analyses.” *Id.* at 73,629.

⁷⁶ See FLEX II Conditional Order at 4-5.

Order.⁷⁷ Some of the comments submitted by Sierra Club, *et al.*⁷⁸ and others in response to the Notice of Availability addressed environmental issues, which DOE/FE determined were outside the scope of the LNG Export Study proceeding. In the FLEX II Conditional Order, DOE/FE stated:

[P]ersons wishing to raise questions regarding the environmental review of the present Application are responsible for doing so within the FERC proceedings. Insofar as a participant in the FERC proceeding actively raises concerns over the scope or substance of environmental review but is unsuccessful in securing that agency's consideration of its stated interests, DOE/FE reserves the right to address the stated interests within this proceeding.⁷⁹

Accordingly, DOE/FE has considered the environmental comments submitted in the LNG Export Study proceeding as part of the record in this proceeding. Where not already addressed in FERC's or DOE/FE's review of the intervenors' protests and comments, these issues are discussed below.

On the basis of the two-part Study and its review of the comments, DOE/FE explained that, "[t]he conclusion of the LNG Export Study is that the United States will experience net economic benefits from issuance of authorizations to export domestically produced LNG."⁸⁰ DOE/FE further found that the LNG Export Study is "fundamentally sound and supports the proposition that [FLEX's] proposed authorization will not be inconsistent with the public interest."⁸¹

In the FLEX II Conditional Order, DOE/FE also considered more recent EIA projections in response to criticisms by commenters that the AEO 2011 projections were based on outdated

⁷⁷ See *id.* at 91-144 (Section VIII).

⁷⁸ In the LNG Export Study proceeding, Sierra Club filed comments on behalf of itself and a coalition of non-profit organizations, including Catskill Citizens for Safe Energy, Center for Biological Diversity, Clean Air Council, Columbia Riverkeeper, Delaware Riverkeeper, Lower Susquehanna Riverkeeper, Shenandoah Riverkeeper, and Upper Green River Alliance (collectively, Sierra Club).

⁷⁹ FLEX II Conditional Order at 132.

⁸⁰ *Id.* at 152-53.

⁸¹ *Id.* at 153.

data and significantly underestimated actual and future demand for natural gas. DOE/FE explained its basis for relying on the AEO 2011 projections, yet also concluded that post-AEO 2011 EIA projections (specifically, the AEO 2012 final projections and the final AEO 2013 Reference Case) would not have materially affected the findings of the LNG Export Study.⁸² However, in May 2014, EIA issued its most recent update, the Annual Energy Outlook 2014 (AEO 2014), with projections to 2040.⁸³ Below, we consider the AEO 2014 projections and conclude that they do not undermine our conclusions regarding the consistency of FLEX's proposed exports with the public interest. *See infra* Section X.D. With this background, we turn to the present stage of this proceeding.

VI. FERC PROCEEDING AND GRANT OF AUTHORIZATION TO FLEX

A. FERC's Pre-Filing Procedures

Authorizations issued by FERC permitting the siting, construction, and operation of LNG export terminals are reviewed under NGA section 3(a) and (e), 15 U.S.C. § 717b(a), (e). FERC's approval process for such an application consists of a mandatory pre-filing process during which the environmental review required by NEPA commences,⁸⁴ and a formal application process that starts no sooner than 180 days after issuance of a notice that the pre-filing process has commenced.⁸⁵

FLEX filed a request with FERC for use of the pre-filing procedures on December 23, 2010. On January 5, 2011, in Docket No. PF11-2-000, the Director of the Office of Energy Projects at FERC granted FLEX's request to commence the pre-filing review process. On July

⁸² *See id.* at 97-100. At the time the FLEX II Conditional Order was issued, EIA's final AOE 2013 Reference Case was the most recent information then available.

⁸³ U.S. Energy Information Administration, *Annual Energy Outlook 2014* (May 7, 2014), available at <http://www.eia.gov/forecasts/aeo/> [hereinafter AEO 2014].

⁸⁴ 18 C.F.R. § 157.21.

⁸⁵ 18 C.F.R. § 157.21(a)(2)(i-ii).

19, 2012, FERC issued a Supplemental Notice of Intent to Prepare an Environmental Impact Statement of the Liquefaction Project.⁸⁶

DOE agreed to participate as a cooperating agency in FERC's preparation of FLEX's environmental analysis,⁸⁷ as set forth in the Notice of Intent.⁸⁸ Consistent with its practice, FERC mailed the Notice of Intent to federal, state, and local government representatives and agencies, elected officials, environmental and public interest groups, Native American Tribes, other interested parties, and local libraries and newspapers.

B. FERC's Environmental Review

On August 31, 2012, FLEX began the second part of FERC's approval process by filing its formal application in FERC Docket No. CP12-509-000 for authorization to site, construct, and operate the Liquefaction Project under NGA section 3.⁸⁹ FERC issued its draft EIS for the Project on March 14, 2014. FERC mailed the draft EIS to persons likely to have an interest in the EIS, including various environmental and public interest groups. FERC published the final EIS on June 20, 2014, and addressed timely, substantive comments received on the draft EIS.

The final EIS was mailed to the same parties as the draft EIS, as well as to those who commented on the draft EIS.

⁸⁶ See Freeport LNG Development, L.P., Freeport LNG Expansion, L.P., FLNG Liquefaction LLC; Supplemental Notice of Intent to Prepare an Environmental Impact Statement for the Planned Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting, 77 Fed. Reg. 43,589 (Jul. 25, 2012).

⁸⁷ 40 C.F.R. § 1501.6 ("In addition, any other Federal agency which has special expertise with respect to any environmental issue, which should be addressed in the statement may be a cooperating agency upon request of the lead agency."); see also *id.* § 1501.6(b) (responsibilities of a cooperating agency).

⁸⁸ See 77 Fed. Reg. at 43,590.

⁸⁹ In addition to its request for authorization to site, construct, and operate the Liquefaction Project, on December 9, 2011, in Docket No. CP12-29-000, FLEX also requested an amendment to its authorization to expand existing LNG import facilities previously granted by FERC on September 26, 2006, in Docket No. CP05-361-000 (the Phase II Modification Project). The modifications to existing facilities in the Phase II Modification Project would facilitate the import and export of LNG at the existing Quintana Island terminal. FERC combined its environmental analyses of the two requests in its Final Environmental Impact Statement.

The final EIS addresses numerous environmental issues including potential impacts on water resources, vegetation, wildlife, fisheries, federally listed species, air quality, noise, and safety.⁹⁰ FERC staff concluded that “construction and operation of Freeport LNG’s Liquefaction Project and the Phase II Modification Project would result in mostly temporary and short-term adverse environmental impacts.”⁹¹ Based on its environmental analysis, FERC staff recommended 83 mitigation measures for the project. FERC staff determined that implementation of the mitigation measures “would ensure that impacts in the area would, with the exception of construction impacts on the residents to the Town of Quintana, be avoided or minimized and would not be significant.”⁹² FERC staff recommended that, if FERC approved FLEX’s requested authorization, the 83 mitigation measures be included as conditions of FERC’s authorization.⁹³

C. FERC’s Order Granting FLEX’s Authorization

On July 30, 2014, FERC issued its Order granting FLEX’s requested authorization to modify previously authorized LNG facilities to facilitate the import and export of LNG at FLEX’s Quintana Island terminal (the Phase II Modification Project) and granted authorization to site, construct, and operate the proposed Liquefaction Project.

FERC concluded that FLEX’s Phase II Modification Project and Liquefaction Project would result in only temporary impacts to residents of the Town of Quintana, and that such impacts would be minimized by conditions imposed in the Order.⁹⁴ FERC further concluded that other adverse impacts would be reduced to less than significant impacts with the

⁹⁰ Final EIS at ES-5.

⁹¹ *Id.* at 5-1.

⁹² *Id.*

⁹³ *See id.*

⁹⁴ FERC Order at 10.

implementation of the mitigation measures set forth in the conditions of the Order, and thus the FLEX project was not inconsistent with the public interest.⁹⁵ On this basis, FERC adopted the 83 mitigation measures recommended in the final EIS as environmental conditions of its Order, set forth in Appendix A.⁹⁶

FERC addressed Sierra Club's claims that the EIS failed to consider the cumulative environmental impacts from all proposed export terminals in the United States, including the effect of increased gas prices. FERC found no merit in Sierra Club's argument, concluding that Sierra Club effectively was seeking a programmatic EIS for a program that is not before the Commission.⁹⁷ FERC found that the proposed FLEX project does not constitute a program for which a programmatic EIS is required pursuant to CEQ's NEPA regulations.⁹⁸ FERC concluded that the EIS properly fulfilled its purpose, which is to disclose the potential environmental impacts of the FLEX Project, and to set forth measures to mitigate, minimize, or eliminate any potential impacts.⁹⁹

FERC next addressed Sierra Club's assertion that the EIS failed to consider the indirect effects of induced natural gas production associated with the Project. FERC cited the CEQ NEPA regulation, which states the "indirect effects" of a proposed action are those that are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable."¹⁰⁰ FERC disagreed with Sierra Club's position, and noted that "no specific shale-play has been identified as a source of natural gas for the project, nor has Sierra Club identified

⁹⁵ *Id.*

⁹⁶ *See id.* at 26-43.

⁹⁷ *Id.* at 20.

⁹⁸ *See id.* at 20-21.

⁹⁹ FERC Order at 21.

¹⁰⁰ 40 C.F.R. § 1508.8(b).

any.”¹⁰¹ FERC also noted that “the purpose of the Project is not to facilitate additional shale production” and that such production “may occur for reasons unrelated to the Project and over which the Commission has no jurisdiction.”¹⁰²

FERC stated that even if, for the sake of argument, it agreed that the FLEX Project would cause induced production, such production is not reasonably foreseeable as contemplated by the CEQ regulations. FERC noted that “[i]t is speculative as to where the gas processed by the Projects will originate, much less where the wells, gathering line locations and the potential associated environmental impacts will occur.”¹⁰³ FERC concluded that such speculative analysis would not provide meaningful information to inform its decision whether to approve the FLEX Project.¹⁰⁴

Because the Phase II Modification Project’s location, design, and purpose are wholly dependent on existing plant facilities and operations at the Quintana Island terminal, FERC noted that geographically separate sites could not satisfy operational flexibility requirements and therefore consideration of such alternatives was unnecessary. Similarly, FERC found that because siting of the liquefaction plant was dictated by the need to be close to existing offloading areas, LNG storage tanks, the docking area, and other existing LNG infrastructure, no viable alternatives were available for siting of the Liquefaction Project.¹⁰⁵ FERC noted that the EIS identified one alternative site for the pretreatment plant, but concluded that, in light of comments from residents regarding the lack of a suitable evacuation route in case of emergency and concerns about materials storage and flood protection, the alternative would not provide a

¹⁰¹ FERC Order at 21.

¹⁰² *Id.*

¹⁰³ *Id.*

¹⁰⁴ *Id.* at 21-22.

¹⁰⁵ *Id.* at 22-23.

significant environmental advantage over the proposed site.¹⁰⁶ As to the route of the sendout pipeline and utility line system, FERC agreed with the EIS that the proposed route constitutes the preferred route because it follows an existing right-of-way and minimizes environmental impacts.¹⁰⁷

FERC also noted that the EIS evaluated whether other proposed LNG export facilities on the West Coast, Gulf Coast, and East Coast of the United States could serve as alternatives, but found in each instance that the alternatives did not address the Liquefaction Project's purpose and would not offer any significant environmental advantage.¹⁰⁸ FERC stated that the final EIS addressed the possibility of expanding the size of another proposed LNG export terminal to provide FLEX's desired export capacity, but found that the alternative would involve environmental impacts at those sites that would not be significantly different than those that would occur as a result of FLEX's proposal.¹⁰⁹

FERC stated that it reviewed the information and analyses contained in the record regarding the potential environmental effects of FLEX's Phase II Modification Project and the Liquefaction Project and agreed with the conclusions presented in the EIS. FERC concluded that approval of FLEX's Liquefaction Project, if constructed and operated as described in the EIS, is "an environmentally acceptable action."¹¹⁰ On this basis, FERC granted FLEX's requested authorizations for the Phase II Modification Project and the Liquefaction Project and included as

¹⁰⁶ See FERC Order at 23.

¹⁰⁷ See *id.* at 23.

¹⁰⁸ See *id.* at 22.

¹⁰⁹ See *id.*

¹¹⁰ *Id.* at 23.

conditions to the FERC Order the 83 environmental mitigation measures recommended in the EIS.¹¹¹

VII. CURRENT PROCEEDING BEFORE DOE/FE

A. Overview

As noted above, the FLEX II Conditional Order granted FLEX's Application in DOE/FE Docket No. 11-161-LNG, but reserved the environmental issues raised in the proceedings for future review and decision. In its Application, FLEX argues that natural gas, as the cleanest-burning fossil fuel, offers a number of environmental benefits when compared to oil and coal. FLEX contends that in comparison to the average air emissions of coal-fired power plants, power plants burning natural gas produce half as much carbon dioxide, less than a third of the nitrogen oxides, and one percent of the sulfur oxides. FLEX asserts that unlike petroleum products and coal, natural gas is not a significant contributor to either acid rain or smog formation. FLEX argues that its proposed Liquefaction Project will offer significant environmental benefits by supplying cleaner energy to help meet increased global demand.

DOE/FE received 11 comments requesting that DOE/FE deny FLEX's Application. Of those emails, seven dispute FLEX's claim that the Liquefaction Project will have significant environmental benefits.¹¹² These commenters generally argue that the construction and operation of the proposed export terminal will negatively impact the environment of the residential neighborhoods and sensitive wetlands in the surrounding area.

¹¹¹ See FERC Order at 23.

¹¹² See FLEX II Conditional Order at 57-59. The seven emails were submitted by concerned citizens, most of whom reside in or near Freeport, Texas. As noted in the FLEX I Conditional Order (at 22-24), DOE/FE received 17 non-intervenor letters and resolutions in that docket, all in support of FLEX's Application.

B. Intervenor Gulf Coast Environmental Labor Coalition

1. GCELC's Protest of FLEX's Application

The Gulf Coast Environmental Labor Coalition (GCELC) filed a Motion to Intervene and Protest in this proceeding on April 13, 2012.¹¹³ GCELC's protest is principally directed at the potential economic impacts of FLEX's proposed authorization and DOE/FE's decisionmaking process, which are addressed in the FLEX II Conditional Order. GCELC cites a Congressional Report prepared by the staff of then-U.S. Representative Edward J. Markey, which (according to GCELC) found that greater natural gas utilization domestically could lead to significant reductions in domestic consumption of coal and U.S. oil imports, thereby enhancing America's environmental security.¹¹⁴ This concern is addressed below. *See* Section X.C.1.

2. FLEX's Answer to GCELC's Protest

FLEX filed a Motion for Leave to Answer and Answer to GCELC's Motion to Intervene and Protest in this proceeding on May 11, 2012.¹¹⁵ In its Answer to GCELC's protest, FLEX contends that its Application was buttressed by substantial evidence supporting the presumption that its proposed exports are in the public interest. In response to GCELC's environmental arguments, FLEX argues that the Markey Report is a partisan document that was not officially adopted by the House Committee on Natural Resources. FLEX further asserts that the Markey Report is based on unrealistic assumptions about how quickly LNG export facilities may be brought online, as well as worst-case scenarios for recoverable domestic shale gas reserves.

¹¹³ Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG, Motion to Intervene and Protest of Gulf Coast Environmental Labor Coalition (Apr. 13, 2012) [hereinafter GCELC Mot.].

¹¹⁴ GCELC Mot. at 4 (citing *Drill Here, Sell There, Pay More*, Congressional Report prepared by the staff of Representative Edward J. Markey, at 1-2, available at: http://democrats.naturalresources.house.gov/sites/democrats.naturalresources.house.gov/files/content/files/2012-03-01_RPT_NGReport.pdf).

¹¹⁵ Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG, Motion for Leave to Answer and Answer of Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC to Motion to Intervene and Protest of Gulf Coast Environmental Labor Coalition (May 11, 2012).

FLEX maintains that its proposed LNG exports will not lead to the natural gas price increases feared by GCELC, and instead will have only minimal price impacts.

C. Intervenor American Public Gas Association

1. APGA's Protest of FLEX's Application

On April 13, 2012, APGA filed a Motion for Leave to Intervene and Protest in this proceeding.¹¹⁶ APGA's protest is mainly directed at the potential economic impacts of FLEX's proposed authorization, which are addressed in the FLEX II Conditional Order. Insofar as APGA's protest can be construed as environmental in nature, APGA's argument is that exports of domestically produced LNG will increase domestic natural gas prices, which in turn will decrease the capacity for natural gas to displace coal in domestic electric generation and will also inhibit efforts to foster the growth of natural gas as a transportation fuel. This concern is addressed below. *See infra* Section X.C.1.

2. FLEX's Answer to APGA's Protest

FLEX filed a Motion for Leave to Answer and Answer to APGA's Motion to Intervene and Protest in this proceeding on May 14, 2012.¹¹⁷ FLEX disputes APGA's claim that small marginal price increases resulting from LNG exports will prevent natural gas from becoming a viable alternative fuel for power generation. According to FLEX, natural gas is considered an economical alternative at prices much higher than projected in even the highest price-impact scenarios. FLEX further asserts that the power sector, which built natural gas-fired generation

¹¹⁶ Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG, Motion for Leave to Intervene and Protest of the American Public Gas Association (Apr. 13, 2012) [hereinafter APGA Mot.].

¹¹⁷ Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG, Motion for Leave to Answer and Answer of Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC to Motion to Intervene and Protest of the American Public Gas Association (May 14, 2012).

plants while prices were increasing, will continue to benefit from the low prices and abundant supply of domestic shale gas.

D. Intervenor Sierra Club

1. Sierra Club's Protest

Sierra Club filed a Motion to Intervene, Protest, and Comments in this proceeding on April 13, 2012.¹¹⁸ Sierra Club's comments, except those addressing the environmental impacts of FLEX's proposal, were summarized and addressed in the FLEX II Conditional Order.

With respect to the environmental impacts associated with the proposed exports, Sierra Club asserts that FLEX's proposed exports will lead to increased natural gas production, especially from unconventional resources such as shale gas. Sierra Club contends that this increased production will significantly harm air, water, and landscape resources. Sierra Club also contends that FLEX's proposal will lead to increased domestic natural gas prices, which will increase domestic coal use and related air and water pollution.

Sierra Club asserts that natural gas production from both conventional and unconventional sources is a significant cause of environmental harm, disrupting ecosystems and watersheds. Sierra Club contends that a 2011 report of the Shale Gas Production Subcommittee of the Secretary of Energy Advisory Board identifies "a real risk of serious environmental consequences" resulting from continued expansion of shale gas production.¹¹⁹ Citing the 2012 EIA Study, Sierra Club states that shale gas sources would account for roughly 72% of the increase in domestic natural gas production expected to meet the demand of LNG exports. Sierra Club further asserts that FLEX's argument—that the proposed Liquefaction Project will create

¹¹⁸ Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG, Sierra Club's Motion to Intervene, Protest, and Comments (Apr. 13, 2012) [hereinafter *Sierra Club Mot.*].

¹¹⁹ *Sierra Club Mot.* at 13 (citing Secretary of Energy Advisory Board, *Shale Gas Production Subcommittee Second 90-Day Report* (Nov. 18, 2011) at 10).

economic benefits—rests largely on the premise that the Project will induce shale gas extraction. Sierra Club states that it agrees with FLEX that LNG exports will induce additional natural gas extraction (particularly from shale gas), but that such extraction will have associated environmental consequences.

Sierra Club states that natural gas production is a major source of air pollution, causing both direct emissions from production equipment and indirect emissions when natural gas replaces cleaner energy sources. Specifically, Sierra Club claims that natural gas production operations emit methane (CH₄), volatile organic compounds (VOCs), nitrogen oxides (NO_x), sulfur dioxide (SO₂), hydrogen sulfide (H₂S), particulate matter (PM), and significant quantities of hazardous air pollutants (HAPs) that contribute to cancer risks and other acute public health problems. Sierra Club asserts that methane is the dominant pollutant from the oil and gas sector, and that EPA has identified natural gas systems as the largest contributor to anthropogenic methane emissions in the United States.

According to Sierra Club, methane is a potent greenhouse gas that substantially contributes to global climate change while causing environmental harm as an ozone precursor. Sierra Club asserts that, due to methane's effects on climate, EPA has found that methane endangers the public health and welfare within the meaning of the Clean Air Act. Sierra Club states that methane reacts in the atmosphere to form ozone, which damages vegetation, agricultural productivity, and cultural resources.

Sierra Club claims the natural gas industry is also a major source of VOCs and NO_x. Sierra Club asserts that, as a result of significant VOC and NO_x emissions associated with oil and gas development, numerous areas of the country with heavy concentrations of drilling are now suffering from serious ground-level ozone problems (*i.e.*, smog). As one example, Sierra

Club states that, in 2008, the Colorado Department of Public Health and Environment concluded that the smog-forming emissions from oil and gas operations exceeded vehicle emissions for the entire state.¹²⁰ According to Sierra Club, smog pollution harms respiratory systems and has been linked to premature death, heart failure, chronic respiratory damage, and premature aging of the lungs. Sierra Club states that significant ozone pollution also damages plants and ecosystems.

Sierra Club next argues that oil and gas production emits sulfur dioxide, primarily from natural gas processing plants, and that some natural gas in the United States contains hydrogen sulfide. Sierra Club asserts that hydrogen sulfide emissions from the oil and gas industry are especially concerning because the pollutant may be harmful even at low concentrations and can lead to neurological impairment or even death. Sierra Club states that long-term exposure to hydrogen sulfide is linked to respiratory infections and eye, nose, and throat irritation, breathlessness, nausea, dizziness, confusion, and headaches. Sierra Club reports that EPA has concluded that the potential for hydrogen sulfide emissions from the oil and gas industry is “significant.”¹²¹

Sierra Club states that the oil and gas industry is also a major source of PM pollution, which it states is generated by heavy equipment used to move and level earth during well pad and road construction. According to Sierra Club, PM consists of tiny particles of a range of sizes suspended in air. Sierra Club states that PM causes a wide variety of health problems and has been linked to respiratory and cardiovascular problems, including coughing, painful breathing, aggravated asthma attacks, chronic bronchitis, decreased lung function, heart attacks, and premature death.

¹²⁰ Sierra Club Mot. at 19 (citing Colo. Dept. of Public Health & Env’t, Air Pollution Control Division, Oil and Gas Emission Sources, *Presentation for the Air Quality Control Commission Retreat*, at 3-4 (May 15, 2008)).

¹²¹ *Id.* at 22 (quoting EPA, Office of Air Quality Planning and Standards, *Report to Congress on Hydrogen Sulfide Air Emissions Associated with the Extraction of Oil and Natural Gas* (EPA-453/R-93-045), at III-35 (Oct. 1993)).

Sierra Club maintains that the air quality impacts of natural gas production may be even greater than currently estimated. Sierra Club cites a study based on direct monitoring of natural gas operations in Colorado, which (according to Sierra Club) finds that actual emissions from natural gas are larger than EPA's estimates and that unconventional gas drilling is linked to increased cancer risk.¹²² According to Sierra Club, EPA's recently finalized new source performance standards and standards for hazardous air pollutants will reduce some of the pollution problems from natural gas production, but they will not solve them. For this reason, Sierra Club argues that DOE/FE may not rely on EPA's rules to avoid the obligation to weigh and disclose the air pollution impacts associated with FLEX's proposed Liquefaction Project.

In addition to the air pollution impacts of natural gas production, Sierra Club argues that increased natural gas production will transform the landscape of regions overlying shale gas plays, bringing industrialization to previously rural landscapes and significantly affecting ecosystems, plants, and animals. According to Sierra Club, land use disturbance associated with natural gas development has negative impacts on plants and animals through direct habitat loss (in which land is cleared for natural gas uses) and indirect habitat loss (in which land adjacent to direct habitat losses loses some of its important characteristics). As an example, Sierra Club cites a study of the Nature Conservancy, which (according to Sierra Club) found that a third of the species tracked by the Pennsylvania Natural Heritage Program are found in areas of the Marcellus Shale play projected to have a high probability of well development, with 132 species considered to be globally rare or critically endangered or imperiled.¹²³

¹²² Sierra Club Mot. at 24 (citing G. Petron *et al.*, *Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study*, 117 J. of Geophysical Research 4304, DOI 10.1029/2011JD016360 (2012)).

¹²³ Sierra Club Mot. at 27 (citing The Nature Conservancy, *Pennsylvania Energy Impacts Assessment, Report 1: Marcellus Shale Natural Gas and Wind* (2010) at 29).

Sierra Club next argues that natural gas production also poses risks to ground and surface water. Sierra Club notes that hydraulic fracturing involves a process of injecting various fracturing chemicals into gas-bearing formations at high pressures to fracture rock and release natural gas. According to Sierra Club, each step of this process presents a risk to water resources. Sierra Club states that hydraulic fracturing requires large quantities of water and that the large water withdrawals could drastically impact aquatic ecosystems and human communities. Sierra Club also contends that hydraulic fracturing poses a serious risk of groundwater contamination from the chemicals added to the fracturing fluid and from naturally occurring chemicals mobilized during the hydraulic fracturing process from formations below the water table. According to Sierra Club, hydraulic fracturing has resulted in groundwater contamination in at least five documented instances, and EPA has found groundwater contamination likely resulting from hydraulic fracturing in Pavillion, Wyoming, and Dimock, Pennsylvania.¹²⁴

Sierra Club states that natural gas production, particularly hydraulic fracturing, produces liquid and solid wastes that must be managed and disposed, including drilling mud, drill cuttings, flowback (the fracturing fluid that returns to the surface after the hydraulic fracturing is completed), and produced water (a mixture of water naturally occurring in the shale formation and lingering fracturing fluid). Sierra Club contends that these wastes are often stored onsite in open pits that may produce harmful air emissions, leach into shallow groundwater, and/or result in surface discharges. Sierra Club also notes that flowback and produced water must be disposed offsite, with a common method being underground injection wells. Sierra Club further claims

¹²⁴ *Id.* at 31-32 (citing EPA, *Draft Investigation of Ground Water Contamination near Pavillion, Wyoming* (Dec. 2011) and EPA Region III, *Action Memorandum - Request for Funding for a Removal Action at the Dimock Residential Groundwater Site* (Jan. 19, 2012)).

that underground injection of hydraulic fracturing wastewater appears to have induced earthquakes in several regions—a phenomenon known as “induced seismicity.”

Sierra Club states that, in addition to the above-described production-related impacts, FLEX’s export proposal will increase air pollution by increasing the amount of coal used for domestic electricity production. Citing the 2012 EIA Study, Sierra Club states that exports of domestically produced LNG will cause natural gas prices to rise, leading to increased electricity generation from coal. Specifically, Sierra Club states that EIA projected that 72 percent of the decrease in natural gas-fired electricity production due to natural gas exports will be replaced by coal-fired production—which, according to Sierra Club, will increase emissions of traditional air pollutants and greenhouse gases. Sierra Club maintains that, if DOE/FE allows exports of LNG, national efforts to control global warming will be frustrated and the public health and welfare will be endangered.

Finally, Sierra Club argues that FLEX overstates the benefits of the proposed Liquefaction Project. Sierra Club claims that the liquefaction, transportation, and regasification process is energy intensive and increases the lifecycle greenhouse gas emissions of LNG compared to methods of consumption where the natural gas remains in gaseous phase. Sierra Club contends that LNG therefore has little, if any, advantage over coal in terms of greenhouse gas emissions, and thus it is unlikely that the proposed exports would reduce global greenhouse gas emissions.

2. FLEX's Answer to Sierra Club's Protest

FLEX filed a Motion for Leave to Answer and Answer to Sierra Club's Motion to Intervene, Protest, and Comments on May 15, 2012.¹²⁵ FLEX first asserts that Sierra Club's arguments should be considered as part of FERC's environmental review, in which DOE/FE is acting as a cooperating agency. Next, FLEX argues that Sierra Club fails to show that the proposed exports are inconsistent with the public interest.

Specifically, FLEX contends that DOE/FE's public interest determination does not require comprehensive environmental review of upstream natural gas production. FLEX asserts that there is no way to anticipate the source of natural gas for the proposed Liquefaction Project because, unlike certain other proposed LNG export projects, FLEX does not intend to purchase natural gas directly from producers. Instead, FLEX will offer LNG liquefaction and send-out facilities at the Freeport Terminal to natural gas purchasers yet to be identified.

FLEX also counters that Sierra Club's protest is an attack on natural gas production in general, not only on the proposed exports. FLEX states its agreement with FERC's conclusion in the FERC Order, in which FERC explained that impacts resulting from additional shale gas development are not reasonably foreseeable as defined by CEQ regulations. FLEX argues that the same principle applies to DOE/FE's review of the FLEX Application.

3. Sierra Club's Reply to FLEX's Answer

Sierra Club filed a Motion to Reply and Reply Comments on May 30, 2012.¹²⁶ Sierra Club argues that both inducement of additional natural gas production and the associated

¹²⁵ Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG, Motion for Leave to Answer and Answer of Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC to Motion to Intervene and Protest of Sierra Club (May 15, 2012).

¹²⁶ Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG, Sierra Club's Motion to Reply and Reply Comments (May 30, 2012).

environmental impacts are reasonably foreseeable effects of LNG exports. Sierra Club contends that FLEX overstates the degree of specificity required for NEPA review and understates DOE/FE's obligation to consider uncertain impacts. For example, Sierra Club argues that DOE/FE can predict upper and lower bounds on the amount of wastewater that will be produced and aggregate air emissions. Further, Sierra Club contends that where FLEX has identified the regions that will be the primary suppliers of gas for its facility, DOE/FE can make predictions about impacts in light of the characteristics of the main supplying regions. Sierra Club asserts that such an assessment does not require predicting where individual wells will be placed.

Sierra Club also argues that FLEX misrepresents Sierra Club's argument regarding the relationship between coal and gas. Sierra Club contends that FLEX ignores that liquefying and transporting American-produced natural gas to foreign markets produces higher emissions than transportation by pipeline of American-produced gas to American consumers. Accordingly, Sierra Club maintains that inducing a shift from actual or potential natural gas consumption to coal consumption in the United States produces a clear environmental harm, but displacing international coal consumption with consumption of U.S.-sourced LNG does not produce a corresponding climate benefit.

Finally, Sierra Club argues that FLEX does not meaningfully dispute Sierra Club's characterization of the environmental harms that would result from increased production of natural gas. Therefore, Sierra Club contends that the only material in the record regarding the environmental effects of increased production is the evidence it submitted. Sierra Club states that its evidence clearly demonstrates the environmental harms associated with natural gas production and the absence of environmental benefit from LNG exports.

4. FLEX's Response to Sierra Club's Reply

FLEX filed a Response to Sierra Club's Motion to Reply and Reply Comments on June 14, 2012.¹²⁷ FLEX asserts that Sierra Club fails to show any specific potential harm to be suffered by Sierra Club or its members resulting from the alleged induced production of natural gas that Sierra Club attributes to FLEX's proposed Liquefaction Project. FLEX also contends that Sierra Club has not identified the specific future induced production to be proximately caused by the FLEX proposal.

In addition, FLEX argues that Sierra Club's claims of induced production lack a reasonably close causal connection with FLEX's proposed exports and a lack of reasonable foreseeability. FLEX states that EPA and the states have regulatory responsibility over the concerns Sierra Club has raised, such that they are the appropriate bodies with whom to raise these concerns. FLEX further argues that DOE/FE's environmental review under NEPA must be rational and consistent with the law, and that DOE/FE's environmental review must not drift off into mere speculation, which (according to FLEX) is what Sierra Club is urging DOE/FE to do.

FLEX stresses that, contrary to Sierra Club's assertion, FLEX has not proposed that DOE/FE use different standards in evaluating environmental and non-environmental factors in its public interest analysis. FLEX argues that, under NEPA's "reasonable foreseeability" standard, there must be a reasonably close relationship between the proposed actions and the reasonably foreseeable alleged harm. FLEX states that Sierra Club has failed to bear the burden of proof because it has not identified any reasonably foreseeable environmental harm or shown

¹²⁷ Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, FE Docket No. 11-161-LNG, Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC's Response to the May 30, 2012 Motion to Reply and Reply comments of Sierra Club (June 14, 2012).

any potential environmental harm to have a reasonably close causal relationship with the proposed exports.

VIII. DOE/FE ADDENDUM TO ENVIRONMENTAL REVIEW DOCUMENTS CONCERNING EXPORTS OF NATURAL GAS FROM THE UNITED STATES

On June 4, 2014, DOE/FE published the Draft Addendum for public comment. The purpose of the Addendum, DOE/FE explained, was to provide information to the public regarding the potential environmental impacts of unconventional natural gas production. Although not required by NEPA, DOE/FE prepared the Addendum in an effort to be responsive to the public and to provide the best information available on a subject that had been raised by commenters in this and other LNG export proceedings. The 45-day comment period on the Draft Addendum closed on July 21, 2014. DOE/FE received 40,745 comments in 18 separate submissions, and considered those comments in issuing the Addendum on August 15, 2014.¹²⁸ DOE provided a summary of the comments received and responses to substantive comments in Appendix B of the Addendum.¹²⁹ DOE/FE has incorporated the Draft Addendum, comments, and final Addendum into the record in this proceeding.

The Addendum focuses on the environmental impacts of unconventional natural gas production, which primarily includes production from shale formations, but also includes tight gas and coalbed methane production. DOE/FE elected to focus the Addendum on unconventional production because such production is considered more likely than other forms of production to increase in response to LNG export demand. EIA's 2012 Study, published as part of the LNG

¹²⁸ Addendum at 3.

¹²⁹ *Id.* at 79-151.

Export Study, projected that more than 90% of the incremental natural gas produced to supply LNG exports would come from these unconventional sources.¹³⁰

Although the 2012 EIA Study made broad projections about the types of resources from which additional production may come, the Addendum stated that DOE cannot meaningfully estimate where, when, or by what particular method additional natural gas would be produced in response to non-FTA export demand. Therefore, the Addendum focuses broadly on unconventional production in the United States as a whole, making observations about regional differences where appropriate.

The Addendum discusses several categories of environmental considerations—Water Resources, Air Quality, Greenhouse Gas, Induced Seismicity, and Land Use Impacts—each of which is summarized briefly below.

A. Water Resources

1. Water Quantity

Natural gas production from shale resources requires water at various stages of development, approximately 89 percent of which is consumed through the process of hydraulic fracturing.¹³¹ The Addendum presents information regarding water usage for shale gas production both in comparison to other energy sources and other regional uses. Although production of natural gas from shale resources is more water-intensive than conventional natural gas production, it is substantially less water-intensive than many other energy sources over the long term after the well has been put into production. As shown in the Addendum, the following table captures differences in water intensity across energy sources.

¹³⁰ See LNG Export Study – Related Documents, *available at* <http://energy.gov/fe/services/natural-gas-regulation/lng-export-study> (EIA 2012 Study) at 11 (total from shale gas, tight gas, and coalbed sources).

¹³¹ Addendum at 10.

Table 1: Water Intensity¹³²

Energy Source	Range in Water Intensity (gallons/mmBtu)
Conventional Natural Gas	~0
Shale Gas	0.6 – 1.8
Coal (no slurry transport)	2 – 8
Nuclear (uranium at plant)	8 – 14
Conventional oil	1.4 – 62
Oil Shale Petroleum (mining)	7.2 – 38
Oil Sands Petroleum (<i>in situ</i>)	9.4 – 16
Synfuel (coal gasification)	11 – 26
Coal (slurry transport)	13 – 32
Oil Sands Petroleum (mining)	14 – 33
Syn Fuel (coal Fischer-Tropsch)	41 – 60
Enhanced Oil Recovery	21 – 2,500
Fuel ethanol (irrigated corn)	2,500 – 29,000
Biodiesel (irrigated soy)	13,800 – 60,000

The Addendum also explains that, despite its relatively low long-term water intensity, shale gas production could impact water supply in specific areas, particularly arid regions such as the Eagle Ford Shale play in Texas. The Addendum notes that the relationship between shale gas production and water quantity is principally a local issue, and that the degree of impact depends on “the local climate, recent weather patterns, existing water use rates, seasonal fluctuations, and other factors.”¹³³ The following table shows the variation in the proportion of water usage by activity in shale gas regions:

¹³² *Id.* at 11 (Table 2).

¹³³ *Id.* at 12.

Table 2: Water Usage in Shale Gas Regions¹³⁴

Play	Public Supply (%)	Industry & Mining (%)	Power Generation (%)	Irrigation (%)	Livestock (%)	Shale Gas (%)	Total Water Use (Bgal/yr)*
Barnett 1	82.7	4.5	3.7	6.3	2.3	0.4	133.8
Eagle Ford ²	17	4	5	66	4	3 – 6	64.8
Fayetteville ¹	2.3	1.1	33.3	62.9	0.3	0.1	378
Haynesville ¹	45.9	27.2	13.5	8.5	4.0	0.8	90.3
Marcellus ¹	12.0	16.1	71.7	0.1	0.01	0.06	3,570
Niobrara ³	8	4	6	82		0.01	1,280

[*Bgal/yr = billion gallons per year]

2. Water Quality

Observing that water quality concerns may have received more attention than any other aspect of unconventional natural gas production, the Addendum addresses water quality issues arising from four aspects of unconventional natural gas production: construction, drilling, use of hydraulic fracturing fluids, and handling of flowback and produced waters.

Runoff from the construction of access roads and other earth-disturbing activities can lead to temporary increases in turbidity and sedimentation in surface waters when well sites are being developed. However, the Addendum states that “when standard industry practices and preventative measures are deployed, only minor impacts are likely to result.”¹³⁵

Drilling in unconventional natural gas production requires penetrating shallower fresh water aquifers. Referring to NETL’s *Modern Shale Gas Development in the United States: A Primer*, the Addendum briefly explains the manner in which such drilling can be undertaken to protect fresh water aquifers.¹³⁶ The Addendum acknowledges, however, that while

¹³⁴ *Id.* at 12 (Table 3) (citations omitted).

¹³⁵ *Id.* at 13.

¹³⁶ Addendum at 13-14 (citing GWPC and ALL Consulting, 2009. *Modern Shale Gas Develop. In the United States: A Primer*. Nat’l Energy Tech. Lab.; available at: http://www.netl.doe.gov/File%20Library/Research/Oil-Gas/Shale_Gas_Primer_2009.pdf).

unconventional natural gas formations are thousands of feet below aquifers associated with public water supply or surface hydrological connection, poor construction practices may cause failure of a casing or cement bond. This failure, in turn, could lead to potential contamination of an aquifer. The Addendum also observes that drilling may create connections with existing fractures or faults, or improperly plugged or abandoned wells, allowing contaminants to migrate through the subsurface.¹³⁷

The fluid used for hydraulic fracturing consists of over 98 percent water, but also may include several different chemical compounds.¹³⁸ These compounds can vary from well to well based on site specific geological information. The Addendum describes federal and state efforts to gather information and require disclosure of the types of chemical additives being used in hydraulic fracturing. The risks posed by the use of these fluids may come from spills and leakages during transport to the well, storage on the well pad, or during the chemical mixing process.¹³⁹ Further, chemical additives may contaminate groundwater should the integrity of the casing or cement seal of the well be compromised.¹⁴⁰

The Addendum considers the potential environmental impacts associated with produced water recovered during flowback operations. Produced water may contain elevated levels of total dissolved solids, salts, metals, organics, and natural occurring radioactive materials, as well as the chemicals included in the fracturing fluid noted above. The Addendum discusses the three principal ways of mitigating the impacts associated with produced water: minimization of the quantity of water used, recycling and re-use of produced water, and disposal.

¹³⁷ *Id.* at 14.

¹³⁸ *Id.* at 14-15.

¹³⁹ *Id.* at 18.

¹⁴⁰ *Id.*

Concluding its discussion of water resources, the Addendum observes that “[u]nconventional natural gas production, when conforming to regulatory requirements, implementing best management practices, and administering pollution prevention concepts, may have temporary, minor impacts to water resources.”¹⁴¹ Further, risks may arise when best practices are not employed: “[I]mproper techniques, irresponsible management, inadequately trained staff, or site-specific events outside of an operator’s control could lead to significant impacts on local water resources.”¹⁴²

B. Air Quality

The Addendum discusses air pollutants emitted at different stages of the natural gas production process. These emissions and their sources are captured in the table below:

¹⁴¹ Addendum at 19.

¹⁴² *Id.* at 19.

Table 3: Source Categories of Airborne Emissions from Upstream Natural Gas Activities (EPA, 2013)¹⁴³

Category	Type of Emissions	Sources of Emissions
Combustion Emissions	NO _x and carbon monoxide (CO) resulting from the burning of hydrocarbon (fossil) fuels. Air toxics, PM, un-combusted VOCs, and CH ₄ are also emitted.	Engines, heaters, flares, incinerators, and turbines.
Vented Emissions	VOCs, air toxics, and CH ₄ resulting from direct releases to the atmosphere.	Pneumatic devices, dehydration processes, gas sweetening processes, chemical injection pumps, compressors, tanks, well testing, completions, and workovers.
Fugitive Emissions	VOCs, air toxics, and CH ₄ resulting from uncontrolled and under-controlled emissions.	Equipment leaks through valves, connectors, flanges, compressor seals, and related equipment and evaporative sources including wastewater treatment, pits, and impoundments.

The Addendum describes the existing regulatory framework relating to such emissions, as well as the U.S. Environmental Protection Agency’s (EPA) 2012 New Sources Performances Standards for hydraulically fractured natural gas wells¹⁴⁴ and EPA’s 2013 update to those standards covering storage tanks.¹⁴⁵ The Addendum also summarizes the existing literature on each significant category of air pollutant and describes the potential contribution of oil and gas production activities to ground-level ozone pollution and reduced visibility in sensitive areas.

The Addendum concludes its discussion of air quality by stating that natural gas development leads to both short- and long-term increases in local and regional air emissions, especially methane, VOCs, and HAPs. According to the Addendum, the intermittent nature of air emissions from sources such as wells makes it difficult to analyze impacts at the regional level.

¹⁴³ *Id.* at 23 (Table 6).

¹⁴⁴ *Id.* at 20-22.

¹⁴⁵ *Id.* at 22.

As more data become available, a better understanding of trends in local and regional air quality and potential impacts may emerge.¹⁴⁶

C. GHG Emissions

Separate from the LCA GHG Report described below in Section IX, the Addendum includes a discussion of GHG emissions associated with unconventional natural gas production—principally methane and carbon dioxide. The Addendum describes the nature of GHG emissions from each phase of the production process, including: well drilling and completion; gas production; well re-completions, workovers, and maintenance; gas processing; and gas transmission and storage.

The Addendum also summarizes regulations affecting GHG emissions from upstream natural gas activity. As in the air quality section, the Addendum discusses EPA's 2012 New Source Performance Standards regulations. The Addendum also describes EPA's publication in April 2014 of five technical white papers on potentially significant sources of emissions in the oil and gas sector, including completions and ongoing production of hydraulically fractured oil wells, compressors, pneumatic valves, liquids unloading, and leaks.¹⁴⁷ EPA stated that it will use these white papers, along with input from peer reviewers and the public to determine how best to pursue emissions reductions from these sources, possibly including the development of additional regulations.¹⁴⁸

Finally, the Addendum summarizes the existing literature estimating GHG emissions and methane leakage rates from the upstream natural gas industry, noting that most studies suggest that

¹⁴⁶ *Id.* at 32.

¹⁴⁷ Addendum at 22 (citing U.S. Env'tl. Prot. Agency, Office of Air Quality Planning & Standards, *White Papers on Methane and VOC Emissions*, available at: <http://www.epa.gov/airquality/oilandgas/whitepapers.html>) (released April 15, 2014).

¹⁴⁸ *Id.* at 44.

“emissions of GHGs from the upstream industry are of similar magnitude for both conventional and unconventional sources.”¹⁴⁹

D. Induced Seismicity

The Addendum provides information on induced seismicity across various types of energy resource activities, namely the production of natural gas, gas condensates, and oil from currently targeted unconventional plays. More specifically, it provides greater detail about the potential for induced seismicity from hydraulic fracturing and wastewater disposal via injection, which is one method of disposing of produced water. Because the duration of injection of hydraulic fracturing fluids is generally minutes or hours and the quantity of injected fluid is relatively low, the Addendum states that “the probability of injecting enough fluid into a natural fault to trigger a felt earthquake is relatively low.”¹⁵⁰ By contrast, the Addendum states that the “incidence of felt earthquakes is higher for wastewater disposal via wastewater injection wells because a large volume of water is injected over a longer period of time without any withdrawal of fluids, with the result that fluid pressures can be increased within a large area surrounding the injection well.”¹⁵¹ The Addendum identifies seismic events thought to have been triggered by wastewater disposal into injection wells in Oklahoma, Colorado, Arkansas, and Ohio.

Addressing the severity of seismic events induced by natural gas activities, the Addendum cites a 2013 National Research Council report characterizing the risk of induced seismicity as principally one of alarm to the public and minor property damage, as opposed to significant disruption.¹⁵²

¹⁴⁹ *Id.* at 40.

¹⁵⁰ *Id.* at 51.

¹⁵¹ *Id.* at 52.

¹⁵² *Id.* at 55-56 (citing *Induced Seismicity Potential in Energy Technologies*. National Research Council. The National Academies Press, Washington, D.C. (2013) at 5).

E. Land Use

The Addendum addresses potential land use impacts resulting from unconventional natural gas production. Land use impacts arise from the construction and development of new access roads, heavy truck traffic on existing local roadways, well pads, pipeline rights of way, and other structures such as compressor stations. The Addendum includes discussions of increased vehicle traffic, habitat fragmentation, reflective light pollution, noise, and other impacts associated with these land use changes. According to the Addendum, “[t]he real issue with land use impacts is not the minor impacts related to each well pad, access road, or pipeline.”¹⁵³ Rather, “[w]hen the impacts from these individual components of shale gas development are considered in aggregate, or cumulatively, the impacts become magnified on an ecosystem or regional scale.”¹⁵⁴ The Addendum identifies siting and design considerations that may minimize land use impacts, as well as traffic and road way impacts associated with large vehicles and concerns for vehicular safety for the motoring public.

IX. DOE/FE LIFE CYCLE GREENHOUSE GAS PERSPECTIVE ON EXPORTING LIQUEFIED NATURAL GAS FROM THE UNITED STATES

A. Description of LCA GHG Report

In January 2014, DOE/FE commissioned NETL to undertake a study analyzing the life cycle emissions of greenhouse gases (GHG), including carbon dioxide (CO₂) and methane (CH₄), associated with natural gas produced in the United States and exported as LNG to other countries for use in electric power generation. The study was intended to inform DOE/FE’s decisionmaking under NGA section 3(a) and to provide additional information to the public. The study—entitled *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United*

¹⁵³ Addendum at 62.

¹⁵⁴ *Id.*

States (LCA GHG Report)—estimated the life cycle GHG emissions of domestically produced LNG (also referred to as U.S. LNG) exports to Europe and Asia, compared with alternative fuel supplies (such as regional coal and other imported natural gas), for electric power generation in the destination countries.

NETL published the LCA GHG Report on May 29, 2014, as well as a 200-page supporting document entitled, *Life Cycle Analysis of Natural Gas Extraction and Power Generation*.¹⁵⁵ On June 4, 2014, DOE/FE provided notice of the documents in the *Federal Register* and invited public comment.¹⁵⁶ The 45-day public comment period closed July 21, 2014. In this section, we summarize the scope of the LCA GHG Report, as well as its methods, limitations, and conclusions. Below, we summarize the public comments on the Report and respond to those comments. *See* Section IX.B.

1. Purpose of the LCA GHG Report

The LCA GHG Report was designed to answer two principal questions:

- How does LNG exported from the United States compare with regional coal (or other LNG sources) used for electric power generation in Europe and Asia, from a life cycle GHG perspective?
- How do those results compare with natural gas sourced from Russia and delivered to the same European and Asian markets via pipeline?

In establishing this framework, NETL considered the following:

¹⁵⁵ See Dep't of Energy, Nat'l Energy Tech. Lab., *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States* (May 29, 2014), available at: <http://energy.gov/fe/life-cycle-greenhouse-gas-perspective-exporting-liquefied-natural-gas-united-states>; see also Dep't of Energy, Nat'l Energy Tech. Lab., *Life Cycle Analysis of Natural Gas Extraction and Power Generation* (May 29, 2014), available at: <http://energy.gov/fe/LCA-GHG-Report> (link to "NETL Natural Gas LCA Model and Analysis") [hereinafter NETL, *Life Cycle Analysis of Natural Gas Extraction and Power Generation*].

¹⁵⁶ Dep't of Energy, Notice of Availability of Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States and Request for Comment, 79 Fed. Reg. 32,260 (June 4, 2014). The NETL documents and all comments received were placed in the administrative record for each of the 25 non-FTA export application dockets then before DOE/FE, including this docket. *See id.*

- In what countries will the natural gas produced in the United States and exported as LNG be used?
- How will the U.S. LNG be used in those countries, *i.e.*, for what purpose?
- What are the alternatives to using U.S. LNG for electric power generation in those countries?

Because the exact destination country (or countries) of U.S. LNG cannot be predicted for this study, NETL considered one medium-distance destination (a location in Europe) and one long-distance destination (a location in Asia). NETL chose Rotterdam, Netherlands, as the European destination and power plant location, and Shanghai, China, as the Asian location. NETL used other locations for the alternative sources of natural gas and coal, as specified in the Report. NETL also determined that one of the most likely uses of U.S. LNG is to generate electric power in the destination countries. In considering sources of fuel other than U.S. LNG, NETL assumed that producers in Europe and Asia could generate electricity in the following ways: (1) by obtaining natural gas from a local or regional pipeline, (2) by obtaining LNG from a LNG producer located closer geographically than the United States, or (3) by using regional coal supplies, foregoing natural gas altogether.

Using this framework, NETL developed four study scenarios, identified below. To compare scenarios, NETL used a common denominator as the end result for each scenario: one megawatt-hour (MWh) of electricity delivered to the consumer, representing the final consumption of electricity. Additionally, NETL considered GHG emissions from all processes in the LNG supply chains—from the “cradle” when natural gas or coal is extracted from the ground, to the “grave” when electricity is used by the consumer. This method of accounting for

cradle-to-grave emissions over a single common denominator is known as a life cycle analysis, or LCA.¹⁵⁷

Using this LCA approach, NETL's objective was to model realistic LNG export scenarios, encompassing locations at both a medium and long distance from the United States, while also considering local fuel alternatives. The purpose of the medium and long distance scenarios was to establish likely results for both extremes (*i.e.*, both low and high bounds).

2. Study Scenarios

NETL identified four modeling scenarios to capture the cradle-to-grave process for both the European and Asian cases. The scenarios vary based on where the fuel (natural gas or coal) comes from and how it is transported to the power plant. For this reason, the beginning "cradle" of each scenario varies, whereas the end, or "grave," of each scenario is the same because the uniform goal is to produce 1 MWh of electricity. The first three scenarios explore different ways to transport natural gas; the fourth provides an example of how regional coal may be used to generate electricity, as summarized below:

¹⁵⁷ The data used in the LCA GHG Report were originally developed to represent U.S. energy systems. To apply the data to this study, NETL adapted its natural gas and coal LCA models. The five life cycle stages used by NETL, ranging from Raw Material Acquisition to End Use, are identified in the LCA GHG Report at 1-2.

Table 4: LCA GHG Scenarios Analyzed by NETL¹⁵⁸

Scenario	Description	Key Assumptions
1	<ul style="list-style-type: none"> Natural gas is extracted in the United States from the Marcellus Shale. It is transported by pipeline to an LNG facility, where it is cooled to liquid form, loaded onto an LNG tanker, and transported to an LNG port in the receiving country (Rotterdam, Netherlands, for the European case and Shanghai, China, for the Asian case). Upon reaching its destination, the LNG is re-gasified, then transported to a natural gas power plant. 	The power plant is located near the LNG import site.
2	<ul style="list-style-type: none"> Same as Scenario 1, except that the natural gas comes from a regional source closer to the destination. In the European case, the regional source is Oran, Algeria, with a destination of Rotterdam. In the Asian case, the regional source is Darwin, Australia, with a destination of Osaka, Japan. 	Unlike Scenario 1, the regional gas is produced using conventional extraction methods, such as vertical wells that do not use hydraulic fracturing. The LNG tanker transport distance is adjusted accordingly.
3	<ul style="list-style-type: none"> Natural gas is produced in the Yamal region of Siberia, Russia, using conventional extraction methods.¹⁵⁹ It is transported by pipeline directly to a natural gas power plant in either Europe or Asia. 	The pipeline distance was calculated based on a “great circle distance” (the shortest possible distance between two points on a sphere) between the Yamal district in Siberia and a power plant located in either Rotterdam or Shanghai.
4	<ul style="list-style-type: none"> Coal is extracted in either Europe or Asia. It is transported by rail to a domestic coal-fired power plant. 	This scenario models two types of coal widely used to generate steam-electric power: surface mined sub-bituminous coal and underground mined bituminous coal. Additionally, U.S. mining

¹⁵⁸ The four scenarios are set forth in the LCA GHG Report at 2.

¹⁵⁹ Yamal, Siberia, was chosen as the extraction site because that region accounted for 82.6% of natural gas production in Russia in 2012.

		data and U.S. plant operations were used as a proxy for foreign data.
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In all four scenarios, the 1 MWh of electricity delivered to the end consumer is assumed to be distributed using existing transmission infrastructure.

3. GHGs Reported as Carbon Dioxide Equivalents

Recognizing that there are several types of GHGs, each having a different potential impact on the climate, NETL normalized GHGs for the study. NETL chose carbon dioxide equivalents (CO₂e), which convert GHG gases to the same basis: an equivalent mass of CO₂. CO₂e is a metric commonly used to estimate the amount of global warming that GHGs may cause, relative to the same mass of CO₂ released to the atmosphere. NETL chose CO₂e using the global warming potential (GWP) of each gas from the 2013 Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) (IPCC, 2013). The LCA GHG Report applied the respective GWPs to a 100-year and a 20-year time frame.

4. Natural Gas Modeling Approach

NETL states that its natural gas model is flexible, allowing for the modeling of different methods of producing natural gas. For Scenario 1, all natural gas was modeled as unconventional gas from the Marcellus Shale, since that shale play reasonably represents new marginal gas production in the United States. For Scenarios 2 and 3, the extraction process was modeled after conventional onshore natural gas production in the United States. This includes both the regional LNG supply options that were chosen for this study (Algeria for Europe and Australia for Asia) and extraction in Yamal, Siberia, for pipeline transport to the power plants in Europe and Asia.

In the above three natural gas scenarios, the natural gas is transported through a pipeline, either to an area that processes LNG (Scenarios 1 and 2) or directly to a power plant (Scenario 3). NETL’s model also includes an option for all LNG steps—from extraction to consumption—known as an LNG supply chain. After extraction and processing, natural gas is transported through a pipeline to a liquefaction facility. The LNG is loaded onto an ocean tanker, transported to an LNG terminal, re-gasified, and fed to a pipeline that transports it to a power plant. NETL assumed that the natural gas power plant in each of the import destinations already exists and is located close to the LNG port.

The amount of natural gas ultimately used to make electricity is affected by power plant efficiency. Therefore, the efficiency of the destination power plant is an important parameter required for determining the life cycle emissions for natural gas power. The less efficient a power plant, the more gas it consumes and the more GHG emissions it produces per unit of electricity generated. For this study, NETL used a range of efficiencies that is consistent with NETL’s modeling of natural gas power in the United States.¹⁶⁰ NETL also assumed that the efficiencies used at the destination power plants (in Rotterdam and Shanghai) were the same as those used in the U.S. model.

5. Coal Modeling Approach

NETL modeled Scenario 4, the regional coal scenario, based on two types of coal: bituminous and sub-bituminous. Bituminous coal is a soft coal known for its bright bands. Sub-bituminous coal is a form of bituminous coal with a lower heating value. Both types are widely used as fuel to generate steam-electric power. NETL used its existing LCA model for the extraction and transport of sub-bituminous and bituminous coal in the United States as a proxy

¹⁶⁰ See LCA GHG Report at 3 (citing NETL, *Life Cycle Analysis of Natural Gas Extraction and Power Generation*).

for foreign extraction in Germany and China. Likewise, NETL modeled foreign coal production as having emissions characteristics equivalent to average U.S. coal production. No ocean transport of coal was included to represent the most conservative coal profile (whether regionally sourced or imported).

The heating value of coal is the amount of energy released when coal is combusted, whereas the heat rate is the rate at which coal is converted to electricity by a power plant. Both factors were used in the model to determine the feed rate of coal to the destination power plant (or the speed at which the coal would be used). For consistency, this study used the range of efficiencies that NETL modeled for coal power in the United States. The study also assumed the same range of power plant efficiencies for Europe and Asia as the U.S. model.

6. Key Modeling Parameters

NETL modeled variability among each scenario by adjusting numerous parameters, giving rise to hundreds of variables. Key modeling parameters described in the LCA GHG Report include: (1) the method of extraction for natural gas in the United States, (2) methane leakage for natural gas production,¹⁶¹ (3) coal type (sub-bituminous or bituminous),¹⁶² (4) the flaring rate for natural gas,¹⁶³ (5) transport distance (ocean tanker for LNG transport, and rail for coal transport),¹⁶⁴ and (6) the efficiency of the destination power plant.

For example, as shown in Table 5-1 of the LCA GHG Report, NETL used two different ranges for methane leakage rates for Scenarios 1 and 2: from 1.2 to 1.6% for natural gas

¹⁶¹ The key modeling parameters for the natural gas scenarios are provided in Table 5-1 (LNG) and Table 5-2 (Russian natural gas). *See* LCA GHG Report at 6. The key parameters for natural gas extraction, natural gas processing, and natural gas transmission by pipeline are set forth in Tables 5-4, 5-5, and 5-6, respectively. *See id.* at 7-8.

¹⁶² The modeling parameters and values for the coal scenarios are provided in Table 5-3. *See* LCA GHG Report at 6.

¹⁶³ Flaring rate is a modeling parameter because the global warming potential of vented natural gas, composed mostly of methane, can be reduced if it is flared, or burned, to create CO₂. *See id.* at 7.

¹⁶⁴ The distances used for pipeline transport of Russian gas are provided in Table 5-2. *See id.* at 6.

extracted from the Marcellus Shale, and from 1.1 to 1.6% from gas extracted using conventional extraction methods. For Scenario 3 (the Russian cases), however, NETL used a higher range for methane leakage rates for both the European and Asian locations, in light of the greater pipeline distance from Russia.¹⁶⁵ As the pipeline distance increases, the total methane leakage from pipeline transmission also increases, as does the amount of natural gas that is extracted to meet the same demand for delivered natural gas. Notably, as part of the study, NETL conducted a methane leakage breakeven analysis to determine the “breakeven leakage” at which the life cycle GHG emissions for natural gas generated power would equal those for the coal reference case (Scenario 3).¹⁶⁶

In sum, NETL noted that the LCA study results are sensitive to these key modeling parameters, particularly changes to natural gas and coal extraction characteristics, transport distances, and power plant performance.¹⁶⁷ NETL also identified several study limitations based on the modeling parameters, including: (1) NETL’s LCA models are U.S.-based models adapted for foreign natural gas and coal production and power generation, and (2) the specific LNG export and import locations used in the study represent an estimate for an entire region (*e.g.*, New Orleans representing the U.S. Gulf Coast).¹⁶⁸

7. Results of the LCA GHG Report

NETL states that two primary conclusions may be drawn from the LCA GHG Report.¹⁶⁹

First, use of U.S. LNG exports to produce electricity in European and Asian markets will *not*

¹⁶⁵ See LCA GHG Report at 5.

¹⁶⁶ The methane leakage breakeven analysis is described in the LCA GHG Report at 14 and 15.

¹⁶⁷ See LCA GHG Report at 5. To ensure that the study results were robust, NETL conducted several side analyses and sensitivity calculations, as discussed in the LCA GHG Report.

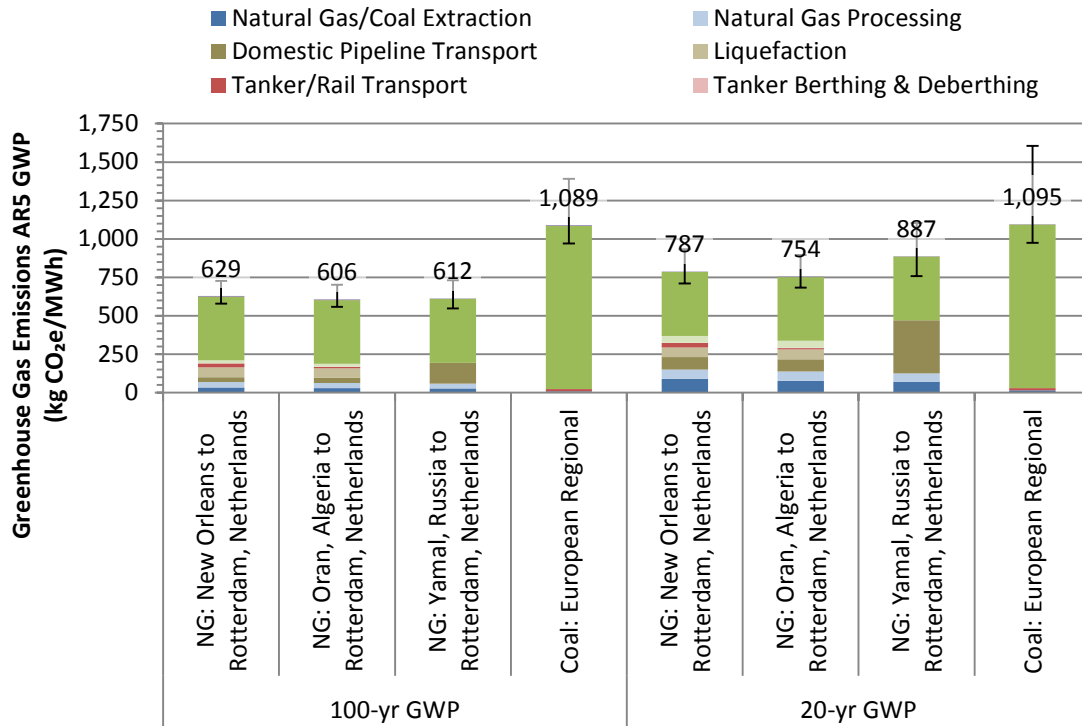
¹⁶⁸ The study limitations are described in the LCA GHG Report at 18.

¹⁶⁹ NETL’s detailed study results, with corresponding figures, are set forth on pages 8 through 18 of the LCA GHG Report.

increase GHG emissions on a life cycle perspective, when compared to regional coal extraction and consumption for power production. As shown below, NETL’s analysis indicates that, for most scenarios in both the European and Asian regions, the generation of power from imported natural gas has lower life cycle GHG emissions than power generation from regional coal.¹⁷⁰ (The use of imported coal in these countries will only increase coal’s GHG profile.) Given the uncertainty in the underlying model data, however, NETL states that it is not clear if there are significant differences between the corresponding European and Asian cases other than the LNG transport distance from the United States and the pipeline distance from Russia.

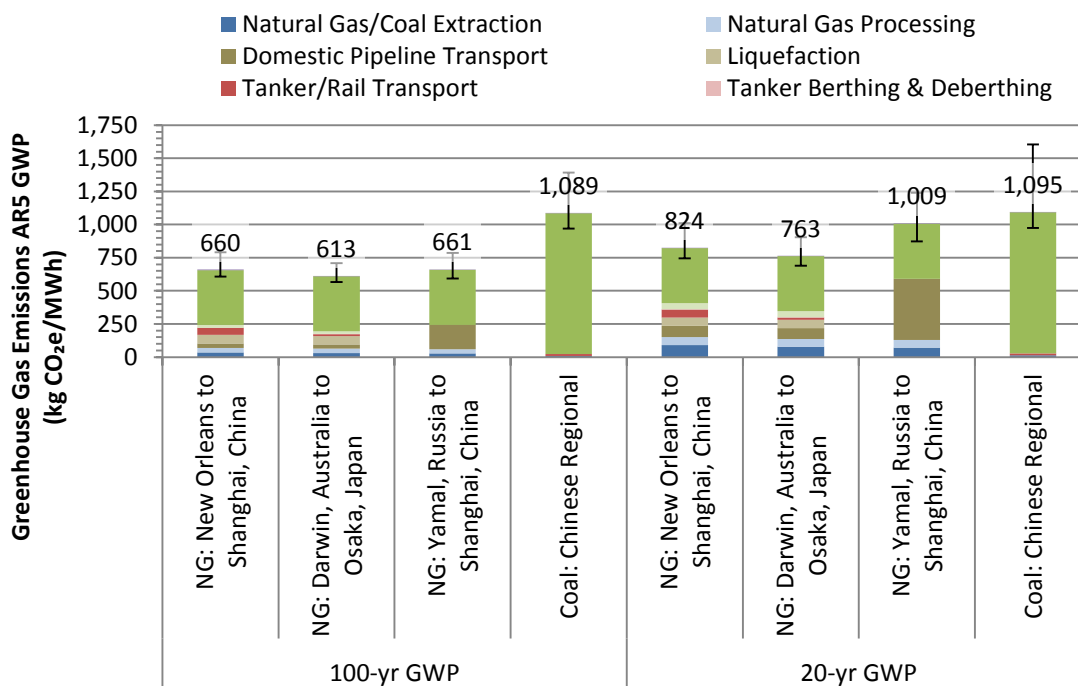
¹⁷⁰ Although these figures present an expected value for each of the four scenarios, NETL states that the figures should not be interpreted as the most likely values due to scenario variability and data uncertainty. Rather, the values allow an evaluation of trends only—specifically, how each of the major processes (*e.g.*, extraction, transport, combustion) contribute to the total life cycle GHG emissions. *See* LCA GHG Report at 8-9.

Table 5: Life Cycle GHG Emissions for Natural Gas and Coal Power in Europe¹⁷¹



¹⁷¹ LCA GHG Report at 9 (Figure 6-1).

Table 6: Life Cycle GHG Emissions for Natural Gas and Coal Power in Asia¹⁷²



Second, there is an overlap between the ranges in the life cycle GHG emissions of U.S. LNG, regional alternative sources of LNG, and natural gas from Russia delivered to the European or Asian markets. Any differences are considered indeterminate due to the underlying uncertainty in the modeling data. Therefore, the life cycle GHG emissions among these sources of natural gas are considered similar, and no significant increase or decrease in net climate impact is anticipated from any of these three scenarios.

B. Comments on the LCA GHG Report and DOE/FE Analysis

As discussed above, the LCA GHG Report compares life cycle GHG emissions from U.S. LNG exports to regional coal and other imported natural gas for electric power generation in Europe and Asia. Following the close of the public comment period on the LCA GHG

¹⁷² LCA GHG Report at 10 (Figure 6-2).

Report, DOE/FE identified 18 unique submissions received from the general public, interest groups, industry, and academia/research institutions, which DOE/FE categorized into seven distinct comments.¹⁷³

DOE/FE identifies below: (i) the pertinent arguments by topic, with reference to representative comments, and (ii) DOE/FE's basis for the conclusions that it drew in reviewing those comments. In so doing, DOE/FE will respond to the relevant, significant issues raised by the commenters.

1. Study Conclusions

a. Comments

Several commenters, including Citizens Against LNG and Oregon Wild, claim that the life cycle GHG emissions from natural gas are higher than those from coal.

b. DOE/FE Analysis

These comments assert that natural gas has higher GHGs than coal, but they do not cite data sources applicable to the comparison of U.S.-exported LNG to regional coal, nor do they acknowledge that the different end uses of coal and natural gas (i.e., heating, power, or transportation) affect their relative life cycle GHG performance. If the characteristics of each fuel (most critically, the carbon content per unit of the fuel's energy) and power plant efficiencies are considered, the lower per-MWh CO₂ emissions from natural gas power plants in comparison to coal power plants make natural gas lower than coal in the context of power plant operations by 61% (see Table 7 below, $[(415 - 1,063)/1,063 \times 100]$). The life cycle of baseload

¹⁷³ In some instances, single letters were sent on behalf of a group of people. In one case, multiple copies of a form letter were received from 149 individuals, hereinafter referred to as "Concerned Citizens." Most of the individuals in the Concerned Citizens group live in New York, but other states and countries are also represented.

electricity generation is a reasonable basis for comparing natural gas and coal because both types of fuels are currently used on a large scale by baseload power plants.

The following table shows the life cycle GHG emissions of carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and sulfur hexafluoride (SF₆) from natural gas and coal systems and demonstrates the importance of power plant operations to total life cycle GHG emissions over 100- and 20-year GWP timeframes. This table is representative of European end-use scenarios, which consume natural gas exported from the United States and coal extracted in Europe. (This table is based on the same data as used by Figure 6-1 of the LCA GHG Report.)

**Table 7: Life Cycle GHG Emissions from Natural Gas and Coal Systems
(kg CO₂e/MWh)**

Life Cycle Process	100-yr GWP		20-yr GWP	
	Natural Gas: New Orleans to Rotterdam, Netherlands	Coal: European Regional	Natural Gas: New Orleans to Rotterdam, Netherlands	Coal: European Regional
Natural Gas/Coal Extraction	33.9	7.8	88.7	13.6
Natural Gas Processing	34.5	-	60.4	-
Domestic Pipeline Transport	32.3	-	81.4	-
Liquefaction	63.6	-	63.6	-
Tanker/Rail Transport	25.0	14.4	28.4	15.3
Tanker Berthing & Deberthing	1.5	-	1.6	-
LNG Regasification	20.0	-	45.3	-
Power Plant Operations	415	1,063	415	1,064
Electricity T&D	3.4	3.4	2.5	2.5
Total	629	1,089	787	1,095

2. Boundaries of the LCA GHG Report

a. Comments

Sierra Club,¹⁷⁴ Food & Water Watch,¹⁷⁵ Americans Against Fracking *et al.*, Susan Sakmar, and Concerned Citizens, among others, contend that the LCA GHG Report has flawed boundaries and scenarios. In particular, these commenters contend that the LCA GHG Report assumes that LNG will displace coal power without also accounting for the displacement of renewable energy.

b. DOE/FE Analysis

The boundaries of the LCA were developed with respect to questions about two fossil fuels, coal and natural gas, and where they come from. The scenarios in the LCA do not model displacement of any kind. These two scenarios are purely attributional, meaning that they focus on independent supply chains for each scenario and do not account for supply or demand shifts caused by the use of one fuel instead of another fuel.

3. Natural Gas Transport between Regasification and Power Plants

a. Comments

Sierra Club and Concerned Citizens, among others, assert that the LCA GHG Report does not account for natural gas transport between LNG regasification facilities and power plants in the importing countries.

¹⁷⁴ Sierra Club submitted comments on behalf of its members and supporters as well as Cascadia Wildlands, Otsego 2000, Inc., Columbia Riverkeeper, Stewards of the Lower Susquehanna, Inc., Friends of the Earth, Chesapeake Climate Action Network, Food and Water Watch, and EarthJustice.

¹⁷⁵ Food & Water Watch submitted comments in the form of a letter signed by 85 individuals representing various national, state, and local public interest groups.

b. DOE/FE Analysis

The choice to exclude transportation between regasification and the power plant was a modeling simplification. The sensitivity analysis of GHG emissions with changes to pipeline transport distance, as illustrated by Figures 4-7 and 4-8 of NETL's *Life Cycle Analysis of Natural Gas Extraction and Power Generation*, shows that the *doubling* (i.e., a 100% increase) of natural gas pipeline transport distance increases the *upstream* GHG emissions from natural gas by 30%. When this upstream sensitivity is applied to the life cycle boundary of the LCA GHG Report, an additional 100 miles beyond the LNG import terminal increases the life cycle GHG emissions for the LNG export scenarios by 0.8%, and an additional 500 miles beyond the LNG import terminal increases the life cycle GHG emissions for the LNG export scenarios by 4% (using 100-year GWPs as specified by the IPCC Fifth Assessment Report). Although this parameter modification changes the results of the LCA slightly, it does not change the conclusions of the LCA GHG Report.

4. Data Quality for LNG Infrastructure, Natural Gas Extraction, and Coal Mining

a. Comments

Several commenters, including the American Petroleum Institute (API), Concerned Citizens, and Sierra Club, commented on whether the data used in the LCA GHG Report is current and fully representative of the natural gas industry. In particular, API asserts that NETL's model is representative of inefficient liquefaction technologies that overstate the GHG emissions from the LNG supply chain, coal data that understates the methane emissions from coal mines, and natural gas extraction data that mischaracterizes "liquids unloading" practices.¹⁷⁶

¹⁷⁶ For purposes of this term, we refer to EPA's description of "liquids unloading" as follows: "In new gas wells, there is generally sufficient reservoir pressure to facilitate the flow of water and hydrocarbon liquids to the surface

API proposes the use of newer data for both liquefaction terminals in the United States and methane emission factors from unconventional natural gas extraction and coal mining.

Concerned Citizens argue that the LCA GHG Report does not clearly identify its source of data for estimates of loss related to LNG production, shipping, and regasification, as well as the basis for estimates of pipeline losses from Russia. Sierra Club points to inaccurate referencing of EPA's Subpart W report, which was the basis for many of NETL's emission factors for natural gas extraction.

b. DOE/FE Analysis

(1) Liquefaction Data

API points to newer data for liquefaction facilities that have higher efficiencies than the liquefaction process in the LCA GHG Report. API points to the GHG intensities of the liquefaction facilities proposed by Sabine Pass, Cameron, and Freeport (each of whom had been conditionally granted a non-FTA LNG export order by DOE/FE) that, according to API, produce 0.26, 0.29 and 0.12 tonnes of CO₂e per tonne of LNG, respectively. The majority of a liquefaction facility's energy is generated by combusting incoming natural gas, so the GHG intensity of a liquefaction facility is directly related to its efficiency. As API correctly points out, the LCA model assumes a GHG intensity of 0.44 tonnes of CO₂e per tonne of LNG; this GHG

along with produced gas. In mature gas wells, the accumulation of liquids in the well can occur when the bottom well pressure approaches reservoir shut-in pressure. This accumulation of liquids can impede and sometimes halt gas production. When the accumulation of liquid results in the slowing or cessation of gas production (i.e., liquids loading), removal of fluids (i.e., liquids unloading) is required in order to maintain production. Emissions to the atmosphere during liquids unloading events are a potentially significant source of VOC and methane emissions." U.S. Env'tl. Prot. Agency, Office of Air Quality Planning & Standards, *Oil & Natural Gas Sector Liquids Unloading Processes*, Report for Oil & Gas Sector Liquids Unloading Processes Review Panel, at 2 (April 2014), available at: <http://www.epa.gov/airquality/oilandgas/pdfs/20140415liquids.pdf>.

intensity is representative of a facility that consumes 12% of incoming natural gas as plant fuel.¹⁷⁷

The above GHG intensities and liquefaction efficiencies are not life cycle numbers, but represent only the gate-to-gate operations of liquefaction facilities, beginning with the receipt of processed natural gas from a transmission pipeline and ending with liquefied natural gas ready for ocean transport. As illustrated by Figures 6-1 and 6-2 in the LCA GHG Report (reproduced as tables herein), liquefaction accounts for approximately 10% of the life cycle GHG emissions of U.S. LNG used for electric power generation in Europe and Asia. A doubling of liquefaction efficiency (thus achieving a GHG intensity comparable to the average of the Sabine Pass, Cameron, and Freeport facilities) would lead to a 6% reduction in the feed rate of natural gas to the liquefaction plant.¹⁷⁸ This feed rate reduction would also reduce natural gas extraction, processing, and transmission emissions by 6%, but would not affect the processes downstream from liquefaction (ocean tankers, power plants, and electricity transmission networks). Applying the increased liquefaction efficiency and the 6% reduction in feed rate to the results of the LCA GHG Report would reduce the life cycle GHG emissions for LNG export scenarios by only 1.5% (using 100-year GWPs as stated in the IPCC Fifth Assessment Report). Increasing liquefaction efficiency may significantly reduce the emissions from one point in the supply chain, but it does not change the conclusions of the LCA.

¹⁷⁷ NETL (2010). NETL Life Cycle Inventory Data – Unit Process: LNG Liquefaction, Operation. U.S. Department of Energy, National Energy Technology Laboratory. Last Updated: May 2010 (version 01); *available at*: http://www.netl.doe.gov/File_Library/Research/Energy_Analysis/Life_Cycle_Analysis/UP_Library/DS_Stage1_O_LNG_Liquefaction_2010-01.xls.

¹⁷⁸ *See id.*

(2) Natural Gas Methane Data

API and Concerned Citizens criticize the quality of data that DOE/NETL uses for natural gas extraction. API's concern is that NETL overstates the GHG emissions from unconventional well completion. API compares NETL's emission factor for unconventional well completions (9,000 Mcf of natural gas/episode) to the emission factor that EPA states in its 2014 GHG inventory (approximately 2,500 Mcf of natural gas/episode). EPA revised its unconventional completion emission factor between its 2013 and 2014 inventory reports,¹⁷⁹ after NETL's model had been finalized and during the time that NETL was completing the LCA GHG Report. These factors are referred to as "potential emission factors" because they do not represent natural gas that is directly released to the atmosphere, but they represent the volume of natural gas that can be sent to flares and other environmental control equipment. NETL uses a potential emission factor of 9,000 Mcf of natural gas per each episode of shale gas hydraulic fracturing, and a potential emission factor of 3.6 Mcf of natural gas per each episode of liquids unloading (with 31 liquids unloading episodes per well-year). NETL's model augments potential emission factors with flaring, thereby reducing the amount of methane that is released to the atmosphere. These emission factors are consistent with the findings of a survey jointly conducted by API and America's Natural Gas Alliance and released in September 2012.¹⁸⁰ They also match the factors used by EPA's 2013 GHG inventory.¹⁸¹

NETL's current model accounts for liquids unloading emissions from conventional wells, but does not account for liquids unloading from unconventional wells. Applying liquids

¹⁷⁹ U.S. Env'tl. Prot. Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2012, available at: <http://www.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2014-Main-Text.pdf>.

¹⁸⁰ *Characterizing Pivotal Sources of Methane Emissions from Natural Gas Production: Summary and Analysis of API and ANGA Survey Responses*. Final Report (Sept. 21, 2012).

¹⁸¹ U.S. Env'tl. Prot. Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011 (Apr. 12, 2013).

unloading to the unconventional wells in this analysis increases the life cycle GHGs by 0.6% for LNG export scenarios (using 100-year GWPs as stated in the IPCC Fifth Assessment Report). This 0.6% was estimated by assigning the liquid unloading emissions from onshore conventional natural gas to the upstream results for Marcellus Shale natural gas, followed by an expansion of the boundaries to a life cycle context. Simply put, liquids unloading accounts for 11% of the upstream GHG emissions from conventional onshore natural gas.¹⁸² When liquids unloading is added to unconventional natural gas in our LCA model, it is scaled according to the unique production rates and flaring practices of unconventional wells in addition to the subsequent flows of natural gas processing, liquefaction, ocean transport, regasification, power plant operations, and electricity transmission. Thus, while liquids unloading may account for a significant share of *upstream* GHG emissions, none of the LCA GHG Report's conclusions would change with the addition of liquids unloading to unconventional natural gas extraction.

The potential emissions from unconventional well completions are modeled as 9,000 Mcf of natural gas per episode. It is important to remember that this factor does not represent methane emissions directly released to the atmosphere, but the flow of natural gas prior to environmental controls. For unconventional natural gas, NETL's model flares 15% of these potential emissions (flaring converts methane to CO₂, thus reducing the GWP of the gas) and apportions all completion emissions to a unit of natural gas by dividing them by lifetime well production (completion emissions occur as one-time episode that must be converted to a life cycle basis by amortizing them over total lifetime production of a well). Further, the life cycle GHG contributions from well completions are diluted when scaled to the subsequent flows of natural gas processing, liquefaction, ocean transport, regasification, power plant operations, and

¹⁸² See NETL, *Life Cycle Analysis of Natural Gas Extraction and Power Generation*.

electricity transmission. However, in NETL's model, life cycle completion emissions are directly affected by the estimated ultimate recovery (EUR) of a well because the total amount of natural gas produced by a well is used as a basis for apportioning completion and other one-time emissions to a unit of natural gas produced. From an engineering perspective, wells with high EURs are more likely to have a high initial reservoir pressure that increases the potential completion emissions. A reasonable uncertainty range around the potential emissions from unconventional completion emissions (9,000 Mcf/episode) is -30% to +50% (6,100 to 13,600 Mcf/episode). This uncertainty range matches the scale of uncertainty around the Marcellus Shale EUR used in the LCA GHG Report (see Table 5-4 of the LCA GHG Report). This -30% to +50% uncertainty around potential emissions from unconventional completions causes a -2% to 3% uncertainty around life cycle GHG emissions for the export scenarios of this analysis.

The recently revised New Source Performance Standards (NSPS) rules for the oil and natural gas sector, which will be in full effect by January 2015, will achieve significant methane emission reductions primarily by requiring all new or modified wells to capture and control potential emissions of VOCs during natural gas well completion. In addition to well completion emissions, the NSPS rules target other point sources of VOC emissions from new and modified sources at natural gas extraction and processing sites, but they do not address liquids unloading.¹⁸³ The LCA GHG Report does not account for the potential effects of the NSPS rules on natural gas emissions because the scope of the LCA accounts for GHG emissions from natural gas being produced today. EPA's Regulatory Impact Analysis estimated that the final NSPS rule would reduce annual methane emissions in 2015 by 18 million metric tons, meaning

¹⁸³ U.S. Env'tl. Prot. Agency, Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews (40 C.F.R. Part 63) (Apr. 17, 2012); *available at*: <http://www.epa.gov/airquality/oilandgas/pdfs/20120417finalrule.pdf>.

that this rule will have the effect of reducing life cycle emissions from natural gas systems as new wells are developed and existing wells are modified. The likely effects of the NSPS rule therefore suggest that the conclusions of the LCA GHG Report are conservative with respect to the life cycle GHG emissions of natural gas produced in the United States.

Sierra Club contends that NETL's documentation, including the 200-page supporting LCA document, does not clearly cite EPA's Subpart W document. NETL's Report has three references to Subpart W, cited as EPA 2011a, 2011b, and 2011c. These three references should refer to the same document.¹⁸⁴ Future versions of the Report will correct these duplicate citations. Sierra Club also calls out the citation for EPA, 2012c, although this is a correct reference that points to EPA's documentation of New Source Performance Standards.

(3) Coal Methane Data

API and Concerned Citizens criticize the quality of data that DOE/NETL uses for coal extraction. In particular, API claims that coal mine methane emissions may be higher than the factors used by NETL. Concerned Citizens simply claim that NETL used a limited set of references to characterize coal mine emissions.

Methane emissions from coal mines are based on data collected by EPA's Coalbed Methane Outreach Program and have been organized by coal type and geography. Due to data limitations, the LCA GHG Report used this data as a proxy for emissions from foreign coal. This limitation is noted in the LCA GHG Report and is accounted for by uncertainty.¹⁸⁵ The bounds on coal methane uncertainty were informed by the variability in coal mine methane emissions between surface mines (subbituminous coal) and underground mines (bituminous

¹⁸⁴ U.S. Env'tl. Prot. Agency, Greenhouse Gas Emissions Reporting from the Petroleum and Natural Gas Industry: Background Technical Support Document (2011), *available at*: http://www.epa.gov/ghgreporting/documents/pdf/2010/Subpart-W_TSD.pdf.

¹⁸⁵ *See, e.g., NETL, Life Cycle Analysis of Natural Gas Extraction and Power Generation.*

coal) in the United States. The default parameters in NETL's model represent subbituminous coal, which has lower coal mine methane emissions than bituminous coal (these parameters are specified in Table 5-3 of the LCA GHG Report). If coal mines in Europe and Asia emit methane at rates similar to the underground, bituminous coal mines in the United States, then the life cycle GHG emissions from coal power would increase. This increase in coal mine methane emissions would increase the life cycle GHG emissions of coal power by 8 percent (from 1,089 to 1,180 kg CO₂e/MWh, using 100-year GWPs as stated in the IPCC Fifth Assessment Report). This uncertainty is illustrated by Figure 6-16 in the LCA GHG Report. Again, even though changes to coal mine methane emissions change the GHG results of the LCA, they do not change the conclusions of the LCA.

5. Methane Leakage Rate Used in the LCA GHG Report

a. Comments

A number of commenters, including Sierra Club, Food & Water Watch, Americans Against Fracking et al., and Zimmerman and Associates, claim that the methane leakage rate used by NETL is too low. They assert that it does not match top-down (or aerial) measurements recently conducted in regions with natural gas activity, nor does it match the leakage rate in a recent analysis of wellhead casings in Pennsylvania.

b. DOE/FE Analysis

Recent studies lack consensus concerning the extent and rates of leakage from the upstream natural gas supply chain, with the leakage rates reported by these studies ranging from less than 1% to as high as 10%.¹⁸⁶ One reason for this broad range of leakage rates is the fact

¹⁸⁶ See NETL, *Life Cycle Analysis of Natural Gas Extraction and Power Generation* (Section 6.2.1) (identifying reports that include various leakage rates).

that different analysts use different boundaries (*e.g.*, extraction only, extraction through processing, extraction through transmission, and extraction through distribution). Further, top-down measurements are taken over narrow time frames and limited geographic scopes that represent only a snapshot of operations. They do not necessarily represent long-term operations over a broad area.

Another reason for this range of leakage rates is confusion between leaks and losses. Natural gas leaks include emissions from pneumatically controlled devices, valves, compressor seals, acid gas removal units, dehydrators, and flanges. These leaks are a mix of methane and other hydrocarbons, and are a subset of total natural gas losses. Another type of loss includes flaring, which converts methane to CO₂ and thus reduces methane venting to the atmosphere. Similarly, the combustion of natural gas by reboilers in a natural gas processing plant or by compressors on a pipeline represents the loss of natural gas that is used to improve the purity of the gas itself and move it along the transmission network.

NETL's expected cradle-through-transmission leakage rate is 1.2%. In other words, the extraction, processing, and transmission of 1 kg of natural gas releases 0.012 kg of CH₄ to the atmosphere. In contrast, NETL's expected loss rate from the same boundary is approximately 8%: for the delivery of 1 kg of natural gas via a transmission pipeline, 0.012 kg of CH₄ is released to the atmosphere, and 0.068 kg is flared by environmental controls or combusted for processing and transmission energy.

Sierra Club compares NETL's leakage rate to a 1.54% leakage rate derived from EPA's 2013 GHG inventory. The two types of leakage rates (the 1.2% calculated by NETL's life cycle model and the 1.54% implied by EPA's 2013 inventory) are not directly comparable. LCAs and national inventories have different temporal boundaries. NETL's leakage rate is a life cycle

number based on a 30-year time frame; it levelizes the emissions from one-time well completion activities over a 30-year time frame of steady-state production. The leakage rate implied by EPA's inventory represents 2011 industry activity; it captures the spike in completion emissions due to the atypically high number of wells that were completed that year. In other words, national inventories calculate all emissions that occur in a given year, while LCAs apportion all emissions that occur during a study period (*e.g.*, 30 years) to a unit of production (*e.g.*, 1 MWh of electricity generated). Both approaches are legitimate with respect to the unique goals of each type of analysis.

Sierra Club also compares NETL's 1.2% leakage rate to the 2.01% leakage rate calculated by Burnham et al.¹⁸⁷ Again, a boundary difference explains why the two leakage rates are not directly comparable. Burnham et al.'s leakage rate includes natural gas distribution, which is an additional transport step beyond transmission. Natural gas distribution moves natural gas from the "city gate" to small scale end users (commercial and residential consumers). NETL's leakage rate ends after natural gas transmission, the point at which natural gas is available for large scale end users such as power plants. The natural gas distribution system is a highly-branched network that uses vent-controlled devices to regulate pressure. This boundary difference explains why Burnham et al.'s leakage rate is higher than NETL's rate. Sierra Club also compares NETL's leakage rate to a shale gas analysis conducted by Weber et al.¹⁸⁸ We have reviewed Weber et al.'s work and do not see any mention of leakage rate.

It is also important to note that leakage rate is not an input to NETL's life cycle model. Rather, it is calculated from the outputs of NETL's life cycle model. NETL uses an approach

¹⁸⁷ Burnham, Andrew, et al. Life-cycle greenhouse gas emissions of shale gas, natural gas, coal, and petroleum. *Environmental Science & Technology* 46.2 (2011): 619-627.

¹⁸⁸ Weber, Christopher L., and Christopher Clavin. Life cycle carbon footprint of shale gas: Review of evidence and implications. *Environmental science & technology* 46.11 (2012): 5688-5695.

that assembles all activities in the natural gas supply chain into a network of interconnected processes. The emissions from each process in this model are based on engineering relationships and emission factors from the EPA and other sources. This method is known as a “bottom-up” approach. Researchers are trying to discern why “top-down” studies such as Pétron’s measurements in northeast Colorado¹⁸⁹ do not match the bottom-up calculations by NETL and other analysts. We believe that inconsistent boundaries (*i.e.*, bottom-up models that account for long term emissions at the equipment level in comparison to top-down measurements that encompass an entire region with more than one type of industrial activity over a narrow time frame) partly explain the differences between bottom-up and top-down results. As research continues, however, we expect to learn more about the differences between bottom-up and top-down methods.

Zimmerman and Associates references a recent study by Ingraffea et al. that assessed failure rates of well casings for oil and gas wells in Pennsylvania.¹⁹⁰ However, Ingraffea et al. do not calculate a methane leakage rate in their analysis; rather, they calculate the rate at which wells develop leaks. The rate at which leaks develop in well casings is a different phenomenon than the rate at which methane leaks from the natural gas supply chain. The former is a measurement of failure rates (the number of wells in a group that have leaks) and the latter is a measurement of the magnitude of total leakage (the amount of methane in extracted natural gas that is released to the atmosphere).

¹⁸⁹ Pétron, G., Frost, *et al.* (2012). Hydrocarbon emissions characterization in the Colorado Front Range: A pilot study. *Journal of Geophysical Research: Atmospheres* (1984–2012), 117(D4).

¹⁹⁰ Ingraffea, A. R., Wells, M. T., Santoro, R. L., & Shonkoff, S. B. (2014). Assessment and risk analysis of casing and cement impairment in oil and gas wells in Pennsylvania, 2000–2012. *Proceedings of the National Academy of Sciences*, 111(30), 10955-10960.

The breakeven analysis shown in Section 6 of the LCA GHG Report models hypothetical scenarios that increase the natural gas leakage rate to the point where the life cycle emissions from natural gas power are the same as those from coal power. The breakeven points between natural gas and coal systems are illustrated in Figures 6-8 and 6-9 of the Report. These results are based on the most conservative breakeven point, which occurs between the high natural gas cases (*i.e.*, lowest power plant efficiency, longest transport distance, and highest methane leakage) with the low coal case (*i.e.*, highest power plant efficiency and shortest transport distance). These graphs show that on a 100-year GWP basis, methane leakage would have to increase by a factor of 1.7 to 3.6, depending on the scenario, before the breakeven occurs. The breakeven methane leakage is lower for the 20-year GWP basis and, for some scenarios, is lower than the modeled leakage rate.

6. The Uncertainty Bounds of the LCA GHG Report

a. Comments

Concerned Citizens claim that the LCA GHG Report has significant uncertainty, and contend that “poor modeling is not a reason to dismiss impacts.”

b. DOE/FE Analysis

The results of the LCA GHG Report are based on a flexible model with parameters for natural gas extraction, processing, and transport. Uncertainty bounds are assigned to three key parameters: well production rates, flaring rates, and transport distances. These uncertainty bars are not an indication of poor modeling. To the contrary, they are used to account for variability in natural gas systems. If the analysis did *not* account for uncertainty, the results would imply that the GHG emissions from natural gas systems are consistently a single, point value, which

would be inaccurate. We therefore believe the chosen uncertainty bounds strengthen the LCA model, as opposed to indicating any weakness in modeling.

7. The LCA GHG Report and the NEPA Approval Process

a. Comments

Several commenters, including Citizens Against LNG, Dominion Cove Point LNG, Susan Sakmar, and Americans Against Fracking et al., note that the LCA GHG Report does not fulfill the requirements of an EIS as defined by NEPA. These commenters maintain that the LCA GHG Report should not be used as a basis for approving proposed LNG export terminals.

b. DOE/FE Analysis

We agree that the LCA GHG Report does not fulfill any NEPA requirements in this proceeding, nor has DOE/FE made any suggestion to that effect. The LCA GHG Report addresses foreign GHG emissions and thus goes beyond the scope of what must be reviewed under NEPA.

X. DISCUSSION AND CONCLUSIONS

In reviewing the potential environmental impacts of FLEX's proposal to export LNG, DOE/FE has considered both its obligations under NEPA and its obligation under NGA section 3(a) to ensure that the proposal is not inconsistent with the public interest. To accomplish these purposes, DOE/FE has reviewed a wide range of information, including:

- FLEX's Application and the submissions of protestors, intervenors, and commenters to the Application;
- FERC's final EIS and July 30 Order, including the 83 environmental conditions recommended in the final EIS and adopted by FERC in that Order;
- Comments regarding potential environmental impacts submitted in response to the 2012 LNG Export Study;

- The Draft Addendum, comments received in response to the Draft Addendum, and the final Addendum; and
- The LCA GHG Report (and the supporting NETL document), including comments submitted in response to those documents.

A. Compliance with NEPA

1. Adoption of FERC's Final EIS

DOE/FE participated in FERC's environmental review of the proposed Liquefaction Project as a cooperating agency and has examined the arguments submitted by the intervenors who challenged FERC's reasoning and conclusions. Because DOE was a cooperating agency, DOE/FE is permitted to adopt FERC's final EIS, provided that DOE/FE has conducted an independent review of the EIS and determines that its comments and suggestions have been satisfied.¹⁹¹ For the reasons set forth below, DOE/FE has not found that the arguments raised in the FERC proceeding, the current proceeding, or the LNG Export Study proceeding detract from the reasoning and conclusions contained in the final EIS. Accordingly, DOE has adopted the EIS (DOE/EIS-0487),¹⁹² and hereby incorporates the reasoning contained in the EIS in this Order.

2. Scope of NEPA Review

Sierra Club intervened in FLEX's proceeding before FERC, challenging the adequacy of the draft EIS. Sierra Club asserted that the draft EIS did not have a sufficiently broad scope because it failed to consider the indirect effects of induced natural gas production associated with the Liquefaction Project.¹⁹³ As discussed above, FERC rejected Sierra Club's argument. FERC found that Sierra Club had not demonstrated that the Liquefaction Project would induce additional upstream gas production. Even assuming that the Liquefaction Project would induce additional

¹⁹¹ See 40 C.F.R. § 1506.3(c).

¹⁹² See *supra* Section I (citing 79 Fed. Reg. at 61,304).

¹⁹³ FERC Order at 21-22. Sierra Club made similar arguments on induced production when it filed comments in response to DOE/FE's LNG Export Study.

gas production, FERC found that such production is not “reasonably foreseeable” within the meaning of NEPA. We find that FERC’s environmental review covered all reasonably foreseeable environmental impacts of the Liquefaction Project,¹⁹⁴ and that NEPA does not require the review to include induced upstream natural gas production.

Fundamental uncertainties constrain our ability to foresee and analyze with any particularity the incremental natural gas production that may be induced by permitting exports of LNG to non-FTA countries. EIA’s 2012 Study projected that incremental natural gas production in the United States would account for 63% of LNG export volumes and, of that amount, 93% would come from unconventional production.¹⁹⁵ For this reason, and because DOE/FE had received comments regarding the potential environmental impacts associated with unconventional production, DOE/FE produced the Addendum and made it available for public comment. The Addendum takes a broad look at unconventional natural gas production in the United States, with chapters covering water resources (including water quantity and quality), air quality, GHG emissions, induced seismicity, and land use.

The Addendum addresses unconventional natural gas production in the nation as a whole. It does not attempt to identify or characterize the incremental environmental impacts that would result from LNG exports to non-FTA nations. Such impacts are not reasonably foreseeable and cannot be analyzed with any particularity. To begin, there is uncertainty as to the aggregate quantity of natural gas that ultimately may be exported to non-FTA countries. Receiving a non-FTA authorization from DOE/FE does not guarantee that a particular facility would be financed and built; nor does it guarantee that, if built, market conditions would continue to favor export

¹⁹⁴ Under CEQ’s regulations, “indirect effects” of a proposed action are “caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.” 40 C.F.R. § 1508.8(b).

¹⁹⁵ See LNG Export Study – Related Documents, available at <http://energy.gov/fe/services/natural-gas-regulation/lng-export-study> (EIA 2012 Study), at 11.

once the facility is operational. To illustrate the point, of the more than 40 applications to build new LNG import facilities that were submitted to federal agencies between 2000 and 2010, only eight new facilities were built and those facilities have seen declining use in the past decade.¹⁹⁶

There is also fundamental uncertainty as to where any additional production would occur and in what quantity. As the Addendum illustrates, nearly all of the environmental issues presented by unconventional natural gas production are local in nature, affecting local water resources, local air quality, and local land use patterns, all under the auspices of state and local regulatory authority. As DOE explained in *Sabine Pass*, Order No. 2961-A, without knowing where, in what quantity, and under what circumstances additional gas production will arise, the environmental impacts resulting from production activity induced by LNG exports to non-FTA countries are not “reasonably foreseeable” within the meaning of the CEQ’s NEPA regulations.¹⁹⁷

3. Cumulative Environmental Impacts

Sierra Club asserted in comments to FERC on the draft EIS and in the current proceeding that the draft EIS was deficient because it failed to consider the cumulative environmental impacts from all proposed export terminals, including export applications pending or approved by DOE. FERC found no merit to Sierra Club’s argument for a cumulative environmental impact analysis that looked at *all* LNG export applications pending before or approved by DOE. As noted above, FERC found that Sierra Club was, in effect, seeking a programmatic EIS when there was no “program” before FERC that met the definition under CEQ guidelines.¹⁹⁸ In rejecting this argument, FERC observed that the EIS considered the cumulative effects on,

¹⁹⁶ See FLEX II Conditional Order at 100 n.161.

¹⁹⁷ *Sabine Pass*, DOE/FE Order No. 2961-A, at 11 (quoting 40 C.F.R. § 1508.7).

¹⁹⁸ 40 C.F.R. §§ 1508.7, 1508.8.

among other things, reasonably foreseeable future shale production within the project area,¹⁹⁹ and FERC determined that the EIS properly fulfilled its purpose of disclosing the environmental impacts of the Freeport LNG Project while also setting forth measures that would mitigate, minimize, or eliminate any potential impacts.²⁰⁰ We agree with FERC's reasoning and adopt its analysis concerning cumulative environmental impacts.

B. Environmental Impacts Associated with Induced Production of Natural Gas

The current rapid development of natural gas resources in the United States likely will continue, with or without the export of natural gas to non-FTA nations.²⁰¹ Nevertheless, a decision by DOE/FE to authorize exports to non-FTA nations could accelerate that development by some increment. For this reason, and because the environmental impacts associated with shale gas development have been raised by Sierra Club and other commenters, DOE/FE prepared and received public comment on the Addendum. As discussed above, the Addendum reviewed the academic and technical literature covering the most significant issues associated with unconventional gas production, including impacts to water resources, air quality, greenhouse gas emissions, induced seismicity, and land use.

The Addendum shows that there are potential environmental issues associated with unconventional natural gas production that need to be carefully managed, especially with respect to emissions of VOCs and methane, and the potential for groundwater contamination. These environmental concerns do not lead us to conclude, however, that exports of natural gas to non-FTA nations should be prohibited. Rather, we believe the public interest is better served by addressing these environmental concerns directly—through federal, state, or local

¹⁹⁹ See FERC Order at 10.

²⁰⁰ See *id.* at 21.

²⁰¹ Addendum at 2.

regulation, or through self-imposed industry guidelines where appropriate—rather than by prohibiting exports of natural gas. Unlike DOE, environmental regulators have the legal authority to impose requirements on natural gas production that appropriately balance benefits and burdens, and to update these regulations from time to time as technological practices and scientific understanding evolve. For example, in 2012, using its authority under the Clean Air Act, EPA promulgated regulations for hydraulically fractured wells that are expected to yield significant emissions reductions.²⁰² In 2013, EPA updated those regulations to include storage tanks,²⁰³ and in 2014 EPA issued a series of technical white papers exploring the potential need for additional measures to address methane emissions from the oil and gas sector.²⁰⁴

Section 3(a) of the NGA is too blunt an instrument to address these environmental concerns efficiently. A decision to prohibit exports of natural gas would cause the United States to forego entirely the economic and international benefits identified in the FLEX II Conditional Order and discussed below, but would have little more than a modest, incremental impact on the environmental issues identified by Sierra Club and others. For these reasons, we conclude that the environmental concerns associated with natural gas production do not establish that exports of natural gas to non-FTA nations are inconsistent with the public interest.

²⁰² U.S. Env'tl. Prot. Agency, Oil and Natural Gas Sector: New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants Reviews; Final Rule, 77 Fed. Reg. 49,490 (Aug. 16, 2012).

²⁰³ U.S. Env'tl. Prot. Agency, Oil and Natural Gas Sector: Reconsideration of Certain Provisions of New Source Performance Standards; Final Rule, 77 Fed. Reg. 58,416 (Sept. 23, 2013).

²⁰⁴ U.S. Env'tl. Prot. Agency, Office of Air Quality Planning & Standards, *White Papers on Methane and VOC Emissions*, available at: <http://www.epa.gov/airquality/oilandgas/whitepapers.html> (released April 15, 2014), discussed *supra* Section VIII.C.

C. Greenhouse Gas Impacts Associated with U.S. LNG Exports

Intervenors and commenters have expressed concern that exports of domestic natural gas to non-FTA nations may impact the balance of global GHG emissions in two principal ways: domestically, through their impact on the price and availability of natural gas for electric generation and other uses; and, internationally, through their effect on the GHG intensity and total amount of energy consumed in foreign nations.

1. Domestic Impacts Associated with Increased Natural Gas Prices

To the extent exports of natural gas to non-FTA nations increase domestic natural gas prices, those higher prices would be expected, all else equal, to reduce the use of natural gas in the United States as compared to a future case in which exports to non-FTA exports were prohibited. Within the U.S. electric generation sector, reduced demand for natural gas caused by higher prices would be balanced by some combination of reduced electric generation overall (aided by conservation and efficiency measures), increased generation from other resources (such as coal, renewables, and nuclear), and more efficient use of natural gas (*i.e.*, shifting of generation to natural gas-fired generators with superior heat rates).

Although EIA's 2012 Study found that additional natural gas production would supply most of the natural gas needed to support added LNG exports, EIA modeled the effects of higher natural gas prices on energy consumption in the United States in the years 2015 through 2035, and found several additional results. In particular, EIA found that "under Reference case conditions, decreased natural gas consumption as a result of added exports are countered proportionately by increased coal consumption (72 percent), increased liquid fuel consumption (8 percent), other increased consumption, such as from renewable generation sources (9 percent),

and decreases in total consumption (11 percent).”²⁰⁵ Further, EIA determined that, in the earlier years of the 2015 to 2035 period, “the amount of natural gas to coal switching is greater,” with “coal play[ing] a more dominant role in replacing the decreased levels of natural gas consumption, which also tend to be greater in the earlier years.”²⁰⁶ Likewise, “[s]witching from natural gas to coal is less significant in later years, partially as a result of a greater proportion of switching into renewable generation.”²⁰⁷ EIA ultimately projected that, for LNG export levels from 6 to 12 Bcf/d of natural gas and under Reference Case conditions, aggregate carbon dioxide emissions would increase above a base case with no exports by between 643 and 1,227 million metric tons (0.5 to 1.0 percent) over the period from 2015 to 2035.²⁰⁸ It is worth noting, however, that a substantial portion of these projected emissions came from consumption of natural gas in the liquefaction process, rather than from increased use of coal. The liquefaction of natural gas is captured in the LCA GHG Report’s estimate of the life cycle GHG emissions of U.S.-exported LNG, discussed below (Section IX).

We further note that EIA’s 2012 Study assumed the continuation of regulations in effect at the time the AEO 2011 was prepared.²⁰⁹ Therefore, EIA’s analysis did not include the impacts that EPA’s Mercury and Air Toxics Standard²¹⁰ and its Transport Rule²¹¹ may have on the extent to which the U.S. coal fleet would compensate for reduced use of natural gas. Nor did EIA’s

²⁰⁵ 2012 EIA Study at 18.

²⁰⁶ *Id.*

²⁰⁷ *Id.*

²⁰⁸ *Id.* at 19.

²⁰⁹ 2012 EIA Study at 12 n.7 (“The degree to which coal might be used in lieu of natural gas depends on what regulations are in-place that might restrict coal use. These scenarios reflect current laws and regulations in place at the time [AEO 2011] was produced.”).

²¹⁰ U.S. Env’tl. Prot. Agency, National Emission Standards for Hazardous Air Pollutants From Coal- and Oil-Fired Electric Utility Steam Generating Units and Standards of Performance for Fossil-Fuel-Fired Electric Utility, Industrial-Commercial- Institutional, and Small Industrial-Commercial-Institutional Steam Generating Units; Final Rule, 77 Fed. Reg. 9,304 (Feb. 16, 2012).

²¹¹ U.S. Env’tl. Prot. Agency, Federal Implementation Plans: Interstate Transport of Fine Particulate Matter and Ozone and Correction of SIP Approvals; Final Rule, 76 Fed. Reg. 48,208 (Aug. 8, 2011).

analysis capture the potential for broad regulation of carbon dioxide emissions from the electric power sector. After publication of the EIA Study in early 2012, EPA proposed two rules that, if finalized, would likely reduce the extent to which increased use of coal would compensate for reduced use of natural gas. In September 2013, EPA proposed a rule that would limit carbon dioxide emissions from new coal-fired electric-generating units.²¹² And, in June 2014, EPA proposed a rule that would limit carbon dioxide emissions from existing coal-fired electric generating units.²¹³

If finalized, these proposed rules appear to have the potential to mitigate significantly any increased emissions from the U.S. electric power sector that would otherwise result from increased use of coal, and perhaps to negate those increased emissions entirely. Therefore, on the record before us, we cannot conclude that exports of natural gas would be likely to cause a significant increase in U.S. GHG emissions through their effect on natural gas prices and the use of coal for electric generation.

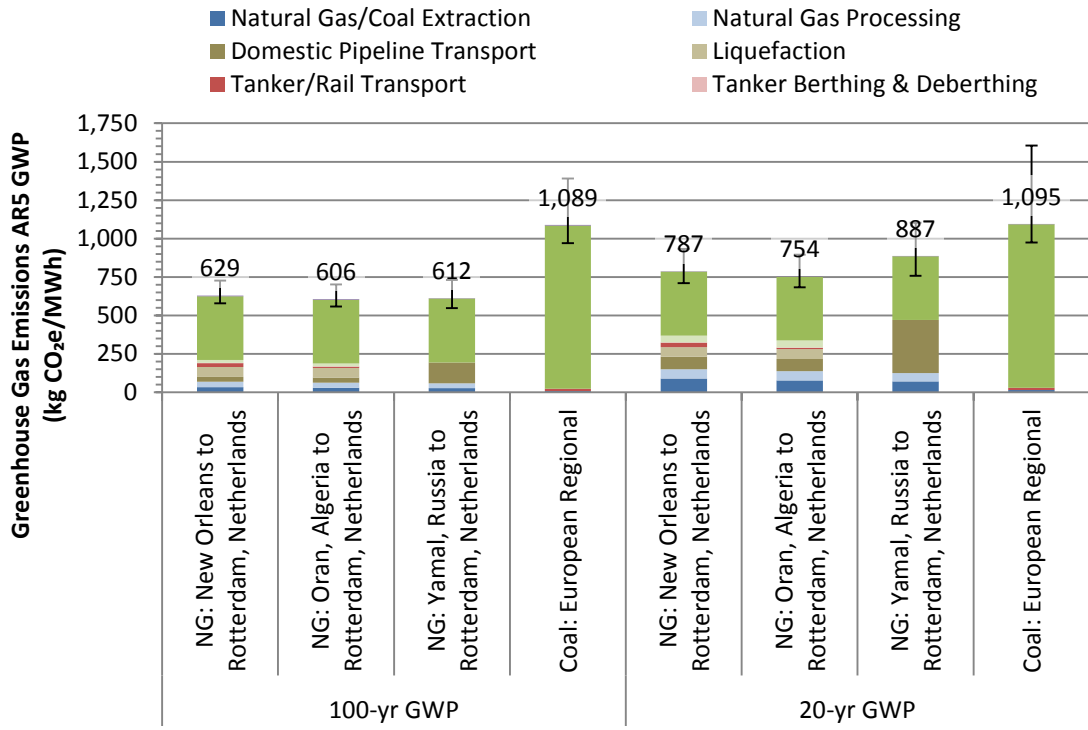
2. International Impacts Associated with Energy Consumption in Foreign Nations

The LCA GHG Report estimated the life cycle GHG emissions of U.S. LNG exports to Europe and Asia, compared with certain other fuels used to produce electric power in those importing countries. The key findings for U.S. LNG exports to Europe and Asia are summarized in the following two figures (also presented above):

²¹² U.S. Env'tl. Prot. Agency, Standards of Performance for Greenhouse Gas Emissions From New Stationary Sources: Electric Utility Generating Units; Proposed Rule, 79 Fed. Reg. 1,430 (Jan. 8, 2014).

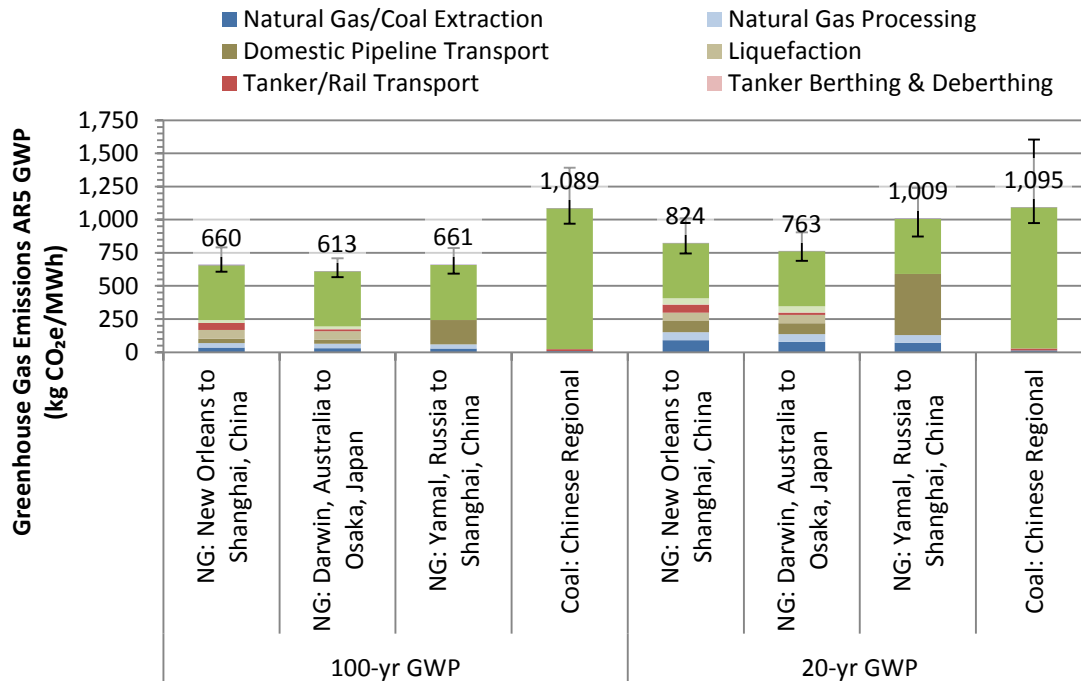
²¹³ U.S. Env'tl. Prot. Agency, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Proposed Rule, 79 Fed. Reg. 34,830 (June 18, 2014).

Table 8: Life Cycle GHG Emissions for Natural Gas and Coal Power in Europe²¹⁴



²¹⁴ LCA GHG Report at 9 (Figure 6-1).

Table 9: Life Cycle GHG Emissions for Natural Gas and Coal Power in Asia²¹⁵



While acknowledging substantial uncertainty, the LCA GHG Report shows that to the extent U.S. LNG exports are preferred over coal in LNG-importing nations, U.S. LNG exports are likely to reduce global GHG emissions. Further, to the extent U.S. LNG exports are preferred over other forms of imported natural gas, they are likely to have only a small impact on global GHG emissions.²¹⁶

As Sierra Club observes, the LCA GHG Report does not answer the ultimate question whether authorizing exports of natural gas to non-FTA nations will increase or decrease global GHG emissions, because regional coal and imported natural gas are not the *only* fuels with which U.S.-exported LNG would compete. U.S. LNG exports may also compete with renewable energy, nuclear energy, petroleum-based liquid fuels, coal imported from outside East Asia or

²¹⁵ LCA GHG Report at 10 (Figure 6-2).

²¹⁶ *Id.* at 9, 18.

Western Europe, indigenous natural gas, synthetic natural gas derived from coal, and other resources, as well as efficiency and conservation measures. To model the effect that U.S. LNG exports would have on net global GHG emissions would require projections of how each of these fuel sources would be affected in each LNG-importing nation. Such an analysis would not only have to consider market dynamics in each of these countries over the coming decades, but also the interventions of numerous foreign governments in those markets.²¹⁷

The uncertainty associated with estimating each of these factors would likely render such an analysis too speculative to inform the public interest determination in this proceeding.

Accordingly, DOE/FE elected to focus on the discrete question of how U.S. LNG compares on a life cycle basis to regional coal and other sources of imported natural gas in key LNG-importing countries. This is a useful comparison because coal and imported natural gas are prevalent fuel sources for electric generation in non-FTA LNG-importing nations. For example, EIA notes that installed electric generation capacity in China was 66% coal and 3% natural gas in 2012.²¹⁸ For India, installed electric generation capacity in 2014 is 59% coal and 9% natural gas.²¹⁹ In both China and India, electric generation capacity is expected to increase substantially in coming years. For Japan, the largest importer of LNG in the world, electric generation from fossil fuels was 74% of total generation in 2011 and 89% in 2012 after the Fukushima disaster.²²⁰ In

Europe, use of fossil fuels is slightly less than in the Asian nations noted above but still

²¹⁷ Sierra Club observes that renewable energy has experienced significant growth in key LNG-importing countries such as India and China. Sierra Club does not, however, place the growth of renewable energy in the context of the aggregate use of fossil energy projects in those countries. Nor does Sierra Club explain the extent to which growth in renewable energy has been driven by public policies in those countries and how the availability of U.S. LNG exports would or would not impact the continuation of those policies.

²¹⁸ U.S. Energy Information Administration, China Analysis Brief (last updated Feb. 4, 2014), *available at*: <http://www.eia.gov/countries/cab.cfm?fips=CH>.

²¹⁹ U.S. Energy Information Administration, India Analysis Brief (last updated June 26, 2014), *available at*: <http://www.eia.gov/countries/cab.cfm?fips=IN>.

²²⁰ U.S. Energy Information Administration, Japan Analysis Brief (last updated July 31, 2014), *available at*: <http://www.eia.gov/countries/cab.cfm?fips=JA>.

significant, comprising 68% and 49% of electric generation in the United Kingdom and Spain for 2012, respectively.²²¹

The conclusions of the LCA GHG Report, combined with the observation that many LNG-importing nations rely heavily on fossil fuels for electric generation, suggests that exports of U.S. LNG may decrease global GHG emissions, although there is substantial uncertainty on this point as indicated above. In any event, the record does not support the conclusion that U.S. LNG exports will increase global GHG emissions in a material or predictable way. Therefore, while we share the commenters' strong concern about GHG emissions as a general matter, based on the current record evidence, we do not see a reason to conclude that U.S. LNG exports will significantly exacerbate global GHG emissions.

D. LNG Export Study

As explained above and detailed in the FLEX II Conditional Order, DOE/FE commissioned the two-part LNG Export Study and invited public comment. DOE/FE analyzed this material and determined that the LNG Export Study provides substantial support for conditionally granting each of FLEX's Applications. The conclusion of the LNG Export Study is that the United States will experience net economic benefits from issuance of authorizations to export domestically produced LNG. We evaluated the initial and reply comments submitted in response to the LNG Export Study. Various commenters criticized the data used as inputs to the LNG Export Study and numerous aspects of the models, assumptions, and design of the Study. As discussed in the Conditional Order, however, we find that the LNG Export Study is

²²¹ EIA, International Energy Statistics, *available at*: <http://www.eia.gov/cfapps/ipdbproject/iedindex3.cfm?tid=2&pid=alltypes&aid=12&cid=SP.UK.&syid=2008&eyid=2012&unit=BKWH>. To evaluate the effect that U.S. LNG exports may have on the mix of fuels used for electric generation in Western Europe also requires consideration of the role of the European Trading System (ETS). The ETS places a cap on GHG emissions. Therefore, where the cap is a binding constraint, the ETS ultimately may ensure that the availability of U.S.-exported LNG will not affect aggregate emissions.

fundamentally sound and supports the proposition that the proposed authorization will not be inconsistent with the public interest.

Since issuing the FLEX II Conditional Order in November 2013, we have seen no developments that would disturb these conclusions or alter the central conclusion of the LNG Export Study. To the contrary, we note that EIA's most recent projections, set forth in AEO 2014 (discussed *supra* Section V), continue to show market conditions that will accommodate increased exports of natural gas. When compared to the AEO 2012 final projections and the final AEO 2013 Reference Case discussed in the FLEX II Conditional Order (at 97-100), the AEO 2014 Reference Case projects marked increases in domestic natural gas production—well in excess of what is required to meet projected increases in domestic consumption.

Additionally, we note that a number of commenters on the LNG Export Study raised environmental concerns that were not germane to the economic issues addressed in the Study.²²² The FLEX II Conditional Order did not address those comments, but did encourage those commenters to participate in FERC's environmental review of the Liquefaction Project.²²³ We have independently reviewed the environmental comments on the LNG Export Study to ensure that all issues regarding the environmental impact of our decision on the proposed exports have been considered. We find that all such issues have been addressed in the EIS for the Liquefaction Project (which we have adopted) or in this Order.

E. Benefits of International Trade

We have not limited our review to the contents of the LNG Export Study or the environmental issues discussed herein, but have considered a wide range of other information.

²²² See, e.g., the comments on the LNG Export Study submitted by the Delaware River Keepers, the Oregon Shores Conservation Coalition, and Citizen Power, among others.

²²³ See FLEX II Conditional Order at 132.

For example, the National Export Initiative, established by Executive Order, sets an Administration goal to “improve conditions that directly affect the private sector’s ability to export” and to “enhance and coordinate Federal efforts to facilitate the creation of jobs in the United States through the promotion of exports.”²²⁴

We have also considered the international consequences of our decision. We review applications to export LNG to non-FTA nations under section 3(a) of the NGA. The United States’ commitment to free trade is one factor bearing on that review. An efficient, transparent international market for natural gas with diverse sources of supply provides both economic and strategic benefits to the United States and our allies. Indeed, increased production of domestic natural gas has significantly reduced the need for the United States to import LNG. In global trade, LNG shipments that would have been destined to U.S. markets have been redirected to Europe and Asia, improving energy security for many of our key trading partners. To the extent U.S. exports can diversify global LNG supplies, and increase the volumes of LNG available globally, it will improve energy security for many U.S. allies and trading partners. As such, authorizing U.S. exports may advance the public interest for reasons that are distinct from and additional to the economic benefits identified in the LNG Export Study and discussed in the FLEX II Conditional Order.

F. Other Considerations

Our decision is not premised on an uncritical acceptance of the general conclusion of the LNG Export Study of net economic benefits from LNG exports. Both the LNG Export Study and many public comments identify significant uncertainties and even potential negative impacts from LNG exports. The economic impacts of higher natural gas prices and potential increases in

²²⁴ National Export Initiative, Exec. Order 13,534, 75 Fed. Reg. 12,433 (Mar. 16, 2010).

natural gas price volatility are two of the factors that we view most seriously. Yet we also have taken into account factors that could mitigate such impacts, such as the current oversupply situation and data indicating that the natural gas industry would increase natural gas supply in response to increasing exports. Further, we note that it is far from certain that all or even most of the proposed LNG export projects will ever be realized because of the time, difficulty, and expense of commercializing, financing, and constructing LNG export terminals, as well as the uncertainties inherent in the global market demand for LNG. On balance, we find that the potential negative impacts of FLEX's proposed exports are outweighed by the likely net economic benefits and by other non-economic or indirect benefits.

More generally, DOE/FE continues to subscribe to the principle set forth in our 1984 Policy Guidelines²²⁵ that, under most circumstances, the market is the most efficient means of allocating natural gas supplies. However, agency intervention may be necessary to protect the public in the event there is insufficient domestic natural gas for domestic use. There may be other circumstances as well that cannot be foreseen that would require agency action.²²⁶ Given these possibilities, DOE/FE recognizes the need to monitor market developments closely as the impact of successive authorizations of LNG exports unfolds.

²²⁵ 49 Fed. Reg. at 6684.

²²⁶ As we noted in the Conditional Order, some commenters on the LNG Export Study asked DOE to clarify the circumstances under which the agency would exercise its authority to revoke (in whole or in part) previously issued LNG export authorizations. We cannot precisely identify all the circumstances under which such action would be taken. We reiterate our observation in *Sabine Pass* that: "In the event of any unforeseen developments of such significant consequence as to put the public interest at risk, DOE/FE is fully authorized to take action as necessary to protect the public interest. Specifically, DOE/FE is authorized by section 3(a) of the Natural Gas Act ... to make a supplemental order as necessary or appropriate to protect the public interest. Additionally, DOE is authorized by section 16 of the Natural Gas Act 'to perform any and all acts and to prescribe, issue, make, amend, and rescind such orders, rules, and regulations as it may find necessary or appropriate' to carry out its responsibilities." *Sabine Pass*, DOE/FE Order No. 2961, at 33 n.45 (quoting 15 U.S.C. § 717o).

G. Conclusion

We have reviewed the evidence in the record and have not found an adequate basis to conclude that FLEX's export of LNG to non-FTA countries will be inconsistent with the public interest. We find that the three intervenor-protestors in this proceeding—APGA, Sierra Club, and GCELC—have failed to overcome the statutory presumption that the proposed export authorization is consistent with the public interest. For that reason, we are authorizing FLEX's proposed exports to non-FTA countries subject to the limitations and conditions described in this Order.

In deciding whether to grant a final non-FTA export authorization, we consider in our decisionmaking the cumulative impacts of the total volume of all final non-FTA export authorizations. With the issuance of this Order, DOE/FE has now issued final non-FTA authorizations in a cumulative volume of exports totaling 5.74 Bcf/d of natural gas, or 2.095 Tcf/yr, for the five final authorizations issued to date—Sabine Pass (2.2 Bcf/d), Carib Energy (USA) LLC (0.04 Bcf/d),²²⁷ Cameron LNG, LLC (1.7 Bcf/d),²²⁸ FLEX I (issued concurrently today) (1.4 Bcf/d), and the current order, FLEX II (0.4 Bcf/d). This total export volume is within the range of scenarios analyzed in the EIA and NERA studies, as discussed in the FLEX II Conditional Order. NERA found that in all such scenarios—assuming either 6 Bcf/d or 12 Bcf/d of export volumes—the United States would experience net economic benefits. As discussed above, the submissions of the intervenors do not undermine the reasonableness of the findings in the LNG Export Study.

²²⁷ *Carib Energy (USA) LLC*, DOE/FE Order No. 3487, FE Docket No. 11-141-LNG, Final Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas in ISO Containers by Vessel to Non-Free Trade Agreement Nations in Central America, South America, or the Caribbean (Sept. 10, 2014).

²²⁸ *Cameron LNG, LLC*, DOE/FE Order No. 3391-A, FE Docket No. 11-162-LNG, Final Opinion and Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Cameron LNG Terminal in Cameron Parish, Louisiana, to Non-Free Trade Agreement Nations (Sept. 10, 2014).

DOE/FE will continue taking a measured approach in reviewing the other pending applications to export domestically produced LNG. Specifically, DOE/FE will continue to assess the cumulative impacts of each succeeding request for export authorization on the public interest with due regard to the effect on domestic natural gas supply and demand fundamentals. In keeping with the performance of its statutory responsibilities, DOE/FE will attach appropriate and necessary terms and conditions to authorizations to ensure that the authorizations are utilized in a timely manner and that authorizations are not issued except where the applicant can show that there are or will be facilities capable of handling the proposed export volumes and existing and forecast supplies that support that action. Other conditions will be applied as necessary.

The reasons in support of proceeding cautiously are several: (1) the LNG Export Study, like any study based on assumptions and economic projections, is inherently limited in its predictive accuracy; (2) applications to export significant quantities of domestically produced LNG are a new phenomena with uncertain impacts; and (3) the market for natural gas has experienced rapid reversals in the past and is again changing rapidly due to economic, technological, and regulatory developments. The market of the future very likely will not resemble the market of today. In recognition of these factors, DOE/FE intends to monitor developments that could tend to undermine the public interest in grants of successive applications for exports of domestically produced LNG and, as previously stated, to attach terms and conditions to the authorization in this proceeding and to succeeding LNG export authorizations as are necessary for protection of the public interest.

XI. TERMS AND CONDITIONS

To ensure that the authorization issued by this Order is not inconsistent with the public interest, DOE/FE has attached the following terms and conditions to the authorization. The

reasons for each term or condition are explained below. FLEX must abide by each term and condition or face rescission of its authorization or other appropriate sanction.

A. Term of the Authorization

FLEX has requested a 25-year term for the authorization commencing from the date export operations begin. However, because the NERA study contains projections over a 20-year period beginning from the date of first export,²²⁹ we believe that caution recommends limiting this conditional authorization to no longer than a 20-year term beginning from the date of first commercial export. In imposing this condition, we are mindful that LNG export facilities are capital intensive and that, to obtain financing for such projects, there must be a reasonable expectation that the authorization will continue for a term sufficient to support repayment. We find that a 20-year term is likely sufficient to achieve this result. We base that conclusion on the fact that FLEX has submitted to DOE/FE LTAs with 20-year terms, which is also the length of all LNG export contracts DOE/FE has received to date. We also note that a 20-year term is consistent with our practice in the final and conditional non-FTA export authorizations issued to date, including both of FLEX's Conditional Orders. Accordingly, the 20-year term will begin on the date when FLEX commences commercial export of domestically sourced LNG at the Freeport Terminal, but not before.

B. Commencement of Operations Within Seven Years

FLEX requested that this authorization commence on the earlier of the date of first export or eight years from the date of the issuance of this order. However, as in the FLEX I Order and consistent with similar authorizations, DOE/FE will require as a condition of the authorization

²²⁹ NERA study at 5 (“Results are reported in 5-year intervals starting in 2015. These calendar years should not be interpreted literally but represent intervals after exports begin. Thus if the U.S. does not begin LNG exports until 2016 or later, one year should be added to the dates for each year that exports commence after 2015.”).

that FLEX commence LNG export operations using the Liquefaction Project facilities to liquefy natural gas no later than seven years from the date of issuance of this order. The purpose of this condition is to ensure that other entities that may seek similar authorizations are not frustrated in their efforts to obtain those authorizations by authorization holders that are not engaged in actual export operations.

C. Commissioning Volumes

FLEX will be permitted to apply for short-term export authorizations to export Commissioning Volumes prior to the commencement of the first commercial exports of domestically sourced LNG from the Freeport Terminal. “Commissioning Volumes” are defined as the volume of LNG produced and exported under a short-term authorization during the initial start-up of each LNG train, before each LNG train has reached its full steady-state capacity and begun its commercial exports pursuant to FLEX’s long-term contracts.²³⁰ Commissioning Volumes will not be counted against the maximum level of volumes authorized in any of FLEX’s FTA or non-FTA LNG export orders, including this Order.

D. Make-Up Period

FLEX will be permitted to continue exporting for a total of three years following the end of the 20-year term established in this Order, solely to export any Make-Up Volume that it was unable to export during the original export period. The three-year term during which the Make-Up Volume may be exported shall be known as the “Make-Up Period.”

The Make-Up Period does not affect or modify the total volume of LNG authorized in any of FLEX’s FTA or non-FTA LNG export orders, including this Order. Insofar as FLEX may

²³⁰ For additional discussion of Commissioning Volumes and the Make-Up Period referenced below, see *Freeport LNG Expansion, L.P.*, DOE/FE Order Nos. 3282-B & 3357-A, at 4-9.

seek to export additional volumes not previously authorized for export, it will be required to obtain appropriate authorization from DOE/FE.

E. Transfer, Assignment, or Change in Control

DOE/FE's natural gas import/export regulations prohibit authorization holders from transferring or assigning authorizations to import or export natural gas without specific authorization by the Assistant Secretary for Fossil Energy.²³¹ As a condition of the similar authorization issued to Sabine Pass in Order No. 2961, DOE/FE found that the requirement for prior approval by the Assistant Secretary under its regulations applies to any change of effective control of the authorization holder either through asset sale or stock transfer or by other means. This condition was deemed necessary to ensure that, prior to any transfer or change in control, DOE/FE will be given an adequate opportunity to assess the public interest impacts of such a transfer or change.

DOE/FE construes a change in control to mean a change, directly or indirectly, of the power to direct the management or policies of an entity whether such power is exercised through one or more intermediary companies or pursuant to an agreement, written or oral, and whether such power is established through ownership or voting of securities, or common directors, officers, or stockholders, or voting trusts, holding trusts, or debt holdings, or contract, or any other direct or indirect means. A rebuttable presumption that control exists will arise from the ownership or the power to vote, directly or indirectly, 10 percent or more of the voting securities of such entity.²³²

²³¹ 10 C.F.R. § 590.405.

²³² For information on DOE/FE's procedures governing a change in control, see U.S. Dep't of Energy, Procedures for Changes in Control Affecting Applications and Authorizations to Import or Export Natural Gas, 79 Fed. Reg. 65,641 (Nov. 5, 2014) (effective Sept. 26, 2014).

F. Agency Rights

As described above, FLEX requests authorization to export LNG on its behalf and as agent for other entities who themselves hold title to the LNG. DOE/FE previously addressed the issue of Agency Rights in Order No. 2913,²³³ which granted FLEX authority to export LNG to FTA countries. In that order, DOE/FE approved a proposal by FLEX to register each LNG title holder for whom FLEX sought to export LNG as agent. DOE/FE found that this proposal was an acceptable alternative to the non-binding policy adopted by DOE/FE in *Dow Chemical*, which established that the title for all LNG authorized for export must be held by the authorization holder at the point of export.²³⁴ We find that the same policy considerations that supported DOE/FE's acceptance of the alternative registration proposal in Order No. 2913 apply here as well. DOE/FE reiterated its policy on Agency Rights procedures in *Gulf Coast LNG Export, LLC*.²³⁵ In *Gulf Coast*, DOE/FE confirmed that, in LNG export orders in which Agency Rights have been granted, DOE/FE shall require registration materials filed for, or by, an LNG titleholder (Registrant) to include the same company identification information and long-term contract information of the Registrant as if the Registrant had filed an application to export LNG on its own behalf.²³⁶

To ensure that the public interest is served, the authorization granted herein shall be conditioned to require that where FLEX proposes to export LNG as agent for other entities who

²³³ *Freeport LNG Expansion, L.P., et al.*, DOE/FE Order No. 2913.

²³⁴ *Dow Chem. Co.*, DOE/FE Order No. 2859, FE Docket No. 10-57-LNG, Order Granting Blanket Authorization to Export Liquefied Natural Gas, at 7-8 (Oct. 5, 2010), *discussed in Freeport LNG*, DOE/FE Order No. 2913, at 7-8.

²³⁵ *Gulf Coast LNG Export, LLC*, DOE/FE Order No. 3163, FE Docket No. 12-05-LNG, Order Granting Long-Term Multi-Contract Authority to Export LNG by Vessel from the Proposed Brownsville Terminal to Free Trade Agreement Nations (Oct. 16, 2012).

²³⁶ *See id.* at 7-8.

hold title to the LNG (Registrants), it must register with DOE/FE those entities on whose behalf it will export LNG in accordance with the procedures and requirements described herein.

G. Contract Provisions for the Sale or Transfer of LNG to be Exported

DOE/FE's regulations require applicants to supply transaction-specific factual information "to the extent practicable."²³⁷ Additionally, DOE/FE regulations allow confidential treatment of the information supplied in support of or in opposition to an application if the submitting party requests such treatment, shows why the information should be exempted from public disclosure, and DOE/FE determines it will be afforded confidential treatment in accordance with 10 C.F.R. § 1004.11.²³⁸

DOE/FE will require that FLEX file or cause to be filed with DOE/FE any relevant long-term commercial agreements, including LTAs, pursuant to which FLEX exports LNG as agent for a Registrant. *See supra* Section IV.D.

DOE/FE finds that the submission of all such agreements or contracts within 30 days of their execution using the procedures described below will be consistent with the "to the extent practicable" requirement of section 590.202(b). By way of example and without limitation, a "relevant long-term commercial agreement" would include an agreement with a minimum term of two years, an agreement to provide gas processing or liquefaction services at the Freeport Terminal, a long-term sales contract involving natural gas or LNG stored or liquefied at the Freeport Terminal, or an agreement to provide export services from the Freeport Terminal.

In addition, DOE/FE finds that section 590.202(c) of DOE/FE's regulations²³⁹ requires that FLEX file, or cause to be filed, all long-term contracts associated with the long-term supply

²³⁷ 10 C.F.R. § 590.202(b).

²³⁸ *Id.* § 590.202(e).

²³⁹ *Id.* § 590.202(c).

of natural gas to the Freeport Terminal, whether signed by FLEX or the Registrant, within 30 days of their execution.

DOE/FE recognizes that some information in FLEX's or a Registrant's long-term commercial agreements associated with the export of LNG, and/or long-term contracts associated with the long-term supply of natural gas to the Freeport Terminal, may be commercially sensitive. DOE/FE therefore will provide FLEX the option to file or cause to be filed either unredacted contracts, or in the alternative (A) FLEX may file, or cause to be filed, long-term contracts under seal, but it also will file either: i) a copy of each long-term contract with commercially sensitive information redacted, or ii) a summary of all major provisions of the contract(s) including, but not limited to, the parties to each contract, contract term, quantity, any take or pay or equivalent provisions/conditions, destinations, re-sale provisions, and other relevant provisions; and (B) the filing must demonstrate why the redacted information should be exempted from public disclosure.

To ensure that DOE/FE destination and reporting requirements included in this Order are conveyed to subsequent title holders, DOE/FE will include as a condition of this authorization that future contracts for the sale or transfer of LNG exported pursuant to this Order shall include an acknowledgement of these requirements.

H. Export Quantity

As in the FLEX II Conditional Order, we are not granting the Application in the full export quantity requested by FLEX, and instead will grant the requested authorization only to the extent of the liquefaction capacity of the Liquefaction Project. FLEX requests authorization to export LNG in a volume equivalent to 1.4 Bcf/d (511 Bcf/yr) of natural gas in addition to the same amount authorized by DOE/FE in FLEX I (Order No. 3282-C), for a total authorized non-

FTA export volume of 2.8 Bcf/d of natural gas. As stated above, however, FLEX has notified FERC that the Liquefaction Project will have a liquefaction capacity of 1.8 Bcf/d of natural gas. As we observed in the FLEX II Conditional Order, DOE/FE's policy is not to authorize exports that exceed the capacity of a LNG export terminal.²⁴⁰ Consequently, we authorize the export of LNG up to the equivalent of 0.4 Bcf/d (146 Bcf/yr) of natural gas, which represents the marginal difference between the authorization of 1.4 Bcf/d in FLEX I and the Project's planned liquefaction capacity of 1.8 Bcf/d.

I. Combined FTA and Non-FTA Export Authorization Volume

FLEX is now authorized to export LNG to: (i) FTA countries, in a total volume equivalent to 1022 Bcf/yr (2.8 Bcf/d) of natural gas as authorized in DOE/FE Order Nos. 2913-A and 3066-A (each authorizing exports of 511 Bcf/yr, or 1.4 Bcf/d), and (ii) non-FTA countries, in a total volume equivalent to 657 Bcf/yr (1.8 Bcf/d) of natural gas as authorized in this final Order and in the final FLEX I Order (DOE/FE Order No. 3282-C) (authorizing exports of 146 Bcf/yr and 511 Bcf/yr, respectively).

As stated above, FLEX has notified FERC that the Liquefaction Project will have a liquefaction capacity of 1.8 Bcf/d of natural gas. Because the source of LNG proposed for export for all of FLEX's export authorizations is from the Freeport Terminal, FLEX may not treat the FTA export volumes authorized in DOE/FE Order Nos. 2913-A and 3066-A as additive to the non-FTA volumes authorized in this Order and in DOE/FE Order 3282-C.

XII. FINDINGS

On the basis of the findings and conclusions set forth above and in the FLEX II Conditional Order, we find that it has not been shown that a grant of the requested authorization

²⁴⁰ See FLEX II Conditional Order at 162 ("There is no basis for authorizing exports in excess of the maximum liquefaction capacity of a planned facility.").

will be inconsistent with the public interest, and we further find that the Application should be granted subject to the terms and conditions set forth herein. The following ordering paragraphs reflect current DOE/FE practice and supersede the ordering paragraphs set forth in the FLEX II Conditional Order.

XIII. ORDER

Pursuant to section 3 of the Natural Gas Act, it is ordered that:

A. FLEX is authorized to export domestically produced LNG by vessel from the Freeport LNG Terminal in Brazoria County, Texas, up to the equivalent of 146 Bcf/yr of natural gas for a term of 20 years to commence on the earlier of the date of first commercial export or seven years from the date that this Order is issued (November 14, 2021). FLEX is authorized to export this LNG on its own behalf and as agent for other entities who hold title to the natural gas, pursuant to one or more long-term contracts (a contract greater than two years).

B. The 20-year authorization period will commence when FLEX commences commercial export of domestically sourced LNG from the Freeport Terminal, but not before. FLEX may export Commissioning Volumes prior to the commencement of the terms of this Order, pursuant to a separate short-term export authorization. The Commissioning Volumes will not be counted against the maximum level of volumes authorized in any of FLEX's FTA or non-FTA LNG export orders, including this Order.

C. FLEX may continue exporting for a total of three years following the end of the 20-year export term, solely to export any Make-Up Volume that it was unable to export during the original export period. The three-year Make-Up Period allowing the export of Make-Up Volumes does not affect or modify the total volume of LNG authorized in any of FLEX's FTA or non-FTA LNG export orders, including this Order. Insofar as FLEX may seek to export

additional volumes not previously authorized for export, it will be required to obtain appropriate authorization from DOE/FE.

D. FLEX must commence export operations using the planned liquefaction facilities no later than seven years from the date of issuance of this Order.

E. The LNG export quantity authorized in this Order is equivalent to 146 Bcf/yr of natural gas. This quantity is not additive to the export volumes in FLEX's FTA authorizations, set forth in DOE/FE Order Nos. 2913-A and 3066-A, but it is additive to the export volume in FLEX's first non-FTA authorization, set forth in DOE/FE Order No. 3282-C.²⁴¹

F. This LNG may be exported to any country with which the United States does not have a FTA requiring the national treatment for trade in natural gas, which currently has or in the future develops the capacity to import LNG, and with which trade is not prohibited by United States law or policy.

G. FLEX shall ensure that all transactions authorized by this Order are permitted and lawful under United States laws and policies, including the rules, regulations, orders, policies, and other determinations of the Office of Foreign Assets Control of the United States Department of the Treasury and FERC. Failure to comply with this requirement could result in rescission of this authorization and/or other civil or criminal remedies.

H. FLEX shall ensure compliance with all terms and conditions established by FERC in the final EIS, including the 83 environmental conditions recommended in the EIS and adopted in the FERC Order at Appendix A. Additionally, this authorization is conditioned on FLEX's on-

²⁴¹ To correct a statement in the FLEX II Conditional Order (at 165, Ordering Para. C), FLEX's non-FTA export volumes are additive to each other, but they are not additive to the FTA export volumes.

going compliance with any other preventative and mitigative measures at the Freeport Terminal imposed by federal or state agencies.

I. (i) FLEX shall file, or cause others to file, with the Office of Oil and Gas Global Security and Supply a non-redacted copy of all executed long-term contracts associated with the long-term export of LNG on its own behalf or as agent for other entities from the Freeport Terminal. The non-redacted copies may be filed under seal and must be filed within 30 days of their execution. Additionally, if FLEX has filed the contracts described in the preceding sentence under seal or subject to a claim of confidentiality or privilege, within 30 days of their execution, FLEX shall also file, or cause others to file, for public posting either: i) a redacted version of the contracts described in the preceding sentence, or ii) major provisions of the contracts. In these filings, FLEX shall state why the redacted or non-disclosed information should be exempted from public disclosure.

(ii) FLEX shall file, or cause others to file, with the Office of Oil and Gas Global Security and Supply a non-redacted copy of all executed long-term contracts associated with the long-term supply of natural gas to the Freeport Terminal. The non-redacted copies may be filed under seal and must be filed within 30 days of their execution. Additionally, if FLEX has filed the contracts described in the preceding sentence under seal or subject to a claim of confidentiality or privilege, within 30 days of their execution, FLEX shall also file, or cause others to file, for public posting either: i) a redacted version of the contracts described in the preceding sentence, or ii) major provisions of the contracts. In these filings, FLEX shall state why the redacted or non-disclosed information should be exempted from public disclosure.

J. FLEX, or others for whom FLEX acts as agent, shall include the following provision in any agreement or other contract for the sale or transfer of LNG exported pursuant to this Order:

Customer or purchaser acknowledges and agrees that it will resell or transfer LNG purchased hereunder for delivery only to countries identified in Ordering Paragraph D of DOE/FE Order No. 3357, issued November 15, 2013, or Ordering Paragraph F of DOE/FE Order No. 3357-B, issued November 14, 2014, in FE Docket No. 11-61-LNG, and/or to purchasers that have agreed in writing to limit their direct or indirect resale or transfer of such LNG to such countries. Customer or purchaser further commits to cause a report to be provided to Freeport LNG Expansion, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC that identifies the country of destination, upon delivery, into which the exported LNG was actually delivered, and to include in any resale contract for such LNG the necessary conditions to insure that Freeport LNG Expansion, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC are made aware of all such actual destination countries.

K. FLEX is permitted to use its authorization in order to export LNG as agent for other entities, after registering the other parties with DOE/FE. Registration materials shall include an acknowledgement and agreement by the Registrant to supply FLEX with all information necessary to permit FLEX to register that person or entity with DOE/FE, including: (1) the Registrant's agreement to comply with this Order and all applicable requirements of DOE/FE's regulations at 10 C.F.R. Part 590, including but not limited to destination restrictions; (2) the exact legal name of the Registrant, state/location of incorporation/registration, primary place of doing business, and the Registrant's ownership structure, including the ultimate parent entity if the Registrant is a subsidiary or affiliate of another entity; (3) the name, title, mailing address, e-mail address, and telephone number of a corporate officer or employee of the registrant to whom inquiries may be directed; and (4) within 30 days of execution, a copy of any long-term contracts not previously filed with DOE/FE, described in Ordering Paragraph I of this Order.

L. Each registration submitted pursuant to this Order shall have current information on file with DOE/FE. Any changes in company name, contact information, change in term of the long-term contract, termination of the long-term contract, or other relevant modification, shall be filed with DOE/FE within 30 days of such change(s).

M. As a condition of this authorization, FLEX shall ensure that all persons required by this Order to register with DOE/FE have done so. Any failure by FLEX to ensure that all such persons or entities are registered with DOE/FE shall be grounds for rescinding in whole or in part the authorization.

N. Within two weeks after the first export of domestically produced LNG occurs from the Freeport Terminal, FLEX shall provide written notification of the date that the first export of LNG authorized in Ordering Paragraph A above occurred.

O. FLEX shall file with the Office of Oil and Gas Global Security and Supply, on a semi-annual basis, written reports describing the progress of the proposed Liquefaction Project. The reports shall be filed on or by April 1 and October 1 of each year, and shall include information on the progress of the Liquefaction Project, the date the liquefaction facility is expected to be operational, and the status of the long-term contracts associated with the long-term export of LNG and any long-term supply contracts.

P. Prior to any change in control of the authorization holder, FLEX must obtain the approval of the Assistant Secretary for Fossil Energy. For purposes of this Ordering Paragraph, a “change in control” shall include any change, directly or indirectly, of the power to direct the management or policies of FLEX, whether such power is exercised through one or more intermediary companies or pursuant to an agreement, written or oral, and whether such power is established through ownership or voting of securities, or common directors, officers, or

stockholders, or voting trusts, holding trusts, or debt holdings, or contract, or any other direct or indirect means.²⁴²

Q. Monthly Reports: With respect to the LNG exports authorized by this Order, FLEX shall file with the Office of Oil and Gas Global Security and Supply, within 30 days following the last day of each calendar month, a report indicating whether exports of LNG have been made. The first monthly report required by this Order is due not later than the 30th day of the month following the month of first export. In subsequent months, if exports have not occurred, a report of “no activity” for that month must be filed. If exports of LNG have occurred, the report must give the following details of each LNG cargo: (1) the name(s) of the authorized exporter registered with DOE/FE; (2) the name of the U.S. export terminal; (3) the name of the LNG tanker; (4) the date of departure from the U.S. export terminal; (5) the country (or countries) of destination into which the exported LNG was actually delivered; (6) the name of the supplier/seller; (7) the volume in Mcf; (8) the price at point of export per million British thermal units (MMBtu); (9) the duration of the supply agreement; and (10) the name(s) of the purchaser(s). (Approved by the Office of Management and Budget under OMB Control No. 1901-0294)

R. All monthly report filings shall be made to U.S. Department of Energy (FE-34), Office of Fossil Energy, Office of Oil and Gas Global Security and Supply, P.O. Box 44375, Washington, D.C. 20026-4375, Attention: Natural Gas Reports. Alternatively, reports may be

²⁴² See U.S. Dep’t of Energy, Procedures for Changes in Control Affecting Applications and Authorizations to Import or Export Natural Gas, 79 Fed. Reg. 65,641 (Nov. 5, 2014).

e-mailed to ngreports@hq.doe.gov or may be faxed to Natural Gas Reports at (202) 586-6050.

Issued in Washington, D.C., on November 14, 2014.

A handwritten signature in blue ink, appearing to read "Chris Smith", is positioned above a horizontal line.

Christopher A. Smith
Principal Deputy Assistant Secretary
Office of Fossil Energy

UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY

OFFICE OF FOSSIL ENERGY

_____)	
FREEPORT LNG EXPANSION, L.P.,)	
FLNG LIQUEFACTION, LLC,)	FE DOCKET NO. 11-161-LNG
FLNG LIQUEFACTION 2, LLC, AND)	
FLNG LIQUEFACTION 3, LLC)	
_____)	

OPINION AND ORDER DENYING REQUEST FOR REHEARING
OF ORDERS GRANTING LONG-TERM, MULTI-CONTRACT AUTHORIZATION
TO EXPORT LIQUEFIED NATURAL GAS BY VESSEL
FROM THE FREEPORT LNG TERMINAL ON QUINTANA ISLAND, TEXAS,
TO NON-FREE TRADE AGREEMENT NATIONS

DOE/FE ORDER NO.3357-C

DECEMBER 4, 2015

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FREQUENTLY USED ACRONYMS

Bcf/d	Billion Cubic Feet per Day
Bcf/yr	Billion Cubic Feet per Year
CEQ	The Council on Environmental Quality
CH ₄	Methane
CO ₂	Carbon Dioxide
DOE	U.S. Department of Energy
EIA	U.S. Energy Information Administration
EIS	Environmental Impact Statement
EPA	U.S. Environmental Protection Agency
FE	Office of Fossil Energy, U.S. Department of Energy
FERC	Federal Energy Regulatory Commission
FTA	Free Trade Agreement
GHG	Greenhouse Gas
GWP	Global Warming Potential
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Analysis
LNG	Liquefied Natural Gas
mtpa	Million Metric Tons per Annum
NEMS	National Energy Modeling System
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
NGA	Natural Gas Act
ROD	Record of Decision

I. INTRODUCTION

Freeport LNG Expansion, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC (collectively, FLEX) filed two applications, a year apart, with the Department of Energy's Office of Fossil Energy (DOE/FE or "the Department") seeking authorization to export liquefied natural gas (LNG) to countries with which the United States does not have a Free Trade Agreement (FTA) that requires national treatment for trade in natural gas (non-FTA countries).¹ In each application FLEX requested authorization to export LNG in a volume equivalent to 1.4 billion cubic feet per day (Bcf/d) of natural gas, for a total of 2.8 Bcf/d, from the same liquefaction facility. On November 14, 2014, the Department issued final orders in both dockets. In Order 3283-C, the Department granted FLEX's first application in the full volume requested: 1.4 Bcf/d.² In Order 3357-B, the Department granted FLEX's second application, but only at a volume of 0.4 Bcf/d.³ The Department did not authorize the full volume because the additive volume requested in the two applications would have exceeded the known liquefaction capacity of the planned Liquefaction Project being examined in the environmental review process under the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. § 4321 *et seq.*, which was 1.8 Bcf/d.⁴ Therefore, to ensure that the total volume

¹ See *respectively*, Application of Freeport LNG Expansion L.P., *et al.*, for Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries, FE Docket No. 10-161-LNG (Dec. 17, 2010) [hereinafter FLEX I App.]; and Application of Freeport LNG Expansion L.P., *et al.*, for Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries, FE Docket No. 11-161-LNG (Dec. 19, 2011) [hereinafter FLEX II App.].

² *Freeport LNG Expansion L.P., et al.*, DOE/FE Order No. 3282-C, FE Docket No. 10-161-LNG, Final Opinion and Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas to Non-Free Trade Agreement Nations (Nov. 14, 2014) [hereinafter FLEX I Order].

³ *Freeport LNG Expansion L.P., et al.*, DOE/FE Order No. 3357-B, FE Docket No. 11-161-LNG, Final Opinion and Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas to Non-Free Trade Agreement Nations (Nov. 14, 2014) [hereinafter FLEX II Order or Final Order].

⁴ See *id.* at 16.

authorized across both orders did not exceed 1.8 Bcf/d, the Department authorized 0.4 Bcf/d of the 1.4 Bcf/d that had been requested in FLEX's second application.

Sierra Club was the sole party to seek rehearing of the Department's Order 3357-B, in which the Department granted FLEX 0.4 Bcf/d of export authority to non-FTA countries. No party sought rehearing of Order 3283-C, in which the Department acted on FLEX's first application. (Sierra Club did not intervene in that proceeding and so could not have sought rehearing). Therefore, the rehearing request being considered in this Order concerns only 0.4 Bcf/d of the 1.8 Bcf/d of exports to non-FTA countries that DOE/FE has authorized FLEX to make.

II. PROCEDURAL BACKGROUND

A. DOE/FE and FERC Proceedings

On November 15, 2013, DOE/FE issued Order No. 3357 (FLEX II Conditional Order)⁵ to FLEX pursuant to section 3(a) of the Natural Gas Act (NGA).⁶ DOE/FE subsequently amended Order No. 3357 to clarify the terms of the Conditional Order.⁷

In the FLEX II Conditional Order, DOE/FE conditionally granted FLEX's Application⁸ in FE Docket No. 11-161-LNG for long-term, multi-contract authority to export domestically produced liquefied natural gas (LNG) by vessel to non-FTA countries. DOE/FE conditionally authorized FLEX to export LNG in a volume equivalent to 146 billion cubic feet per year

⁵ *Freeport LNG Expansion L.P. and FLNG Liquefaction, LLC*, DOE/FE Order No. 3357, FE Docket No. 11-161-LNG, Order Conditionally Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas to Non-Free Trade Agreement Nations (Nov. 15, 2013).

⁶ 15 U.S.C. § 717b(a). This authority is delegated to the Assistant Secretary for Fossil Energy pursuant to Re-delegation Order No. 00-002.04F (July 11, 2013).

⁷ On November 15, 2013, DOE/FE issued Order No. 3357-A to clarify, among other things, the date the export term commences. Collectively, Order Nos. 3357 and 3357-A are referred to herein as the FLEX II Conditional Order.

⁸ *See supra*, fn. 1.

(Bcf/yr) of natural gas (0.4 Bcf/d)⁹ for a term of 20 years. The proposed exports will originate from the existing Freeport Terminal, located on Quintana Island, southeast of the City of Freeport in Brazoria County, Texas, from liquefaction and related facilities to be constructed by FLEX (Liquefaction Project).

The FLEX II Conditional Order addressed the record evidence and entered findings on all non-environmental issues considered under NGA section 3(a), including the economic impacts, international impacts, and security of gas supply associated with FLEX's proposed exports. Because DOE/FE must also consider environmental issues, DOE/FE conditioned its authorization on the satisfactory completion of the environmental review process and on DOE/FE's issuance of a finding of no significant impact or a record of decision (ROD) pursuant to NEPA.¹⁰ DOE/FE stated that it intended to complete its NEPA review as a cooperating agency in the environmental review of the Liquefaction Project being performed by the Federal Energy Regulatory Commission (FERC) and explained that the Conditional Order "indicates ... DOE/FE's determination at this time on all but the environmental issues in this proceeding."¹¹

FERC issued a draft Environmental Impact Statement (EIS) for the proposed Liquefaction Project and other facilities modifications on March 14, 2014,¹² and a final EIS on June 16, 2014.¹³ The final EIS recommended that FERC subject any approval of FLEX's

⁹ This volume was a portion of the LNG export volume requested by FLEX in the Application, which was 1.4 Bcf/d of natural gas (511 Bcf/yr). DOE/FE's rationale for not granting the requested volume is set forth in the FLEX II Conditional Order. *See* FLEX II Conditional Order at 12-13, 15-17.

¹⁰ *See* FLEX II Conditional Order at 165 (Ordering Para. F).

¹¹ *Id.* at 163-64 (Terms and Conditions § H) (stating that "DOE/FE's participation as a cooperating agency ... is intended to avoid duplication of effort by agencies with overlapping environmental review responsibilities, to achieve early coordination among agencies, and to concentrate public participation in a single forum.").

¹² *See* Freeport LNG Development, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC; Notice of Availability of the Draft Environmental Impact Statement for the Proposed Phase II Modification and Liquefaction Projects, 79 Fed. Reg. 15,989 (March 24, 2014).

¹³ *See* Freeport LNG Development, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC; Notice of Availability of the Final Environmental Impact Statement for the Proposed Phase II Modification and Liquefaction Projects, 79 Fed. Reg. 35,345 (June 20, 2014). *See also* *Freeport LNG Development*,

proposed Liquefaction Project to 83 environmental conditions. On July 30, 2014, FERC issued an Order Granting Authorization under Section 3 of the Natural Gas Act (FERC Order), which authorized FLEX to site, construct, and operate the Liquefaction Project and other facilities modifications subject to the 83 environmental conditions contained in Appendix A of that FERC Order.¹⁴ On October 3, 2014, after an independent review, DOE/FE adopted FERC's final EIS for the FLEX Liquefaction Project (DOE/EIS-0487), and the U.S. Environmental Protection Agency (EPA) published a notice of the adoption on October 10, 2014.¹⁵

On November 14, 2014, DOE/FE issued Order No. 3357-B (FLEX II Order or Final Order)¹⁶ in which it granted final authorization for FLEX to export LNG to non-FTA countries up to the equivalent of 146 Bcf/yr of natural gas (0.4 Bcf per day (Bcf/d))¹⁷ for a term of 20 years. The FLEX II Order was conditioned on FLEX's compliance with the 83 environmental conditions adopted in the FERC Order. Concurrently with the FLEX II Order, DOE/FE issued a Record of Decision (ROD) for FLEX's proposed Liquefaction Project and other related facilities modifications.¹⁸

Sierra Club has asked DOE/FE to grant rehearing of the FLEX II Conditional Order (to the extent relied upon or incorporated by reference in the FLEX II Order), the FLEX II Order,

L.P., et al., Freeport LNG Liquefaction Project, Phase II Modification Project, Final Environmental Impact Statement, FERC/EIS-0250F (June 2014) [hereinafter Final EIS].

¹⁴ *Freeport LNG Development, L.P., et al.*, Order Granting Authorizations Under Section 3 of the Natural Gas Act, 148 FERC ¶ 61,076 (July 30, 2014) [hereinafter FERC Order].

¹⁵ U.S. Env'tl. Prot. Agency, Environmental Impact Statements; Notice of Availability, 79 Fed. Reg. 61,303, 61,304 (Oct. 10, 2014) (providing notice that DOE/FE adopted FERC's final EIS for the FLEX Liquefaction Project).

¹⁶ *See supra*, fn. 3.

¹⁷ This volume was a portion of the LNG export volume requested by FLEX in the Application, which was 1.4 Bcf/d of natural gas (511 Bcf/yr). DOE/FE's rationale for not granting the requested volume is set forth in the FLEX II Conditional Order. *See* FLEX II Conditional Order at 12-13, 15-17.

¹⁸ Record of Decision and Floodplain Statement of Findings for the Freeport LNG Expansion, L.P. Export Application, 79 Fed. Reg. 69101 (Nov. 20, 2014) [hereinafter ROD]. In the ROD, DOE/FE concurrently issued a Floodplain Statement of Findings, as required by 10 C.F.R. Part 1022 (Floodplain and Wetland Environmental Review Requirements).

and the ROD. Sierra Club asks DOE/FE to withdraw these actions pending further inquiry into the environmental impacts of FLEX's proposed exports or, in the alternative, to withdraw the FLEX II Conditional Order and the FLEX II Order and deny FLEX's Application.¹⁹ For the reasons below, DOE/FE denies Sierra Club's Request for Rehearing, and affirms the findings and conclusions in the FLEX II Conditional Order and the FLEX II Order and the ROD for FLEX's Application.

B. Environmental Review Procedures

When an applicant seeks authority both to export LNG to non-FTA countries and to construct a terminal for that purpose, DOE and FERC work together to avoid duplication of effort in the environmental review required under NEPA. In such cases, FERC is the "lead agency" and DOE/FE is the "cooperating agency" within the meaning of the regulations of the Council on Environmental Quality (CEQ) that implement NEPA.²⁰ FERC's lead agency role was codified by section 313 of the Energy Policy Act of 2005 (Pub. L. 109-58 (Aug. 8, 2005)), which amended section 15 of the NGA (15 U.S.C. § 717n).

The present case follows that framework. On January 5, 2011, FERC granted FLEX's request to commence the pre-filing review process. Shortly thereafter, FERC issued a Notice of Intent to Prepare an Environmental Impact Statement of the Liquefaction Project.²¹ The pre-

¹⁹ Sierra Club, Request for Rehearing, FE Docket No. 11-161-LNG (Dec. 15, 2014) [hereinafter Rehearing Request].

²⁰ The CEQ regulations implementing NEPA define a "cooperating agency" as "any Federal agency other than a lead agency which has jurisdiction by law or special expertise with respect" to any proposed action for which a NEPA analysis is prepared. 40 C.F.R. § 1508.5. The selection and responsibilities of a cooperating agency are described in 40 C.F.R. § 1501.6. DOE has issued regulations stating that it will perform its NEPA responsibilities in accordance with the CEQ regulations. 10 C.F.R. §§ 1021.101 & 103.

²¹ See Freeport LNG Development, L.P., Freeport LNG Expansion, L.P., FLNG Liquefaction LLC; Supplemental Notice of Intent to Prepare an Environmental Impact Statement for the Planned Liquefaction Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting, 77 Fed. Reg. 43,589 (Jul. 25, 2012).

filing proceeding involved a public scoping process to determine the issues requiring environmental review under NEPA.²²

On August 31, 2012, FLEX began the second part of FERC's approval process by filing its formal Application in FERC Docket No. CP12-509-000 for authorization to site, construct, and operate the Liquefaction Project under NGA section 3.²³

FERC issued its final EIS on June 16, 2014.²⁴ On July 30, 2014, FERC issued its Order granting FLEX's requested authorization to modify previously authorized LNG facilities to facilitate the import and export of LNG at FLEX's Quintana Island terminal (the Phase II Modification Project) and granted authorization to site, construct, and operate the proposed Liquefaction Project.²⁵

FERC addressed Sierra Club's claims that the EIS failed to consider the cumulative environmental impacts from all proposed export terminals in the United States, including the effect of increased gas prices, finding no merit in the argument.²⁶ FERC also addressed Sierra Club's argument that the EIS was defective because it did not examine induced natural gas production associated with the Project.

²² The Conditional Order, as supplemented by the FLEX II Order, provides the history of the FLEX Terminal and describes the proposed Liquefaction Project. These orders also set forth the procedural history of FLEX's proceedings before DOE/FE and FERC, including arguments made by Sierra Club in each proceeding.

²³ In addition to its request for authorization to site, construct, and operate the Liquefaction Project, on December 9, 2011, in Docket No. CP12-29-000, FLEX also requested an amendment to its authorization to expand existing LNG import facilities previously granted by FERC on September 26, 2006, in Docket No. CP05-361-000 (the Phase II Modification Project). The modifications to existing facilities in the Phase II Modification Project would facilitate the import and export of LNG at the existing Quintana Island terminal. FERC combined its environmental analyses of the two requests in its Final Environmental Impact Statement.

²⁴ *Freeport LNG Development, L.P FLNG Liquefaction, FLNG Liquefaction 2, LLC FLNG Liquefaction 3, LLC*; Notice of Availability of the Final Environmental Impact Statement for the Proposed Phase II Modification and Liquefaction Projects, 79 Fed. Reg. 35,345 (June 20, 2014).

²⁵ FERC Order, *supra* note 15.

²⁶ *See id.* at 20.

In connection with this and other LNG export proceedings, on June 4, 2014, DOE/FE provided notice in the *Federal Register* of two separate documents that proposed to evaluate different environmental aspects of the LNG production and export chain. First, DOE/FE announced that it had conducted a review of existing literature on potential environmental aspects associated with unconventional gas production in the lower-48 states. DOE/FE published its draft report for public review and comment, entitled *Draft Addendum to Environmental Review Documents Concerning Exports of Natural Gas from the United States* (Draft Addendum).²⁷ DOE/FE received comments on the Draft Addendum and, on August 15, 2014, issued the final Addendum (Addendum) with its response to the public comments contained in Appendix B.²⁸

Second, DOE/FE commissioned the National Energy Technology Laboratory (NETL), a DOE applied research laboratory, to conduct an analysis estimating the life cycle greenhouse gas (GHG) emissions for LNG exported from the United States, regasified, and combusted for electric generation in Europe or Asia. The report compared the life-cycle GHG emissions of U.S.-exported LNG to other sources of natural gas available in Europe and Asia, as well as those of regionally-sourced coal. On May 29, 2014, DOE/FE published NETL's report entitled, *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States* (LCA GHG Report)²⁹ as well as a 200-page supporting document entitled, *Life Cycle Analysis of*

²⁷ Dep't of Energy, Draft Addendum to Environmental Review Documents Concerning Exports of Natural Gas From the United States, 79 Fed. Reg. 32,258 (June 4, 2014). DOE/FE announced the availability of the Draft Addendum on its website on May 29, 2014.

²⁸ Dep't of Energy, Addendum to Environmental Review Documents Concerning Exports of Natural Gas From the United States, 79 Fed. Reg. 48,132 (Aug. 15, 2014).

²⁹ Dep't of Energy, Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas From the United States, 79 Fed. Reg. 32,260 (June 4, 2014). DOE/FE announced the availability of the LCA GHG Report on its website on May 29, 2014. The LCA GHG Report and supporting documents are incorporated herein by reference.

Natural Gas Extraction and Power Generation.³⁰ DOE/FE received public comments on the LCA GHG Report and the supporting document, and provided its response to those comments in the Final Order.

DOE/FE issued its Final Opinion and Order on November 14, 2014.³¹ In the Final Order, DOE/FE: (i) independently reviewed FERC’s NEPA analysis and other outstanding environmental issues, including public comments received on the Addendum and LCA GHG Report;³² (ii) considered the environmental information that had been developed and the related arguments of the commenters and parties, and found that it had not been demonstrated that FLEX’s requested authorization was inconsistent with the public interest;³³ and (iii) granted FLEX’s Application subject to further conditions, including the 83 environmental conditions adopted in the FERC Order.³⁴

C. Sierra Club’s Request for Rehearing of DOE’s Orders and FLEX’s Answer

Sierra Club filed its Rehearing Request on December 15, 2014.³⁵ On December 19, 2014, FLEX filed a “Motion for Leave to Answer to Sierra Club’s Request for Rehearing”³⁶ and on December 22, 2014, DOE/FE issued an Order granting Sierra Club’s Request for Rehearing

³⁰ See Dep’t of Energy, Nat’l Energy Tech. Lab., *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States* (May 29, 2014), available at: <http://energy.gov/fe/life-cycle-greenhouse-gas-perspective-exporting-liquefied-natural-gas-united-states>; see also Dep’t of Energy, Nat’l Energy Tech. Lab., *Life Cycle Analysis of Natural Gas Extraction and Power Generation* (May 29, 2014), available at: <http://energy.gov/fe/LCA-GHG-Report> (link to “NETL Natural Gas LCA Model and Analysis”).

³¹ See FLEX II Order, *supra* note 3.

³² See *id.* at 55-85.

³³ See *id.* at 106.

³⁴ See *id.* at 109.

³⁵ See Rehearing Request, *supra* note 15.

³⁶ FLEX, Motion for Leave to Answer to Sierra Club’s Request for Rehearing, FE Docket No. 11-161-LNG (Dec. 19, 2014). FLEX’s Motion will be granted because it provides additional relevant argument pertinent to our review of the record.

and FLEX’s Motion for Leave to Answer solely for purposes of further consideration.³⁷ On January 15, 2015, FLEX filed an “Answer to Sierra Club’s Request for Rehearing.”³⁸

III. DISCUSSION

A. The Rebuttable Presumption Derives from the Natural Gas Act

1. Sierra Club’s Position

Sierra Club asserts that DOE/FE erred in finding that section 3(a) of the NGA establishes a rebuttable presumption that exports of natural gas are in the public interest. Likewise, Sierra Club challenges the proposition that *Panhandle Producers & Royalty Owners Ass’n v. Economic Regulatory Administration*, 822 F.2d 1105 (D.C. Cir. 1987) (*Panhandle Producers*) recognized a statutory presumption applicable to LNG export proceedings. Instead, Sierra Club submits that the presumption addressed in *Panhandle Producers* applied only to import proceedings and was derived from DOE Policy Guidelines adopted in 1984 rather than the language of the NGA.³⁹ Sierra Club further states that it provided record evidence and argument that affirmatively demonstrated that the Application is inconsistent with the public interest and that even if DOE/FE were to determine that Sierra Club had not made this showing, DOE/FE must take a

³⁷ See Order Granting Request for Rehearing and Motion for Leave to Answer for the Purpose of Further Consideration, FE Docket No. 11-161-LNG (Dec. 22, 2014). This Order prevented both Sierra Club’s and FLEX’s motions from being deemed denied by operation of law pursuant to 10 C.F.R. §§ 590.504 and 590.302 (c), respectively.

³⁸ See FLEX Answer to Sierra Club’s Request for Rehearing, DOE/FE Docket No. 11-161-LNG (Jan. 15, 2015) [hereinafter FLEX Answer].

³⁹ According to Sierra Club, the U.S. Court of Appeals for the District of Columbia Circuit in *Panhandle Producers* reviewed certain presumptions regarding natural gas imports set forth in DOE’s *New Policy Guidelines and Delegation Orders from Secretary of Energy to Economic Regulatory Administration and Federal Energy Regulatory Commission Relating to the Regulation of Imported Natural Gas*, 49 Fed. Reg. 6684 (Feb. 22, 1984) [hereinafter 1984 Policy Guidelines]. Sierra Club asserts that the “two specific rebuttable presumptions” arising from the 1984 Policy Guidelines are: (i) if the terms of a natural gas import contract are flexible enough, the natural gas will be delivered only if it is competitive; and (ii) if the imported gas is competitive, it will fill a domestic need. Rehearing Request at 2-3 (citing *Panhandle Producers*, 822 F.2d at 1111). Sierra Club further contends that *Panhandle Producers* did not reach the question of whether any presumptions regarding imports or exports were compelled by the NGA. *Id.* at 3.

“hard look” at the environmental impacts of the project to determine whether they are consistent with the public interest⁴⁰

2. FLEX’s Answer

FLEX asserts that Sierra Club is mistaken in arguing both that Section 3 of the Natural Gas Act does not create a rebuttable presumption in natural gas export proceedings, and that DOE/FE failed to undertake its own inquiry into the environmental impacts of its actions.⁴¹ FLEX cites the Final Opinion and Order in which DOE/FE explained that Section 3 of the Natural Gas Act creates a rebuttable presumption that a proposed export of natural gas is in the public interest and that DOE must approve such a proposal “unless opponents of the application overcome the presumption by making an affirmative showing of inconsistency with the public interest.”⁴²

FLEX disputes Sierra Club’s claim that DOE/FE relied on the rebuttable presumption to avoid undertaking its own inquiry to consider the environmental impacts of its actions.⁴³ FLEX notes that DOE/FE acknowledged in its ROD that it “must...consider environmental issues” and that DOE/FE considered environmental issues as one of a range of factors in making its public interest determination.⁴⁴

3. DOE/FE Analysis

The rebuttable presumption comes from the language of NGA section 3(a), which requires the Department to issue both export and import authorizations “*unless*, after opportunity for a hearing, it finds that the proposed exportation or importation will not be consistent with the

⁴⁰ See *id.* at 3.

⁴¹ See FLEX Answer at 6.

⁴² See *id.* (citing Final Opinion and Order at 9).

⁴³ See *id.* (citing Sierra Club Request for Rehearing at 3).

⁴⁴ See *id.* FLEX notes that DOE’s Conditional Order approving FLEX’s Application was “explicitly conditioned on the satisfactory completion of FLEX’s environmental review process under NEPA, and on DOE/FE’s issuance of a finding of no significant impact or a record of decision.” *Id.*

public interest.” 15 U.S.C. § 717b(a) (emphasis added). DOE interprets these words to mean that, for the Department to deny an application, it must make an affirmative finding based on record evidence that the proposed import or export is inconsistent with the public interest. The Department refers to this as a rebuttable presumption because, absent evidence demonstrating that a proposed export or import is inconsistent with the public interest, the Department must grant the requested authorization. Sierra Club claims that the court in *Panhandle Producers* “did not reach the question of whether any presumptions regarding imports or exports were compelled by the Natural Gas Act.”⁴⁵ But in fact the court stated that “§ 3 [of the NGA] requires an affirmative showing of inconsistency with the public interest to *deny* an application.”⁴⁶

The rebuttable presumption in section 3(a) may affect the Department’s ultimate judgment whether to grant or deny an application, but it does not affect the Department’s obligations under NEPA. NEPA places an independent obligation on the Department to present information relating to the environmental impacts that may result from its decisions and to take a “hard look” at those impacts.⁴⁷ The rebuttable presumption has no bearing on these independent NEPA obligations and did not affect the Department’s performance of those obligations in this proceeding.

As the record demonstrates, the Department took the “hard look” at FLEX’s export proposal required by NEPA. The Department participated as a cooperating agency in FERC’s environmental review. The Department independently reviewed the EIS prepared by FERC and adopted all 83 environmental conditions recommended by FERC staff and adopted by the

⁴⁵ Rehearing Request at 3.

⁴⁶ *Panhandle Producers*, 822 F.2d at 1111 (emphasis in original); *see also id.* at 1112 (describing the court’s earlier decision in *West Virginia Pub. Serv. Comm. v. DOE*, 681 F.2d 847, 856 (D.C. Cir. 1982), as having “explicitly found that the statute created a presumption in favor of authorization.”).

⁴⁷ 42 U.S.C. § 4332.

Commission. In fulfilling its responsibilities under NEPA, the Department applied no presumptions regarding the potential environmental impacts associated with FLEX's proposed exports, as the record shows. We therefore reject Sierra Club's arguments concerning DOE/FE's interpretation of the NGA as it relates to the rebuttable presumption.

B. DOE/FE's Analysis of Indirect and Cumulative Environmental Impacts Satisfied the National Environmental Policy Act

1. Sierra Club's Position

Sierra Club asserts that DOE/FE's environmental review failed to comply with NEPA because FERC's EIS, which DOE/FE adopted, did not take a "hard look" at the indirect and cumulative impacts of LNG exports. Sierra Club asserts that the Environmental Addendum and the National Energy Technology Laboratory (NETL) Reports are not substitutes for NEPA review, because they contradict one another, do not specify impacts of this project and thereby fail to inform the public and provide a basis for public comment.⁴⁸ Sierra Club also asserts that, whether or not FERC did so, DOE/FE should have taken a hard look at the environmental impacts of natural gas production activities that would be induced by LNG exports. Sierra Club states that induced production is a reasonably foreseeable consequence of increased demand for natural gas due to LNG exports. Sierra Club offers the National Energy Modeling System (NEMS) developed by the U.S. Energy Information Administration (EIA) as a methodology DOE/FE could have used to determine where, in what quantity, and under what circumstances exports would induce additional gas production. According to Sierra Club, the NEMS model underlying the Department's 2012 LNG Export Study predicted how production would respond

⁴⁸ See Rehearing Request at 4-5.

to exports.⁴⁹ Sierra Club asserts that because NEMS is built on “play-level” modeling, EIA must have already developed forecasts of where production would increase in response to exports. According to Sierra Club, the specific environmental impacts of these additional natural gas production activities include increased generation of ozone precursors (*e.g.*, volatile organic chemicals and hazardous air pollutants) and methane releases resulting in additional GHG emissions into the atmosphere. Sierra Club also contends that DOE/FE’s NEPA analysis was flawed because it did not examine the environmental impacts of switching from natural gas to coal in the generation of electricity, which Sierra Club contends could be induced by natural gas exports.

2. FLEX’s Answer

FLEX notes that DOE explained that the Environmental Addendum was not required by NEPA.⁵⁰ Rather, the Environmental Addendum and the NETL Reports were provided above and beyond NEPA requirements. FLEX also maintains that Sierra Club failed to establish a reasonably close causal relationship between induced production and the Liquefaction Project as would be necessary to conclude that induced production is reasonably foreseeable.⁵¹ FLEX submits that both DOE and FERC reasonably concluded that insufficient facts exist to consider the timing, location, and scope of future gas production activities. FLEX also challenges Sierra Club’s assertion that the NEMS modeling methodology supports meaningful discussion of

⁴⁹ In 2011, the Department engaged the U.S. Energy Information Administration (EIA) and NERA Economic Consulting to conduct a two-part study of the economic impacts of LNG exports. In relevant part, EIA published its study, *Effect of Increased Natural Gas Exports on Domestic Energy Markets*, in January 2012 [hereinafter EIA 2012 Study]. Using the NEMS model, EIA examined the impact of two DOE/FE-prescribed levels of assumed natural gas exports (at 6 Bcf/d and 12 Bcf/d) under numerous scenarios and cases based on EIA’s 2011 projections. Both the 2012 EIA and NERA Studies are discussed in detail in the Conditional Order (§§ I, VI, VIII).

⁵⁰ FLEX Answer at 6.

⁵¹ *See id.* at 7.

induced production.⁵² NEMS could not provide DOE with information of sufficient specificity to warrant consideration of it in a NEPA review.⁵³ For example, according to FLEX, NEMS could not predict the location or amounts of additional gas production for a single export facility when that facility has pipeline connections to the nationwide grid.

3. DOE/FE Analysis

a. Induced Natural Gas Production

The CEQ regulations implementing NEPA require that agencies consider the “indirect effects” of proposed actions. “Indirect effects,” the regulations provide, “are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable.” 40 C.F.R. § 1508.8(b); 10 C.F.R. § 1021.200 (adopting CEQ’s regulations for the Department). Courts have articulated two principles useful in interpreting this provision. The first is that NEPA requires “a reasonably close causal relationship” between the environmental effect and the alleged cause.⁵⁴ The Supreme Court has stated that “a ‘but for’ causal relationship is insufficient to make an agency responsible for a particular effect under NEPA and the relevant regulations.”⁵⁵ Rather, in considering the strength of the causal relationship required by NEPA, the Supreme Court has “analogized . . . to the ‘familiar doctrine of proximate cause from tort law,’” instructing courts to “look to the underlying policies or legislative intent in order to draw a manageable line between those causal changes that may make an actor responsible for an effect and those that do not.”⁵⁶ The second principle is that “inherent in NEPA and its implementing

⁵² *See id.* at 8-9.

⁵³ *See id.*

⁵⁴ *Metropolitan Edison Co. v. People Against Nuclear Energy*, 460 U. S. 766, 774 (1983).

⁵⁵ *Dep’t of Transp. v. Public Citizen*, 541 U.S. 752, 767 (2004).

⁵⁶ *Id.* (quoting *Metropolitan Edison Co.*, 460 U.S. at 774).

regulations is a ‘rule of reason.’”⁵⁷ With respect to indirect effects, the rule of reason counsels that agencies are not required to address remote or speculative consequences, where insufficient information is available to permit meaningful consideration.⁵⁸

Sierra Club claims the Department violated NEPA by failing to consider the environmental impacts of increased natural gas production that may result indirectly from authorizing FLEX to export LNG to non-FTA countries. The causal relationship Sierra Club posits is an economic one. Sierra Club argues that a decision to authorize exports of natural gas from the United States to non-FTA countries may increase the price of natural gas in the United States, and therefore concludes the Department must examine the consequences of that potential price increase, including increased domestic production of natural gas and increased consumption of coal, which competes with natural gas as a fuel for electric generation. We do not read Sierra Club’s petition to argue that the Department must examine the environmental impacts of producing the very molecules of natural gas that will be exported by FLEX. Rather, we understand Sierra Club to contend that the Department must examine the environmental impacts of the economically marginal natural gas production that may be induced as a result of granting an export authorization to FLEX and other similarly situated applicants.

The Department does not dispute the economic logic that authorizing exports of natural gas to non-FTA countries could, all else equal, exert upward pressure on domestic natural gas prices as foreign purchasers compete with domestic purchasers. Nor does the Department

⁵⁷ *Id.* at 767.

⁵⁸ *See, e.g., N. Plains Res. Council v. Surface Transp. Bd.*, 668 F.3d 1067, 1078 (9th Cir. 2011) (“Each project is different, and the agency is required to rationally explain its decision in the context of project-specific effects.”); *Hammond v Norton*, 370 F.Supp.2d 226, 241 (D.D.C. 2005) (“The setting of the objectives and the range of alternatives to be considered by an agency are governed by a ‘rule of reason.’ All that NEPA requires is that the agency weigh all reasonable alternatives and come to a fully-informed decision.”); *Hoosier Env’t. Council v. U.S. Army Corps of Engineers*, 105 F. Supp. 2d 953, 974-975 (S.D. Ind. 2000) (upholding issuance of a permit to a casino riverboat, in part, because associated indirect effects were “tenuous and speculative” and therefore excluded from NEPA analysis under the “rule of reason”).

dispute that higher natural gas prices could lead to increased natural gas production at the national level, among other potential economic consequences (including decreased domestic consumption of natural gas, increased pipeline imports of natural gas from Canada, and increased use of competing resources). Indeed, EIA's 2012 Study modeled the effects that exporting natural gas at levels of 6 and 12 Bcf/d at "high" and "slow" ramp-up scenarios could have on the energy sector.⁵⁹ EIA projected that "about 63 percent, on average, of the increase in exports in each of the four scenarios is accounted for by increased production [of natural gas], with most of the remainder from decreased consumption [of natural gas] from 2015 to 2035."⁶⁰ EIA further projected that, of the increased production, over 90% would come from unconventional sources, such as shale gas, tight gas, and coalbed methane.⁶¹

Although natural gas exports may increase domestic production at the margin, we reject the conclusion that the environmental impacts of such marginal production are "reasonably foreseeable" within the meaning of the CEQ's regulations and the applicable case law. To the contrary, it would be impossible to identify with any confidence the marginal production at the wellhead or local level that would be induced by FLEX's exports over the period of its non-FTA authorization. Natural gas will be produced in substantial quantities across the United States regardless of how the Department rules on FLEX's Application. As the Department observed in the Final Order:

There is also fundamental uncertainty as to where any additional production would occur and in what quantity. As the Addendum illustrates, nearly all of the environmental issues presented by unconventional natural gas production are local in nature, affecting local water resources, local air quality, and local land use patterns,

⁵⁹ See LNG Export Study – Related Documents, available at <http://energy.gov/fe/services/natural-gas-regulation/lng-export-study> (EIA 2012 Study). See Conditional Order at 24-26.

⁶⁰ U.S. Energy Information Administration, *Effect of Increased Natural Gas Exports on Domestic Energy Markets*, at 10 (2012), available at http://www.energy.gov/sites/prod/files/2013/04/f0/fe_eia_lng.pdf [hereinafter EIA Study].

⁶¹ See Final Order at 85.

all under the auspices of state and local regulatory authority. As DOE explained in *Sabine Pass*, DOE/FE Order No. 2961-A, without knowing where, in what quantity, and under what circumstances additional gas production will arise, the environmental impacts resulting from production activity induced by LNG exports to non-FTA countries are not ‘reasonably foreseeable’ within the meaning of the CEQ’s NEPA regulations.⁶²

Further, insofar as FLEX’s Application is viewed cumulatively with other similar applications to export LNG to non-FTA countries, the Department has observed that there is considerable market uncertainty regarding the aggregate quantity of exports that will ultimately materialize:

[T]here is uncertainty as to the aggregate quantity of natural gas that ultimately may be exported to non-FTA countries. Receiving a non-FTA authorization from DOE/FE does not guarantee that a particular facility would be financed and built; nor does it guarantee that, if built, market conditions would continue to favor export once the facility is operational. To illustrate the point, of the more than 40 applications to build new LNG import facilities that were submitted to federal agencies between 2000 and 2010, only eight new facilities were built and those facilities have seen declining use in the past decade.⁶³

Sierra Club emphasizes the potential for economic modeling tools, such as EIA’s NEMS model, to render the environmental impacts of export-induced production reasonably foreseeable. But where, as here, it is fundamentally uncertain how natural gas production at the local level will respond to price changes at the national level, an environmental analysis attempting to quantify local impacts would be more misleading than informative.⁶⁴ Economic modeling results are a product of the parameters that are entered into the model. In this context, the key parameter that would be used as a modeling input is the price elasticity of natural gas production, estimated at a sufficiently local level so as to analyze how the production would

⁶² Final Opinion and Order at 85.

⁶³ *Id.* (citing *See FLEX II Conditional Order* at 100 n.161)).

⁶⁴ *See Mayo Found. v. Surface Transp. Bd.*, 472 F.3d 545, 555-56 (8th Cir. 2006) (rejecting Sierra Club’s argument that the Surface Transportation Board must use the NEMS model as the basis for analyzing local-level environmental impacts).

impact specific natural resources and human health. But, due to the limitations of estimating geology at the local level, and the uncertainties of predicting local regulation, land use patterns, and the development of supporting infrastructure, estimating the price elasticity of natural gas supply at the local level is much more speculative than doing so at the national level where local idiosyncrasies are averaged out.

Sierra Club’s argument concerning “play level” modeling also does not persuade us that the environmental impacts of induced production are reasonably foreseeable. The term “plays” refers to subsurface geologic formations containing substantial quantities of natural gas and may be used in reference to shale gas⁶⁵ or tight gas.⁶⁶ The shale plays, to which we believe Sierra Club is referring, overlap and stretch for thousands of square miles below diverse surface environments.⁶⁷ While the size of the shale plays makes them more reliable units for generating projections from economic models than smaller units such as counties, their size also makes them less useful units for analyzing impacts to environmental resources such as air,⁶⁸ water,⁶⁹ or land.⁷⁰ An economic model that estimated induced production across each shale play would provide no information about where any incremental production would arise within those shale

⁶⁵ Addendum at 6, Fig. 2 (Approximate Locations of Current Producing Gas Shales and Prospective Shales).

⁶⁶ *See id.* at 7, Fig. 3 (Location of Currently Active Areas for Tight Sand Development and Production).

⁶⁷ *See id.* at 54, Table 13 (estimating the size of seven major shale plays ranging from 5,000 square miles for the Barnett Shale to 95,000 square miles for the Marcellus Shale).

⁶⁸ Air pollutants largely concentrate in the local area in which they are emitted. Without knowing where within a shale play incremental production will occur, the impacts to air quality of such production cannot be well understood. For example, with respect to ozone—the only air pollutant Sierra Club describes as amenable to regional discussion—the Addendum presents a map that overlays ozone non-attainment zones with the shale basins. Addendum at 29, Fig. 8. The non-attainment zones appear near urban areas and bear little recognizable relationship to the subsurface geology. Without knowing where in relation to existing ozone concentrations the incremental production would occur, the play-level modeling Sierra Club urges would not enable DOE/FE to characterize the environmental and human health impacts posed by such production.

⁶⁹ *See* Addendum at 10-19 (describing water impacts and concluding that “specific impacts to water resources cannot be predicted even on a regional level”).

⁷⁰ Given the geographic expanse of the shale plays, characterizing the land use impacts of new, incremental wells would not be possible without knowing where those new wells would be located. On this point Sierra Club suggests that DOE/FE could have simply estimated how many wells in each play would be necessary to meet projected export demand. Absent an understanding of what land would be affected, however, an attempt to estimate the total number of wells would not have meaningfully informed our decision.

plays and would not render the environmental impacts of such production reasonably foreseeable in a manner that would facilitate meaningful analysis.

Such an analysis would also be without limit. Because the price elasticity of natural gas production is likely to be positive in every producing region in the country and because there is a robust interstate pipeline system in the United States, it is likely that upward pressure on natural gas prices could encourage at least some additional production in every producing region in the lower-48 states. The logic of Sierra Club's argument, therefore, would compel the Department, before acting on an application to export natural gas, to undertake an environmental impact statement or environmental assessment that examines separately the environmental impacts of natural gas production in every producing region in the country. Were such a requirement law, it would impose an unreasonable and unrealistic burden on the Department's ability to act on the export applications before it. And the weight of this burden would be misplaced: Unlike state and local regulators, or other federal agencies such as EPA and the U.S. Department of the Interior, the Department of Energy lacks any authority to regulate the environmental effects of natural gas production, much less to address issues identified at the local, regional or play level.

In sum, there is no "reasonably close causal relationship" between any particular environmental impacts of induced natural gas production and the Department's decision in this case. The causal chain linking the Department's decision to environmental impacts resulting from induced natural gas production is probabilistic and attenuated, not close and proximate as the Supreme Court has stated must be evident to bring the effects within the scope of NEPA review.

Nevertheless, even though the environmental impacts of induced natural gas production are not "reasonably foreseeable," the Department has taken all reasonable steps to ensure that its

public interest review was informed by a consideration of the general environmental impacts of natural gas production. On June 4, 2014, DOE/FE issued the draft Addendum, which, as noted above, presented a discussion of environmental issues associated with unconventional gas production in the lower-48 states based on DOE's review of existing literature, regulations, and best management practices. The Addendum focused on the environmental impacts of unconventional natural gas production in the United States because of the projections by EIA in its 2012 Study that over 90% of incremental production resulting from exports would come from unconventional sources (i.e. shale gas, tight gas, and coalbed methane). The Addendum contained chapters separately considering water resources, air quality, greenhouse gases, induced seismicity, and land use impacts.⁷¹ After a 45-day comment period, the Department received 40,745 comments on the Addendum in 18 separate submissions, including comments from Sierra Club and its members. On August 15, 2014, the Department issued a final version of the Addendum, with textual changes resulting from the comments and a comment response chapter addressing each discrete issue raised in the comments. Although the Department has consistently maintained that an analysis of the environmental impacts of induced natural gas production falls outside the scope of what NEPA requires, the Department nonetheless observed NEPA's procedural requirements in publishing and taking comments on the Addendum.

In its Rehearing Request, Sierra Club offers three reasons why it believes the Addendum fails to satisfy the NEPA obligation it believes the Department has with respect to induced natural gas production. First, Sierra Club claims that information in the Addendum contradicts information in other documents in the Department's record. Sierra Club states that the EIS prepared by FERC claims that it is not reasonably foreseeable whether exports will increase gas

⁷¹ See Final Order at 36-45 (summarizing the Addendum's findings).

production,⁷² but that DOE expresses a contrary view regarding the relationship between exports and production by relying on EIA's conclusion that production will increase to supply exports, reducing the potential for exports to compete with domestic gas consumers.⁷³ According to Sierra Club, the Environmental Addendum also adopts EIA's conclusion that exporting LNG will increase domestic production of natural gas. In fact, there is no inconsistency.

Projections by EIA that domestic production will increase in response to exports do not make the location or amounts of additional gas, or its impacts, reasonably foreseeable. This is the same conclusion that the Department reached in the Addendum,⁷⁴ and that FERC staff reached in the EIS.⁷⁵

Second, Sierra Club claims that the Addendum cannot be used for NEPA compliance because "the Addendum and NETL reports . . . reach different conclusions regarding [1] the potency of methane as a greenhouse gas and [2] the amount of air pollution emitted by natural gas production."⁷⁶ On the former point, the Department's reasoning for selecting the global warming potential (GWP) for methane used in the LCA GHG Report is explained below in Section III.C.2. The claim that the Addendum reached a "different conclusion" than the LCA GHG Report regarding the GWP for methane mischaracterizes the Addendum's objective. The Addendum did not seek to resolve scientific uncertainty regarding the heat-trapping effects of methane. Rather, the Addendum sought to explain what was known on this subject in order to inform this proceeding. To that end, the Addendum explained that it had included the carbon dioxide equivalency factor for methane used in the 2007 Intergovernmental Panel on Climate

⁷² See Rehearing Request at 5 (*citing* EIS at 4-240 to 4-241).

⁷³ See *id.*

⁷⁴ See Addendum at 2.

⁷⁵ See EIS at 4-240 to 4-241

⁷⁶ Rehearing Request at 4-5.

Change's (IPCC) report in Table 7 "to maintain consistency with the EPA's Inventory reports and to allow usage of EPA's estimate for total greenhouse gas emissions from all sources," but it also described the values from the most recent IPCC reports (then in draft) as well as those of other scholars.⁷⁷ Finally, there was no inconsistency in the conclusions regarding air pollution emissions for the reasons explained in section III.C.1 of this Order.

Third, Sierra Club claims that the Addendum is inadequate because it does not "consider the effects of the particular proposal under consideration." But, to the extent that FLEX's proposal leads to additional unconventional natural gas production in the United States, then surely the Addendum does inform DOE/FE's consideration of the effects of the proposal in its description of how unconventional gas production impacts various resource areas and, where relevant, how those impacts vary geographically. The Addendum did not attempt, however, to quantify the environmental impacts associated with FLEX's proposals or to apportion those environmental impacts across the many production areas currently active across the United States. For the reasons above, we believe that the speculative nature of such an effort would have made it of dubious value to our public interest review.

b. Increased Use of Coal

Sierra Club argues that the Department must examine the possible increased use of coal in electric power generation that may result from the Department's decision in this case. Sierra Club's argument centers on EIA's 2012 Study, which (according to Sierra Club) projected that the increased price of natural gas resulting from exports of LNG leads to additional use of coal because coal competes with natural gas on price as a fuel for electric power generation.⁷⁸

⁷⁷ Addendum at 36, 87.

⁷⁸ See Rehearing Request at 18-19.

The causal relationship between the Department’s decision in this proceeding and the level of coal generation in the United States is even more attenuated than its relationship to induced natural gas production. In effect, Sierra Club is arguing that any time a federal agency takes an action that will affect the supply or demand of a commodity, it must examine the impacts of producing or consuming that commodity, as well as the impacts of producing or consuming the substitute commodities with which it competes. What Sierra Club is proposing goes far beyond what the Supreme Court described must be a “manageable line” defining the scope of review required by NEPA.

We also believe that certain assumptions underlying EIA’s projections in its 2012 Study—specifically, the estimated increase in coal consumption arising from higher natural gas prices—are now out of date. As we observed in the Final Order, EIA’s projections assume continuation of the regulations in force at the time of its analysis. EIA prepared the 2012 Study before several EPA rulemakings had been finalized. Most significantly, on August 3, 2015, EPA finalized rules under the Clean Air Act that will impose limits on GHG emissions from both new and existing coal-fired power plants.⁷⁹

⁷⁹ U.S. Environmental Protection Agency, Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units, *available at* <http://www3.epa.gov/airquality/cpp/cps-final-rule.pdf>; U.S. Environmental Protection Agency, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units, *available at* <http://www2.epa.gov/sites/production/files/2015-08/documents/cpp-final-rule.pdf>.

C. The Methodology Underlying the Life Cycle Greenhouse Gas (LCA GHG) Report Was Reasonable

1. Methane Leakage Rate

a. Sierra Club's Position

Sierra Club charges that DOE/FE has not adequately justified the methane leakage rate implied by the LCA GHG Study as compared to higher leakage rates estimated by other life cycle analyses.⁸⁰ Sierra Club also states that the 1.2 percent leakage rate estimate attributed to NETL in Order No. 3357-B is lower than the “expected” cradle-to-liquefaction leakage rates provided by NETL in the LCA GHG Report—1.3 percent for conventional onshore production and 1.4 percent for shale gas production.⁸¹ Sierra Club points out that, in the Addendum, NETL refers to five major studies that account for the GHG emissions from upstream natural gas, including three (Howarth, Burnham, and Weber) that either provide or imply an estimate of methane leakage rates. Sierra Club claims that all of these studies estimate much higher methane leakage than does NETL and states that “[w]hile NETL provided a basis for disagreeing with the highest of these estimates, Howarth, nothing in the record explains why NETL’s estimate is superior to Burnham and Weber.”⁸²

According to Sierra Club, DOE/FE in Order 3357-B correctly noted that the boundary conditions applied in the Burnham study differed from those in the NETL study in that NETL reviewed “cradle-through-transmission” whereas Burnham also included the additional step of distribution. Sierra Club maintains that the vast difference in methane emission estimates cannot be explained by the difference in boundary conditions or by other differences between NETL and the Burnham study. Burnham estimated that 0.28 percent of methane produced was emitted

⁸⁰ See Rehearing Request at 15.

⁸¹ See *id.*

⁸² See *id.*

during distribution and that subtracting this 0.28 percent from Burnham’s total estimate leaves a cradle-through-transmission leak rate of 2.47 percent for conventional onshore gas and 1.73 percent for unconventional gas.⁸³

Sierra Club also addresses the statement in Order 3357-B that the Weber study made no mention of leakage rate. Sierra Club acknowledges that the Weber study does not discuss emissions in terms of leakage rate, but contends that the emissions estimates in the Weber study imply the same leakage rate that is set out in NETL’s Unconventional Production Report and asserts that this leakage rate is explained by Bradbury 2014, as discussed in the NETL reports. Sierra Club contends: “Because NETL already determined that the Weber team’s conclusions could be expressed as a leakage rate estimate, DOE cannot now argue that this work has no bearing on the appropriate estimate of leakage rates or, ultimately, methane emissions.”⁸⁴

Sierra Club also argues that the Department should have modeled methane emissions using “top-down” rather than “bottom-up” studies. On rehearing, Sierra Club cites five top-down studies that it claims estimate higher methane leakage rates of generally 3 percent or more on the basis of atmospheric measurements. Order 3357-B, according to Sierra Club, acknowledges that top-down studies do not generally match bottom-up calculations due to different boundaries, but Sierra Club maintains that DOE/FE gave no explanation as to why the boundaries used in bottom-up studies are more appropriate.⁸⁵

Based on Brandt 2014 and other research,⁸⁶ Sierra Club maintains that bottom-up estimates are likely to be inaccurate. Sierra Club states that nothing in Brandt indicates that the

⁸³ *See id.*

⁸⁴ *See id.* at 15-16.

⁸⁵ *See id.* at 16.

⁸⁶ Sierra Club also notes that, on June 19, 2014, after DOE/FE had released the draft Addendum and the LCA GHG Report, a new study by researchers at Carnegie Mellon and the National Oceanic and Atmospheric Administration

broader top-down estimates, such as Miller 2013, are not representative. The 3 percent leakage rate indicated by Miller is more than double the rate used by DOE. Sierra Club recognizes that leakage rate is an output of, rather than an input to, NETL's model. But Sierra Club's maintains that NETL's model produces an output that is so inconsistent with the outputs of other models that there is either a problem with the inputs to NETL's model or with the model itself.⁸⁷

According to Sierra Club, DOE/FE did not provide a rational basis for using the NETL estimates instead of a higher methane leakage rate estimated by such top-down studies.⁸⁸

b. DOE/FE Analysis

The average methane leakage rate estimated in the LCA GHG Report is reasonable. Sierra Club is correct that NETL determined 1.3 percent and 1.4 percent to be the methane leakage rates for natural gas extracted using conventional extraction methods and extracted from the Marcellus Shale, respectively, as shown in Table 5-1 of the LCA GHG Report. But, as DOE/FE has explained, NETL determined that 1.2 percent is the expected "cradle-through-transmission" leakage rate for the *average* mix of domestic natural gas, which includes seven extraction sources. The contribution of the other five sources of domestic natural gas (offshore, associated, tight gas, Barnett Shale, and coal bed methane) lower the average methane leakage to 1.2 percent, below the 1.3 percent and 1.4 percent reported for actual gas extracted using conventional on-shore extraction and from the Marcellus Shale. This means that the extraction,

(NOAA) was published that, Sierra Club claims, concludes that the most likely methane leakage rate is between 2 percent and 4 percent. Rehearing Request at 16-17 n.36 (citing Stefan Scheietzke *et al.*, "Natural Gas fugitive emissions rates constrained by global atmospheric methane and ethane," *Environmental Science & Technology* (June 19, 2014), DOI: 10.1021/es50104c). Although Sierra Club does not explain whether this study used a top-down or bottom-up modeling approach, its assertions regarding the study nevertheless are untimely. Sierra Club did not mention the study in its comments on the LCA GHG Report submitted to DOE/FE on July 21, 2014, and DOE/FE will not consider new evidence on rehearing.

⁸⁷ See Rehearing Request at 17.

⁸⁸ See *id.* at 15.

processing, and transmission of 1 kg of natural gas⁸⁹ in the United States releases 0.012 kg of methane to the atmosphere from the average mix of natural gas produced in the United States (excluding Alaskan production). Thus, NETL's expected value and range on methane emission rates are calculated results that capture the underlying uncertainty and variability of the natural gas system average performance. This approach results in a reasonable estimate and we reject Sierra Club's arguments to the contrary.

We also reject Sierra Club's assertion that NETL's methane leakage rate is significantly lower than those used or calculated by other bottom-up studies. Weber *et al.*⁹⁰ reconciled the boundaries from six studies (including work by NETL and Burnham) and demonstrated that the expected values and uncertainty ranges of NETL's upstream natural gas GHG emissions closely match the results for most other studies.

We likewise reject Sierra Club's argument that DOE/FE should have used a "top-down"⁹¹ approach to derive a methane leakage rate. In the Final Order, DOE/FE responded by noting that researchers are currently working to discern why top-down studies do not match bottom-up studies.⁹² DOE/FE also noted that, as research continues, scientists expect to learn more about the differences between these two types of methodologies.

⁸⁹ As a convention to improve comparability to other studies, NETL expresses leakage rate using delivered natural gas as a denominator; that is, methane emissions per unit of delivered natural gas, not methane emissions per unit of delivered methane.

⁹⁰ Weber, Christopher L., and Christopher Clavin. Life cycle carbon footprint of shale gas: Review of evidence and implications. *Environmental science & technology* 46.11 (2012): 5688-5695. Final Order at 69.

⁹¹ Rehearing Request at 16. For the purposes of this discussion, bottom-up *data* account for emissions at the device level (e.g., liquid unloading equipment, compressors, etc.), and bottom-up *models* aggregate multiple processes to compose a system. In contrast, top-down *data* account for emissions from an entire system (e.g., a sector or geographical region), and top-down *models* apportion system emissions to the products of the system. Currently, the bottom-up models for natural gas systems are based mostly on engineering relationships and represent long-term operating regimes, while top-down models for natural gas systems represent measurements collected for specific regions during narrow time frames. See Final Order at 80.

⁹² See Final Order at 80.

With that caveat in mind, based on the scientific studies available at the time the analysis in this proceeding was performed, our judgment is that bottom-up studies are a more appropriate basis for analysis of methane emissions from U.S. natural gas systems than available top-down studies. The broad boundaries of top-down measurements may capture all emissions from natural gas production facilities within a study region; however, these emissions are not always distinguishable from emissions from nearby oil production activities, or emissions from other sectors that operate in the same region such as agriculture. Further, top-down measurements capture methane emissions only at a particular place and time. Thus, in the Final Order, we discussed the role of temporal and geographical representativeness as potential reasons for the differences between top-down and bottom-up results, while at the same time noting that research into that question is continuing. The top-down studies cited by Sierra Club represent valuable research that advance our understanding of methane emissions, but do not form a robust basis for estimating the leakage rate from U.S. natural gas systems in the aggregate.

2. Global Warming Potential of Methane

a. Sierra Club's Position

Sierra Club claims that the LCA GHG Report erroneously “understates the impact of each ton of methane pollution”⁹³ and that DOE/FE should have used Global Warming Potential (or GWP)⁹⁴ estimates drawn from the IPCC that include climate carbon feedbacks.⁹⁵ Sierra Club contends these estimates would have yielded a 20 percent higher GWP. According to Sierra

⁹³ Rehearing Request at 17.

⁹⁴ Global Warming Potential (GWP) is a measure of how much energy the emissions of one ton of a gas will absorb over a given period of time, relative to the emissions of one ton of carbon dioxide. The larger the GWP, the more that a given gas warms the Earth compared to carbon dioxide over that time period. The time period usually used for GWPs is 100 years. GWPs provide a common unit of measure, which allows analysts to add up emissions estimates of different gases (e.g., to compile a national greenhouse gas inventory), and allows policy-makers to compare emissions-reductions opportunities across sectors and gases. *See* U.S. Environmental Protection Agency, *Understanding Global Warming Potentials*, <http://www.epa.gov/climatechange/ghgemissions/gwps.html>.

⁹⁵ Rehearing Request at 17.

Club, the IPCC has stated that including the climate-carbon feedback for methane and other non-carbon dioxide greenhouse gases—in which an increase in the atmospheric temperature causes a further increase in atmospheric concentration of carbon dioxide—provides a better estimate of the metric value. Sierra Club therefore argues that DOE should have used the IPCC’s “20-year and 100-year fossil methane global warming potentials of 87 and 36, respectively.”⁹⁶ Without providing a calculation or citation, Sierra Club asserts that using a GWP value of 36 for methane increases the life cycle GHG emissions from the scenarios by 20 percent relative to those calculated by NETL using a GWP value of 30.

b. DOE/FE Analysis

The LCA GHG Report addresses an area of scientific study—the study of life cycle GHG emissions—that is constantly evolving. In the Report, NETL acknowledges the wide range of scenario variability, the uncertainty in the underlying modeled data, and other study limitations arising from this subject matter.⁹⁷ As explained below, NETL and DOE/FE made a reasoned evaluation of the scientific facts then-available concerning the potential impacts of U.S. LNG exports on global GHG emissions.

NETL selected the GWP values and other parameters for its LCA GHG Report in the fall of 2013. At that time, working group papers for the IPCC’s Fifth Assessment Report⁹⁸ were available in draft form. For the first time, those analyses produced two sets of GWP values for methane: GWP values based solely on the radiative forcing of methane and GWP values that also included an adder for climate-carbon feedbacks. Based on a perception of uncertainty

⁹⁶ *Id.*

⁹⁷ LCA GHG Report at 18 (“Summary and Study Limitations”).

⁹⁸ IPCC, 2013: Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Stocker, T.F., D. Qin, G.-K. Plattner, M. Tignor, S.K. Allen, J. Boschung, A. Nauels, Y. Xia, V. Bex and P.M. Midgley (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 1535 pp, doi:10.1017/CBO9781107415324.

underlying the climate carbon feedback adders, as well as their novelty and a lack of clear guidance from the IPCC at that time, NETL elected to use the GWP values without the climate carbon feedback adders as it had done in the past. Specifically, the LCA GHG Report uses 20- and 100-year methane GWPs of 85 and 30, respectively—as compared to the GWPs of 87 and 36 when climate carbon effects are included.

We agree with Sierra Club that using 20- and 100-year methane GWPs of 87 and 36 is most appropriate for use today and that climate carbon feedbacks should be captured in the GWP values for methane. Using these values, however, would not have materially affected the conclusions of the LCA GHG Report. Contrary to Sierra Club’s suggestion, there is no one-for-one relationship between the GWP of methane and the total life-cycle GHG impact of U.S.-exported LNG because methane is not the only type of GHG emission. Natural gas energy systems release both methane and carbon dioxide. On a life cycle basis for delivered electricity, combustion at the power plant—which produces carbon dioxide emissions—accounts for the majority of GHG emissions. The following table (Table 2) depicts how the life cycle GHG emissions for three key scenarios in the LCA GHG Report would change depending on whether the 100-GWP for methane was 30 or 36. These changes were calculated by scaling the methane emissions in Figures 6-3 through 6-5 of the LCA GHG Report by a ratio of 36/30.

Table 2: Increase in GHG Emissions by Changing 100-year CH₄ GWP

Scenario	GHG Emissions (kg CO ₂ e/MWh)		% change
	GWP _{CH₄} = 30	GWP _{CH₄} = 36	
Natural gas power using U.S. LNG transported to Rotterdam	629	646	2.8%
Natural gas power using Russian NG transported by pipeline to Rotterdam	612	642	4.9%
Coal power using regional coal	1,089	1,090	0.1%

As this table demonstrates, using the 100-year methane GWP of 36 does not increase the 100-year GWP by 20 percent compared to NETL’s estimates based on a GWP value of 30. Rather, the estimate of GHG emissions resulting from U.S.-exported LNG increases by 2.8%, the estimate for Russian gas increases more, by 4.9%, and the estimate for use of regional coal increases by 0.1%. This change in the GWP estimate would not have made a material difference to the conclusions of the LCA GHG Report and does not warrant re-opening this proceeding to update the LCA GHG Report.

D. Consideration of Climate Impacts

1. Sierra Club’s Position

Sierra Club claims that DOE/FE’s consideration of climate impacts in its public interest analysis was based on unsupported assumptions and failed to place these impacts in the proper context.⁹⁹ In the Final Order, DOE considered whether emissions from U.S.-exported LNG would be offset by displacement of combustion of other fossil fuels and avoidance of associated emissions. Sierra Club maintains that this approach is not the proper way to assess climate

⁹⁹ See Rehearing Request at 20.

impacts and that the United States' international commitments require consideration of domestic GHG emissions without consideration of displaced foreign emissions.¹⁰⁰ In addition, Sierra Club claims that DOE/FE's analysis of climate impacts focuses on the LCA GHG analysis but does not focus on "the simpler problem" represented by FLEX's specific proposal with the majority of output contracted to Japanese buyers.¹⁰¹ Sierra Club asserts that this modeling effort for FLEX's Liquefaction Project would not be unreasonably burdensome or speculative.

Sierra Club also maintains that the available evidence does not support DOE/FE's decision to compare the lifecycle of U.S. LNG solely to coal and other sources of gas. First, Sierra Club asserts that DOE provides no basis for comparing U.S. LNG against coal and natural gas used in China rather than the aggregate GHG intensity of China's generation fleet or, even more appropriately, the average GHG intensity of additional generation capacity that China is expected to add (based on EIA data). According to Sierra Club, DOE cited China's 2012 generation capacity, which was composed of 66 percent coal and 3 percent natural gas. Sierra Club maintains that it would have been reasonable to assume that U.S. LNG would be more likely to compete against sources of new capacity rather than existing sources, and states that the new capacity will be more than 50 percent renewables and, therefore, will have a significantly lower GHG intensity than DOE's estimate even under a 100-year GWP.¹⁰²

Second, in the case of Japan, Sierra Club states that DOE did not forecast future Japanese generation even though this information is available. Sierra Club contends that DOE/FE has an obligation to seek out the environmental effects of the proposed project. However, Sierra Club states that the data of the International Energy Agency on which EIA relied indicates that the

¹⁰⁰ *See id.* at 20-21.

¹⁰¹ Rehearing Request at 21.

¹⁰² *See id.*

GHG intensity of Japan's aggregate mix is very near NETL's estimate of the intensity of U.S. LNG. Therefore, Sierra Club maintains that correcting any of the errors in NETL's assessment would likely lead to the conclusion that U.S. LNG has higher life-cycle emissions than the energy that U.S. LNG would likely displace in Japan.¹⁰³

2. DOE/FE Analysis

The Department has thoroughly reviewed the GHG impacts of its decision. At the project level, the EIS describes direct GHG emissions resulting from the construction and operation of the FLEX Terminal, including the liquefaction process.¹⁰⁴ The Addendum contains a chapter devoted to GHG emissions and includes a range of estimates from the scientific literature of the GHGs emitted by producing and transporting natural gas from unconventional resources.¹⁰⁵ Finally, the LCA GHG Report analyzes the life-cycle GHGs emitted from U.S.-exported LNG that is re-gasified and combusted for electric power generation in Europe or Asia. The LCA GHG Report compares the life-cycle GHGs of U.S.-exported LNG to those of LNG exported from other producing countries, pipeline gas delivered from Russia, and domestic coal burned in both Europe and Asia.¹⁰⁶

It is useful to compare the life-cycle GHG emissions of U.S.-exported LNG to other forms of generation because U.S.-exported LNG has the potential to displace other fuels and thus to avoid the emissions associated with burning those fuels. Sierra Club argues that the Department should have focused on the emissions solely within the United States because of the importance of the United States' international emissions reductions commitments. On the record before us, however, Sierra Club has provided no basis to support its contention that FLEX's

¹⁰³ See *id.* at 21-22.

¹⁰⁴ Final EIS at 4-204 to 4-224.

¹⁰⁵ See Addendum at 33-44.

¹⁰⁶ See Final Order at 90-94.

proposed exports, or U.S. LNG exports in general, will have a material effect on the ability of the United States to fulfill economy-wide emissions reductions targets.

The comparison cases used in the LCA GHG Report were well-chosen. When U.S.-exported LNG enters the marketplace, it will compete with LNG sourced from other countries. Therefore, the comparison of U.S.-sourced LNG to foreign-sourced LNG is clearly instructive. U.S.-exported LNG also will compete directly with pipeline deliveries from Russia in some markets, another form of “gas-on-gas” competition. Recognizing that the availability of U.S.-exported LNG may affect the electric power generation mix in importing countries, the LCA GHG Report also compared U.S.-exported LNG to coal produced domestically in both Europe and Asia. This comparison is likewise instructive because, as the Department explained in the Final Order, coal remains a prevalent choice for electric power generation in LNG-importing countries and competes with natural gas as a source of baseload power.¹⁰⁷

It is important, however, to recognize the Department’s limited aims in making these comparisons. In the Final Order, the Department made clear that the comparisons to coal and foreign-sourced gas in the LCA GHG Report did not themselves answer the ultimate question of how U.S. LNG exports would affect the global GHG balance because U.S. LNG could compete with other resources as well.¹⁰⁸ The Department explained that, given the prevalence of coal and natural gas as sources of electric generation in LNG-importing countries, the comparison nonetheless provided useful information. Looking at the record before it, the Department concluded only that it did “not see a reason to conclude that U.S. LNG exports will significantly exacerbate global GHG emissions.”¹⁰⁹

¹⁰⁷ *See id.* at 93.

¹⁰⁸ *See id.* at 92.

¹⁰⁹ *Id.* at 94.

The Department also explained why it was not attempting a more precise prediction regarding global GHG impacts. The Department explained that the compounded uncertainties in estimating how the availability of U.S. LNG exports would affect the market for every potential energy source in every importing country, along with the interventions of foreign governments in those markets, would render such an analysis too speculative to inform its public interest determination.¹¹⁰ In its rehearing petition, Sierra Club suggests alternative comparisons the Department could have used to approach the difficult question of how U.S. LNG exports would affect the global GHG balance. For one, Sierra Club states that the Department could have analyzed FLEX's specific LNG export proposal. With the majority of FLEX's proposed output of LNG contracted to Japanese buyers, Sierra Club suggests that DOE should have focused solely on Japan, which Sierra Club characterizes as a "simpler problem."¹¹¹ We disagree. Focusing solely on Japan is a "simpler problem" only because it ignores that there is a global market for LNG. Even if *all* U.S.-exported LNG went to Japan, those exports would affect the global price of LNG, which in turn would affect energy systems in numerous countries, not only Japan.

Sierra Club also suggests that the Department should have compared the lifecycle GHG emissions of U.S.-exported LNG to those of the average new facility in China. But Sierra Club does not explain why this would be an appropriate comparison. To the extent that U.S.-exported LNG lowers the price of natural gas in a given country, that price change could affect dispatch and retirement decisions facing existing units as well as decisions of what new units to build. Moreover, even with respect to new capacity, it may not be valid to assume that natural gas

¹¹⁰ *See id.* at 93.

¹¹¹ Rehearing Request at 21.

would compete directly with renewables in all nations given the potential intervention of public policy and the different role these resources play in an integrated electric system.

IV. CONCLUSION

We find that it has not been shown that a grant of the requested authorization is inconsistent with the public interest. We affirm our previous finding that the Application should be granted subject to the terms and conditions set forth in the Final Order.

V. ORDER

Pursuant to sections 3 and 19 of the Natural Gas Act, and for the reasons set forth above and in Order Nos. 3357, 3357-B, and the ROD, it is ordered that:

- A. FLEX's Motion for Leave to Answer to Sierra Club's Request for Rehearing is granted.
- B. Sierra Club's Request for Rehearing is denied.

Issued in Washington, D.C., on December 4, 2015.



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