UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY

OFFICE OF FOSSIL ENERGY

PIERIDAE ENERGY (USA) LTD.	)	FE DOCKET NO. 14-179-LNG

OPINION AND ORDER GRANTING LONG-TERM, MULTI-CONTRACT AUTHORIZATION TO EXPORT U.S.-SOURCED NATURAL GAS BY PIPELINE TO CANADA FOR LIQUEFACTION AND RE-EXPORT IN THE FORM OF LIQUEFIED NATURAL GAS TO NON-FREE TRADE AGREEMENT COUNTRIES

DOE/FE ORDER NO. 3768

FEBRUARY 5, 2016

TABLE OF CONTENTS

FREQUENTLY USED ACRONYMS

AEO	Annual Energy Outlook
API	American Petroleum Institute
Bcf/d	Billion Cubic Feet per Day
Bcf/yr	Billion Cubic Feet per Year
CH_4	Methane
CO_2	Carbon Dioxide
DOE	U.S. Department of Energy
EIA	U.S. Energy Information Administration
EITE	Energy Intensive, Trade Exposed
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., *et al.*
FTA	Free Trade Agreement
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GNGM	Global Natural Gas Model
GWP	Global Warming Potential
IECA	Industrial Energy Consumers of America
kWh	Kilowatt-Hour
LNG	Liquefied Natural Gas
MassPLAN	Massachusetts Pipeline Awareness Network
Mcf	Thousand Cubic Feet
MMBtu	Million British Thermal Units
NED	Proposed Northeast Energy Direct Pipeline
NEES	Northeast Energy Solutions, Inc.
NEMS	National Energy Modeling System
NEPA	National Environmental Policy Act
NERA	NERA Economic Consulting
NGA	Natural Gas Act
NGL	Natural Gas Liquid
NOx	Nitrogen Oxides
TRR	Technically Recoverable Resources
VOC	Volatile Organic Compound

I. INTRODUCTION

On October 24, 2014, Pieridae Energy (USA) Ltd. (Pieridae US) filed an application (Application)[1] with the Office of Fossil Energy (FE) of the Department of Energy (DOE) under section 3 of the Natural Gas Act (NGA).[2] The Application requests long-term, multi-contract authorization to export natural gas from the United States to Canada and, after liquefaction in Canada, to re-export[3] the U.S.-sourced natural gas in the form of liquefied natural gas (LNG) to other countries as described below, in a combined total volume equivalent to 292 billion cubic feet per year (Bcf/yr) of natural gas, or 0.8 Bcf per day (Bcf/d). Pieridae US, a Canadian corporation,[4] states that the U.S.-sourced natural gas will be exported to Canada at the United States-Canada border near Baileyville, Maine, at the juncture of the Maritimes & Northeast (M&N) US Pipeline and the M&N Canada Pipeline (collectively, the M&N Pipeline).[5]

Pieridae US seeks to export this volume of U.S.-sourced natural gas in any allocation among the following three "specified purposes":

(i) To use as feedstock in a proposed Canadian natural gas liquefaction facility called the Goldboro LNG Project—to be developed by one or more Pieridae affiliates

[1] Pieridae Energy (USA) Ltd., Application for Long-Term, Multi-Contract Authorization to Export Natural Gas into Canada for Consumption and Through Canada to Free Trade and Non-Free Trade Agreement Nations after Conversion into LNG, FE Docket No. 14-179-LNG (Oct. 24, 2014) [hereinafter Pieridae US App.]. Pieridae US also filed two supplements to the Application, as described *infra* § IV.D. The information contained in those supplements is reflected in the description of the Application herein.

[2] 15 U.S.C. § 717b. The authority to regulate the imports and exports of natural gas, including liquefied natural gas, under section 3 of the NGA (15 U.S.C. § 717b) has been delegated to the Assistant Secretary for FE in Redelegation Order No. 00-006.02 issued on November 17, 2014.

[3] For purposes of this Order, "re-export" means to ship or transmit U.S.-sourced natural gas in its various forms (gas, compressed, or liquefied) subject to DOE/FE's jurisdiction under the Natural Gas Act, 15 U.S.C. § 717b, from one foreign country *(i.e.*, a country other than the United States) to another foreign country.

[4] Pieridae US states that it filed the Application in its capacity as the sole general partner of Goldboro LNG Limited Partnership II, a limited partnership formed under the laws of the Province of Alberta, Canada. Pieridae US App. at 5; *see infra* § IV.A.

[5] The M&N US Pipeline system is a 690-mile long cross-border pipeline owned and operated by Maritimes & Northeast Pipeline, L.L.C., a Delaware limited liability company (Maritimes) in the United States, and by Maritimes's Canadian pipeline affiliate, Maritimes & Northeast Pipeline Limited Partnership, in Canada. The M&N Pipeline transports natural gas from a point near Goldboro, Nova Scotia, to the Canadian-United States border and through the northeastern states of Maine and New Hampshire, with one terminus in Dracut, Massachusetts, and another in Beverly, Massachusetts.

and to be located in the Municipality of the District of Guysborough County Guysborough County, Nova Scotia, Canada—and for other potential uses in Canada;

(ii) To use as feedstock in the Goldboro LNG Project, where the U.S.-sourced natural gas is liquefied, then re-exported as LNG from Canada by vessel to one or more countries with which the United States has a free trade agreement requiring national treatment for trade in natural gas (FTA countries),[6] and

(iii) To use as feedstock in the Goldboro LNG Project, where the U.S.-sourced natural gas is liquefied, then re-exported as LNG from Canada by vessel to any other country with which trade is not prohibited by U.S. law or policy (non-FTA countries).[7]

According to Pieridae US, the Goldboro LNG Project will be capable of producing the equivalent of approximately 487 Bcf/yr (1.33 Bcf/d) of pipeline-quality natural gas.

On May 22, 2015, in DOE/FE Order No. 3639, DOE/FE granted the portion of Pieridae US's Application requesting long-term authority to export U.S.-sourced natural gas to Canada and to other FTA countries, pursuant to NGA section 3(c), 15 U.S.C. § 717b(c).[8] Under the terms of that FTA order, Pieridae US is authorized to export natural gas to Canada by pipeline for end use[9] in Canada, and to re-export the U.S.-sourced natural gas, after liquefaction in

[6] The United States currently has FTAs requiring national treatment for trade in natural gas with Australia, Bahrain, Canada, Chile, Colombia, Dominican Republic, El Salvador, Guatemala, Honduras, Jordan, Mexico, Morocco, Nicaragua, Oman, Panama, Peru, Republic of Korea, and Singapore. FTAs with Israel and Costa Rica do not require national treatment for trade in natural gas.

[7] *See* Pieridae US App. at 4 n.4 ("Pieridae US's request is for authorization to export up to 292 Bcf/yr of natural gas in the aggregate, divided in any manner it chooses between [its] Specified Purposes.").

[8] *Pieridae Energy (USA) Ltd*., DOE/FE Order No. 3639, FE Docket No. 14-179-LNG, Order Granting Long-Term, Multi-Contract Authorization to Export Natural Gas to Canada and to Other Free Trade Agreement Nations (May 22, 2015) [hereinafter Pieridae US FTA Order], *discussed infra* § IV.D.

[9] For purposes of DOE/FE Order No. 3639 and this Order, "end use" is defined as combustion or other chemical reaction conversion process (*e.g*., conversion to methanol). *See* Pieridae US FTA Order at 3 n.7.

Canada, to other FTA countries for end use in FTA countries, in a total combined volume of 292 Bcf/yr of natural gas (the same volume requested in the non-FTA portion of the Application).[10]

In this Order, we review the portion of the Application requesting long-term authorization to export U.S.-sourced natural gas by pipeline to Canada for liquefaction and re-export in the form of LNG from Canada to non-FTA countries, pursuant to NGA section 3(a), 15 U.S.C. § 717b(a). Pieridae US requests this export authorization for a 20-year term to commence on the earlier of the date of first export or seven years from the date the authorization is granted (February 5, 2023). Pieridae also requests this authorization on its own behalf and as agent for other entities, including but not limited to its affiliate Pieridae Energy (Canada) Ltd. (Pieridae CA), which will hold title to the U.S-sourced natural gas at the time it is re-exported in the form of LNG from Canada to non-FTA countries.[11]

For the reasons discussed below, this Opinion and Order authorizes Pieridae US to export U.S.-sourced natural gas to Canada—using the existing pipeline capacity of the M&N US Pipeline—for liquefaction at the proposed Goldboro LNG Project, and to re-export the U.S.-sourced natural gas in the form of LNG to non-FTA countries, and/or to FTA countries for end use in non-FTA countries, up to the requested total volume of 292 Bcf/yr (0.8 Bcf/d). In so ruling, we observe that Section 3 of the NGA differentiates between exports of natural gas to non-FTA countries and exports to FTA countries. In determining whether an export is to a FTA or non-FTA country, DOE/FE must look to the trade status of the country in which the natural gas or LNG is delivered for end use. To do otherwise would allow exporters to evade the public interest review and opportunity for public participation afforded in non-FTA export proceedings under NGA section 3(a), simply by transiting the natural gas or LNG through a FTA country en

[10] *See id.* at 3, 12.
[11] *See* Pieridae Energy (USA) Ltd., Supplement to Application, FE Docket No. 14-179-LNG, at 3-4 (May 8, 2015) [hereinafter First Supp. to Pieridae US App.]; *see also infra* § IV.D. (Procedural History).

route to a non-FTA country. We do not believe Congress intended the dual-track scheme it created in the NGA to be so easily evaded.

We emphasize that this authorization is limited to volumes that can be exported using the existing capacity of the M&N US Pipeline. As discussed in Section XI.B.2, we find that the current capacity of the cross-border facilities of the M&N US Pipeline is 833,317 dekatherms per day (Dth/d), as set forth in two orders issued to Maritimes & Northeast Pipeline, L.L.C. (Maritimes) by the Federal Energy Regulatory Commission (FERC) in 2007 and 2009, respectively.[12] The existing capacity at the cross-border facilities thus is capable of accommodating the full volume of exports requested by Pieridae US in this proceeding (0.8 Bcf/d of natural gas).[13] On the other hand, the 2007 and 2009 FERC Orders do not clearly establish the capacity of the other segments of the M&N US Pipeline that would be used to transport natural gas in a northerly direction from Dracut, Massachusetts, to the cross-border facilities. The Application itself states that the M&N Pipeline's cross-border capacity is 440,000 Dth/d,[14] but this assertion does not demonstrate the capacity of the Pipeline to transport natural gas north from Dracut. It may be, as intervenors and commenters have alleged, that Maritimes will be incentivized to make capacity additions partly or wholly in response to the demand enabled by this and similar export authorizations. Those facts cannot be ascertained on the record before us. Insofar, however, as DOE/FE export authorizations are likely to lead to the expansion of the capacity of the M&N US Pipeline or the construction or expansion of other

[12] *See* Maritimes & Northeast Pipeline, L.L.C., Order Amending Presidential Permit and Authorization Under Section 3 of the Natural Gas Act, 128 FERC ¶ 61,070 (July 21, 2009) [hereinafter FERC 2009 Order]; Maritimes & Northeast Pipeline, L.L.C., Order Issuing Certificate and Amending Presidential Permit, 118 FERC ¶ 61,137 (Feb. 21, 2007) [hereinafter FERC 2007 Order].

[13] DOE/FE estimates the current physical capacity of the M&N US Pipeline at the United States-Canada border is 0.81 Bcf/d of natural gas, based on the capacity of 833,317 Dth/d in the FERC 2009 Order and the most recent average annual heat content of delivered natural gas in the United States of 1,030 Btu/cubic foot according to the U.S. Energy Information Administration.

[14] Pieridae US App. at 17 n.22.

cross-border pipelines for purposes of non-FTA exports, DOE/FE is responsible for assessing the impacts of such expansions as part of its public interest review under NGA section 3(a) and NEPA. Therefore, to ensure that DOE/FE has an opportunity to review the public interest and environmental impacts of any such capacity additions or the use of other existing or new pipelines with cross-border facilities, this authorization requires Pieridae US to submit a new export application with DOE/FE should it propose to export natural gas using new capacity not presently in existence on the M&N US Pipeline, or if it proposes to use capacity on newly constructed or upgraded cross-border pipelines.[15] Pipeline capacity will be considered "new" or "upgraded" for purposes of this limitation if it is the result of physical changes that increase the northbound capacity of such a pipeline and any such changes require an amendment to the pipeline's certificate issued by FERC under NGA section 7, 15 U.S.C. §717f. In the event that such a certificate proceeding is required and a new application is filed, DOE may participate in the FERC-led NEPA review, as it typically does in proceedings involving LNG export facilities pursuant to NGA section 15, 15 U.S.C. §717n.

DOE/FE Proceeding. On December 10, 2014, DOE/FE published a Notice of Pieridae US's Application in the Federal Register.[16] The Notice of Application called on interested

[15] Concurrently with this Order, we are issuing an order to Bear Head LNG Corporation and Bear Head LNG (USA), LLC (collectively, Bear Head LNG) granting it long-term authority to export U.S.-sourced natural gas through Canada to non-FTA countries (and/or to FTA countries for end use in non-FTA countries) after liquefaction in Canada. *See Bear Head LNG Corp. & Bear Head LNG (USA), LLC*, DOE/FE Order No. 3770, FE Docket No. 15-33-LNG, Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export U.S.-Sourced Natural Gas by Pipeline to Canada for Liquefaction and Re-Export In the Form of Liquefied Natural Gas to Non-Free Trade Agreement Countries (Jan. 29, 2015). Because both Pieridae US and Bear Head LNG propose to use the M&N US Pipeline to transport U.S.-sourced natural gas to Canada, we are limiting the combined authorized export volume in this Order and the Bear Head LNG order (DOE/FE No. 3770) to a total of 0.81 Bcf/d of natural gas—the capacity of the cross-border facilities and the existing Presidential Permit. We are attaching a similar condition to the Bear Head LNG authorization requiring the submission of a new export application should the M&N US Pipeline seek to increase its capacity in the future due in whole or in part to export operations. Therefore, the non-FTA export volumes in this Order and the Bear Head LNG order are not additive to one another.

[16] Pieridae Energy (USA) Ltd., Application for Long-Term Authorization to Export Domestically Produced Natural Gas Through Canada to Non-Free Trade Agreement Countries After Liquefaction to Liquefied Natural Gas for a 20-Year Period, 79 Fed. Reg. 73,285 (Dec. 10, 2014) [hereinafter Pieridae US Notice of Application].

persons to submit protests, motions to intervene, notices of intervention, and comments no later than 4:30 p.m., Eastern time, on February 9, 2015. In response to the Notice of Application, DOE/FE received the following: (i) 31 filings characterized as motions for leave to intervene and/or protest; and (ii) 151 comments, of which three supported the Application, 140 opposed the Application, and eight took no position.[17] We have determined, based in part on Pieridae US's opposition to certain filings, that 27 of the 31 filings characterized as motions for leave to intervene and/or protest fail to comply with DOE/FE's procedures set forth in 10 C.F.R. § 590.103(b). Below, we reject these 27 filings as motions for leave to intervene and/or protest, and instead accept them as comments opposing the Application. Additional procedural history is set forth below. *See infra* §§ VII, XI.

Previously, on May 20, 2011, 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 states to non-FTA countries.[18] In that order, DOE/FE conditionally authorized Sabine Pass to export a volume of LNG equivalent to 2.2 Bcf/d of natural gas.

By August 2011, with other non-FTA export applications then pending before it, DOE/FE determined that further study of the economic impacts of LNG exports was warranted to better inform its public interest review under section 3 of the NGA.[19] Accordingly, DOE/FE

[17] Of the 150 comments submitted to DOE/FE, 18 comments were filed past the 4:30 p.m. deadline on February 9, 2015. Nonetheless, because Pieridae US did not oppose these late-filed comments, and because they were filed on the last day of the comment period, we accept them into the record of this proceeding. *See infra* § VII.A.1.

[18] *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 (May 20, 2011) [hereinafter *Sabine Pass*]. In August 2012, DOE/FE granted 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).

[19] DOE/FE stated in *Sabine Pass* that it "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." DOE/FE Order No. 2961 at 33.

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.[20]

First, in August 2011, DOE/FE requested that EIA assess how prescribed levels of natural gas exports above baseline cases could affect domestic energy markets. Using its National Energy Modeling System (NEMS), 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 projections from EIA's 2011 *Annual Energy Outlook* (AEO 2011), the most recent EIA projections available at the time.[21] The new scenarios and cases examined by EIA included a variety of supply, demand, and price outlooks. EIA published its study, *Effect of Increased Natural Gas Exports on Domestic Energy Markets* (EIA Study), in January 2012.[22] As discussed below, EIA generally found that LNG exports will lead to higher domestic natural gas prices, increased domestic natural gas production, reduced domestic natural gas consumption, and increased natural gas imports from Canada via pipeline.

Second, DOE contracted with NERA to assess the potential macroeconomic impact of LNG exports by incorporating EIA's then-forthcoming case study output from the NEMS model into NERA's general equilibrium model of the U.S. economy. 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.[23] Among its key findings, NERA projected that the United States would gain net economic benefits from

[20] *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).
[21] The Annual Energy Outlook (AEO) presents long-term projections of energy supply, demand, and prices. It is based on results from EIA's NEMS model. *See infra* §§ V.A.1, VIII.A.
[22] *See* 2012 LNG Export Study – Related Documents, *available at* http://energy.gov/fe/downloads/lng-export-study-related-documents (EIA Analysis (Study - Part 1)).
[23] *See id*. (NERA Economic Consulting Analysis (Study - Part 2)).

allowing LNG exports. For every market scenario examined, net economic benefits increased as the level of LNG exports increased.[24]

On December 11, 2012, DOE/FE published a Notice of Availability (NOA) of the EIA and NERA Studies (collectively, the 2012 LNG Export Study or Study).[25] DOE/FE invited public comment on the LNG Export Study, and stated that its disposition of the then-pending non-FTA LNG export applications would be informed by the Study and the comments received in response thereto.[26] The NOA required initial comments by January 24, 2013, and reply comments between January 25 and February 25, 2013.[27] DOE/FE received over 188,000 initial comments and over 2,700 reply comments, of which approximately 800 were unique.[28] The comments also included 11 economic studies prepared by commenters or organizations under contract to commenters.

The public comments represent a diverse range of interests and perspectives, including those of federal, state, and local political leaders; large public companies; public interest organizations; academia; industry associations; foreign interests; and thousands of U.S. citizens. While the majority of comments were short letters expressing support or opposition to the 2012 LNG Export Study or to LNG exports in general, others contained detailed statements of differing points of views. The comments were posted on the DOE/FE website and entered into the public records of several then-pending non-FTA LNG export proceedings.[29] As discussed below,

[24] *See infra* § V.B.
[25] 77 Fed. Reg. at 73,627.
[26] *Id*. at 73,628.
[27] *Id*. at 73,627. On January 28, 2013, DOE issued a Procedural Order accepting for filing any initial comments that had been received as of 11:59 p.m., Eastern time, on January 27, 2013.
[28] Because many comments were nearly identical form letters, DOE/FE organized the initial comments into 399 docket entries, and the reply comments into 375 entries. *See* http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/export_study_initial_comments.html (Initial Comments – 2012 LNG Export Study) & http://www.fossil.energy.gov/programs/gasregulation/authorizations/export_study/export_study_reply_comments.html (Reply Comments – 2012 LNG Export Study).
[29] *See* 77 Fed. Reg. at 73,629 & n.4.

DOE/FE has carefully examined the comments and has considered them in its review of Pieridae US's Application, to the extent relevant.

Additionally, 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).[30] DOE/FE received comments on the Draft Addendum and, on August 15, 2014, issued the final Addendum (hereafter Addendum) with its response to the public comments contained in Appendix B.[31]

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. *See infra* § X.A. 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*

[30] 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.

[31] 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). *See infra* § IX.

Liquefied Natural Gas from the United States (LCA GHG Report).[32] DOE/FE also received public comment on the LCA GHG Report, and provides its response to those comments in this Order. *See infra* § X.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.[33] As explained below, neither the Addendum nor the LCA GHG Report are required by the National Environmental Policy Act (NEPA), 42 U.S.C. § 4321 *et seq.*, 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.

DOE/FE's Categorical Exclusion Under NEPA. On January 28, 2016, DOE/FE issued a categorical exclusion from the preparation of an environmental impact statement or environmental assessment under NEPA for the proposed exports. (Categorical Exclusion).[34] Specifically, DOE/FE applied categorical exclusion B5.7 of DOE/FE's regulations (10 C.F.R. Part 1021, Subpart D, Appendix B5). This exclusion applies to natural gas import or export activities requiring minor operational changes to existing projects, but no new construction. As discussed below, this Order grants Pieridae US's Application, in part, on the basis of this Categorical Exclusion, but does not apply to any future construction or operational changes to expand the capacity of the M&N US Pipeline or other facilities located within the United States caused either in whole or in part by Pieridae US's export operations.

[32] 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.
[33] *See* Pieridae US Notice of Application, 79 Fed. Reg. at 73,286.
[34] U.S. Dep't of Energy, Categorical Exclusion Determination, *Pieridae Energy (USA) Ltd.*, FE Docket No. 14-179-LNG (Jan. 28, 2016) [hereinafter Categorical Exclusion].

II. SUMMARY OF FINDINGS AND CONCLUSIONS

This Order presents DOE/FE's findings and conclusions on all issues associated with Pieridae US's proposed re-exports under NGA section 3(a), both environmental and non-environmental.[35] As the basis for this Order, DOE/FE has reviewed a substantial administrative record that includes (but is not limited to) Pieridae US' Application and supplements to the Application; the numerous public comments, motions to intervene, and protests filed in opposition to or in support of the Application; the 2012 LNG Export Study; the Addendum; the LCA GHG Report; and public comments received on DOE/FE's various analyses. Based on that record and for the reasons set forth below, DOE/FE has determined that opponents of the Application have not demonstrated that the proposed exports will be inconsistent with the public interest, as would be required to deny the Application under NGA section 3(a).

On this basis, DOE/FE authorizes Pieridae US to export U.S.-sourced natural gas for the purpose of liquefying the gas in Canada and re-exporting that natural gas in the form of LNG from the proposed Goldboro LNG Project to non-FTA countries (or for end use in non-FTA countries) in a volume equivalent to 0.8 Bcf/d of natural gas. Because Pieridae US's proposed re-exports fall within the scope of a categorical exclusion under NEPA, the authorization issued by this Order is subject to the Terms and Conditions and Ordering Paragraphs set forth herein, but is not conditioned on additional environmental analysis or review. *See infra* §§ XII-XIV.

III. PUBLIC INTEREST STANDARD

Section 3(a) of the NGA sets forth the standard for review of Pieridae US'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

[35] As discussed below, the non-environmental issues primarily include economic and international impacts associated with the proposed exports, as well as security of the natural gas supply in the United States. *See infra* § III (public interest standard).

> secured an order of the [Secretary of Energy[36]] 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 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 the presumption is rebutted by an affirmative showing of inconsistency with the public interest.[37]

Although 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,[38] among others. To conduct this review, DOE/FE looks to record evidence developed in the application proceeding.[39]

DOE/FE's prior decisions have also looked to certain principles established in its 1984 Policy Guidelines.[40] The goals of the Policy Guidelines are to minimize federal control and

---

[36] 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.

[37] *See, e.g., Sabine Pass*, Order No. 2961, at 28; *Phillips Alaska Natural Gas Corp. & Marathon Oil Co.*, DOE/FE Order No. 1473, Order Extending Authorization to Export Liquefied Natural Gas from Alaska, at 13 (April 2, 1999), citing *Panhandle Producers & Royalty Owners Ass'n v. ERA*, 822 F.2d 1105, 1111 (D.C. Cir. 1987).

[38] Insofar as environmental impacts are concerned, we note that 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 obtain information relating to the environmental impacts that may result from its decisions and to take a "hard look" at those impacts pursuant to 42 U.S.C. § 4332. The rebuttable presumption has no bearing on these NEPA obligations and consequently does not affect the Department's performance of those obligations in individual proceedings.

[39] *See, e.g., Sabine Pass*, DOE/FE Order No. 2961, at 27-42 (reviewing record evidence in issuing conditional authorization).

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

involvement in energy markets and to promote a balanced and mixed energy resource system. The Guidelines provide that:

> The market, not government, should determine the price and other contract terms of imported [or exported] gas …. The federal government's primary responsibility in authorizing imports [or exports] should 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.[41]

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.[42]

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 section 3 of the NGA, 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."[43] In February 1989, the Assistant Secretary for Fossil Energy assumed the delegated responsibilities of the Administrator of ERA.[44]

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.

---

[41] *Id*. at 6685.
[42] *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, 71,128 (1989)).
[43] DOE Delegation Order No. 0204-111, at 1; *see also* 49 Fed. Reg. at 6690.
[44] *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 the portion of the Application subject to this Order, Pieridae US requests long-term, multi-contract authorization to export up to 292 Bcf/yr of U.S.-sourced natural gas. Pieridae US states that it expects to use this U.S-sourced natural gas as follows: (i) once Train 2 of the Goldboro LNG Project (described below) commences commissioning, to use a portion of the U.S-sourced natural gas as feedstock in the production of LNG, where the LNG produced from such feedstock will be re-exported from Canada to non-FTA countries; and (ii) to use in Canada a portion of the natural gas as a source of energy in the production of energy applied, in whole or in part, to operate the Goldboro LNG Project and for other potential uses that constitute consumption in Canada for purposes other than as feedstock in the Goldboro LNG Project.[45]

A. Description of Applicant

Pieridae US is a corporation formed under the federal laws of Canada. Pieridae US states that it filed the Application in its capacity as the sole general partner of Goldboro LNG Limited Partnership II, a limited partnership formed under the laws of the Province of Alberta, Canada.

Both Pieridae US and Goldboro LNG Limited Partnership II are controlled by Pieridae Energy Limited, which owns all of Pieridae US's capital stock and all of the limited partner interests in Goldboro LNG Limited Partnership II. Pieridae Energy Limited is a privately held corporation formed under the federal laws of Canada.

Pieridae US's affiliate Pieridae Energy (Canada) Ltd. (Pieridae CA) is also a corporation formed under the federal laws of Canada. It is the sole general partner of Goldboro LNG Limited Partnership, formed under the laws of the Province of Alberta, Canada. Pieridae Energy

[45] Pieridae US App. at 4 (Specified Purposes (b) and (c)), 9; *see also* Letter from E. Swensen, Counsel for Pieridae US, to John Anderson, DOE/FE, Request to Correct Errata in DOE/FE Order No. 3639, FE Docket No. 14-179-LNG, at 2 (June 17, 2015) (clarifying that Pieridae US will use the U.S.-sourced natural gas "either for use asfeedstock in the production of LNG from Train 2 [of the proposed Goldboro LNG Project] for export to its customers or for sale, in whole or in part, to one or more other entities, including Pieridae CA").

Limited owns substantially all of the shares in Pieridae CA and substantially all of the limited partner interests in Goldboro LNG Limited Partnership.

Pieridae US states that the principal business offices of Pieridae Energy Limited and its subsidiary corporations are located in Halifax, Nova Scotia.

On December 18, 2015, Pieridae US filed a Notice of Change in Control and Amendment to Application to notify DOE/FE about a change in control of an upstream entity indirectly holding a 10% or greater interest in Pieridae US. Pieridae US states that, as a result of a transaction that occurred on December 1, 2015, ORLEN Upstream Canada Ltd. (a Canadian corporation) now holds indirect ownership of approximately 10.77 percent of Pieridae US's outstanding shares.[46] Pieridae US remains wholly-owned by Pieridae Energy Limited.

B. Liquefaction Project

Pieridae US states that the proposed exports of U.S.-sourced natural gas to Canada would be made from a point located near Baileyville, Maine, on the M&N US Pipeline at or near meter station ID 30014.[47] The natural gas would be transported from the export point through the M&N Canada Pipeline, which extends from the Canadian side of the proposed export point throughout the Provinces of New Brunswick and Nova Scotia, including to a point immediately adjacent to the proposed Goldboro LNG Project. The Goldboro LNG Project is to be located at the Goldboro Industrial Park in the Municipality of the District of Guysborough County, Nova Scotia. Pieridae US states that the construction and operation of the Goldboro LNG Project are necessary to move the natural gas beyond Canada to serve overseas markets.

[46] Pieridae Energy (USA) Ltd., Notice of Change in Control and Amendment to Application, FE Docket No. 14-179-LNG at 2 (Dec. 18, 2015) (stating that CEX Atlantic Holdings Ltd. owned and continues to own approximately 10.77 percent of Pieridae US's outstanding shares, and that CEX Atlantic's parent company—Kicking Horse Energy Inc.—was acquired by ORLEN Upstream Canada Ltd. on December 1, 2015, and thus acquired indirect ownership of these shares of Pieridae US).

[47] A map showing the location of the export point and a map of the M&N Pipeline are provided with the Application as Appendices A and B, respectively.

According to Pieridae US, the Goldboro LNG Project will be capable of producing approximately 10 million metric tons per annum (mtpa) of LNG, which it states is equivalent to approximately 487 Bcf/yr of natural gas (1.33 Bcf/d). Pieridae US states that the Goldboro LNG Project will have two substantially identical liquefaction production facilities, known as LNG Trains 1 and 2; natural gas treatment and compression equipment; LNG storage and marine loading facilities; and ancillary facilities. Additionally, Goldboro will have at least two full containment, cryogenic, LNG storage tanks, each with a capacity of up to 230,000 cubic meters. The maximum on-site LNG storage capacity will be equivalent to approximately 9.7 Bcf of natural gas. Marine loading facilities (including two LNG ship loading berths) and other common facilities are described in the Application.

Pieridae US states that each LNG train will have the capability of producing approximately five mtpa of LNG. The use of the production capacity for Train 1 will be reserved for Pieridae CA, and the use of the production capacity of Train 2 will be reserved for Pieridae US.[48] According to Pieridae US, the amount of LNG to be produced by the Goldboro LNG Project and the amount of U.S.-sourced natural gas that will be used as feedstock in Train 2 to produce the LNG will vary with demand for LNG abroad, the availability and cost of U.S. natural gas, and other factors.[49]

C. M&N Pipeline

Pieridae US intends to export the U.S.-sourced natural gas subject to the requested authorization from the United States to Canada via the M&N Pipeline. According to Pieridae US, the M&N Pipeline is approximately 889 miles in length, and consists of a main pipeline and

[48] Pieridae US states that, although the amount of natural gas to be exported from the United States by Pieridae US pursuant to the requested authorization does not "precisely coincide" with the amount of LNG to be produced by Train 2, "Train 2's feed requirements are expected to represent a substantial amount of the demand for the natural gas exported from the United States by Pieridae US." Pieridae US App. at 10.

[49] *See id*.

several laterals. The Pipeline connects Dracut, Massachusetts, in the United States to Halifax, Goldboro, and Point Tupper, Nova Scotia, in Canada.[50]

Pieridae US states that the portion of the Pipeline located in the United States—the M&N US Pipeline—is approximately 346 miles in length.[51] Pieridae US notes that, on July 21, 2009, FERC issued an order amending the Presidential Permit and authorization under NGA section 3 for the Pipeline's cross-border facilities.[52] Citing FERC's 2009 Order, Pieridae US states that, "[t]he maximum capacity specified by the Presidential Permit is 440,000 dekatherms ("dth")/d, whereas the amount proposed to be exported by Pieridae US is equivalent to an average daily throughput of 829,000 dth …."[53] As discussed above, Pieridae US asserts that this existing capacity is equivalent to "about 0.4243 Bcf/d … compared to Pieridae US's proposed exports of up to 0.8000 Bcf/d [of natural gas]."[54]

Pieridae US also states that "M&N US and other third parties have announced various projects to construct or expand pipeline infrastructure for the purpose of transporting natural gas from the Marcellus and Utica producing regions to customers in [the] northeastern US and eastern Canada."[55] Pieridae US asserts that:

> In light of these circumstances, and because (a) the development lead time for natural gas transportation facilities is shorter than the development lead time for the Goldboro LNG Project, and (b) the development path for the border crossing and other pipeline facilities to be used by Pieridae US is well defined, it is appropriate for Pieridae US to file, and the DOE/FE to process, this Application in advance of Pieridae US formalizing its transportation arrangements on the M&N US Pipeline.[56]

---

[50] *See supra* n.5.
[51] According to Pieridae US, the M&N US Pipeline is owned by Spectra Energy Partners, LP (77.53%); Emera, Inc. (12.92%); and ExxonMobil Corp. (9.55%); and is operated by M&N Operating Company, L.L.C. Pieridae US App. at 17.
[52] FERC 2009 Order, *supra* n.12.
[53] Pieridae US App. at 17 n.22.
[54] *Id*. at 23 n.32.
[55] *Id*. at 17-18; *see also id*. at 23-25 & n.32.
[56] *Id*. at 18-19 (emphasis added).

As to the Canadian portion of the M&N Pipeline, Pieridae US states that it will secure transportation on the existing M&N CA Pipeline to move natural gas from the point of export on the U.S.-Canada border to a point adjacent to the Goldboro LNG Project.[57]

D. Procedural History

Pertinent procedural history concerning Pieridae US's Application is summarized below. Additional procedural history concerning filings submitted in response to Pieridae US's Notice of Application, filed on October 24, 2014, and its two supplements to the Application filed in 2015 is set forth in Section VII.

First Supplement to Application. On May 8, 2015, Pieridae US filed its First Supplement to the Application.[58] Pieridae US explained that, since the filing of the Application, Pieridae US and its affiliates have redefined their business plans with respect to the Goldboro LNG Project and certain arrangements for the supply of natural gas to Goldboro. Under these business plans, Pieridae US may also sell and transfer title to some or all of the natural gas that Pieridae US exports from the United States to one or more entities or affiliates, such as Pieridae CA. According to Pieridae US, the point of sale/transfer of title to the natural gas would occur at a point on the Canadian side of the United States/Canada border before the natural gas is processed into LNG at the Goldboro LNG Project. In the case of natural gas purchased by Pieridae CA, Pieridae CA would be responsible for producing the LNG from the U.S.-sourced natural gas and for exporting the LNG from Canada to non-FTA countries. In light of these anticipated arrangements, Pieridae US requests authorization to export the U.S-sourced natural gas on its own behalf and as agent for other entities (including but not limited to Pieridae CA)

[57] *See id.* at 19 (describing the M&N CA Pipeline, including its owners and operator).
[58] Pieridae Energy (USA) Ltd., Supplement to Application, FE Docket No. 14-179-LNG (May 8, 2015) [hereinafter Pieridae US First Supp.].

who would hold title to the U.S.-sourced natural gas, including LNG made from the natural gas, at the time the LNG is re-exported from Canada for delivery to non-FTA countries.[59]

FTA Order (DOE/FE Order No. 3639). On May 22, 2015, in DOE/FE Order No. 3639, DOE/FE authorized Pieridae US to "export U.S.-sourced natural gas by pipeline from the United States to Canada for end use in Canada and/or, after liquefaction in Canada, by vessel from the proposed Goldboro LNG Project … to FTA countries for end use in FTA countries."[60] Under the terms of that Order, Pieridae US is authorized to act on its own behalf and as agent for other entities who hold title to the natural gas. The total combined volume authorized in the FTA order is up to the equivalent of 292 Bcf/yr of natural gas for a 20-year term, beginning on the earlier of the date of first export or seven years from the date the authorization was issued (May 22, 2022). As set forth below, the volumes authorized for export (or re-export) in the FTA order and this Order are not additive to one another. *See infra* § XII.I.

Long-Term Natural Gas Supplement Agreement. On July 31, 2015, Pieridae US submitted, for public posting, a summary of the major provisions of the natural gas supply agreement dated July 1, 2015, between Pieridae US as the seller and Pieridae CA as the buyer.[61] According to Pieridae US, this agreement pertains to the long-term export of U.S.-sourced natural gas to the proposed Goldboro LNG Project, and generally contemplates the purchase and sale of between 292,000,000 and 292,800,000 cubic feet of natural gas annually, for a 20-year term.

[59] *See id*. at 4.
[60] *Pieridae Energy (USA) Ltd.*, DOE/FE Order No. 3639, *supra* n.8 at 12 (Ordering Para. A); *see also Pieridae Energy (USA) Ltd.*, Errata to DOE/FE Order No. 3639, FE Docket No. 14-179-LNG (Nov. 2, 2015).
[61] Pieridae Energy (USA) Ltd., Long-Term Natural Gas Supply Agreement, FE Docket No. 14-179-LNG (July 31, 2015) [hereinafter Natural Gas Supply Agreement] (stating that it also filed a non-redacted copy separately under seal).

Second Supplement to Application and Motion to Lodge. On August 10, 2015, Pieridae US filed a combined Second Supplement to the Application and Motion to Lodge.[62] Pieridae US reiterates its view that NEPA does not require DOE/FE to take into account the environmental consequences of facilities to be located in Canada.[63] Nonetheless, Pieridae US seeks to call DOE/FE's attention to the fact that, on March 21, 2014, the Minister of Environment of Nova Scotia (Minister) completed the mandatory environmental assessment (EA) of the proposed Goldboro LNG Project.[64] Pieridae US attaches the Minister's Environmental Assessment Approval (EA Approval) as Exhibit A.

According to Pieridae US, even though the Minister's EA Approval is called a "conditional approval" under Canadian law, the EA Approval is not "conditional" in the same sense as the "conditional orders" previously issued by DOE/FE with respect to certain non-FTA LNG export applications: "In the Canadian process, 'conditional' is merely used to refer to the fact that the approval imposes conditions on the project developer/owner, just as a FERC order approving an LNG export terminal imposes conditions on the terminal developer/owner."[65] Pieridae US asserts that the Minister's EA Approval is now a final, non-appealable approval pursuant to the Nova Scotia Environment Act, and binds both the Governments of Nova Scotia and Canada. Pieridae US attaches an opinion letter from Pieridae US's Canadian counsel as Exhibit B, which (according to Pieridae) "confirms the completeness and finality of the conditional environmental assessment approval of Goldboro by the Minister."[66]

[62] Pieridae Energy (USA) Ltd., Second Supplement to Application and Motion to Lodge, FE Docket No. 14-179-LNG (Aug. 7, 2015) [hereinafter Pieridae US Second Supp. & Mot. to Lodge].
[63] *Id*. at 9 n.22.
[64] *See id*. at 6 (noting that this information is also provided in the Application at footnote 158).
[65] *Id*. at 6-7.
[66] *Id*. at 7.

Pieridae US also contends that the Goldboro LNG Project does not require a separate federal environmental assessment by the Government of Canada, for reasons including that the Minister's EA Approval is the only final environmental approval needed to proceed with the Project.[67] As Exhibit C, Pieridae US attaches an email, dated December 20, 2012, to Pieridae from a project manager with the Canadian Environmental Assessment Agency, an agency of the Canadian federal government. According to Pieridae US, this email confirms that a separate federal environmental assessment for Goldboro is not required under the Canadian Environmental Assessment Act of 2012. On this basis, Pieridae maintains that "Nova Scotia's environmental review approval process for Goldboro stands as proxy for the FERC's environmental review process for U.S. LNG export terminals."[68]

Pieridae US asks DOE/FE to lodge the environmental findings by the Minister and the email from the Canadian Environmental Assessment Agency (Exhibits A and C) in the administrative record of this proceeding, and to consider these materials in its review of the Application.[69]

E. Business Model

Pieridae US requests this authorization on its own behalf and as agent for other entities (including Pieridae CA) that would hold title to the U.S.-sourced natural gas, including LNG made from the natural gas, at the time of re-export from Canada. Pieridae US states that it will comply with all DOE/FE requirements for exporters and agents. Pieridae US further states that, when acting as agent, it will register with DOE/FE each LNG title holder for which it seeks to

[67] *See id*. at 7-8.
[68] Pieridae US Second Supp. & Mot. to Lodge at 9.
[69] *Id*. at 5-6. Pieridae US also asks DOE/FE to issue an order taking action on its Application "within 21 days of the DOE/FE's receipt of this Second Supplement." *Id*. at 10-11. This request was denied by operation of law and is also mooted by issuance of this Order.

export LNG as agent, and will comply with other registration requirements as set forth in recent DOE/FE orders.

As noted above, Pieridae US has filed with DOE/FE the major provisions of a natural gas supply agreement for the supply of U.S.-sourced natural gas to the Goldboro LNG Project.[70] Pieridae US states that it will submit any other transaction-specific information to DOE/FE when such contracts are executed.

F. Source of Natural Gas

Pieridae US states that it will source natural gas from the United States either for use as feedstock in the production of LNG from Train 2 for export to its customers or for sale, in whole or in part, to one or more entities including Pieridae CA. Citing the existing M&N U.S. Pipeline, its interconnections with other pipeline systems in the eastern United States, and the "various proposed enhancements to such natural gas transportation facilities," Pieridae US asserts that it "will have the ability to source natural gas from almost any point on the U.S. natural gas pipeline grid through direct physical delivery or by displacement."[71] Pieridae US further states that natural gas from the Marcellus and Utica producing regions can be readily tapped to source the proposed exports. According to Pieridae US, "[w]hile Pieridae US intends to obtain natural gas from whatever sources offer a reliable supply at a commercially attractive price, there is no question that adequate supplies abound."[72]

G. Environmental Review

In the Application, Pieridae US distinguishes between the proposed exports to be authorized by DOE/FE, and certain facilities to be constructed that will (once built) facilitate those exports. According to Pieridae US, these facilities can be subdivided into the "downstream

[70] *See supra* n.61.
[71] Pieridae US App. at 21.
[72] *Id*. at 21-22.

facilities" located, in this case, in Canada—*i.e.*, the proposed Goldboro LNG Project—and the "upstream facilities" located in the United States—*i.e.*, the M&N US Pipeline and the cross-border facilities where the exports of U.S.-sourced natural gas to Canada physically will occur.[73]

As to the downstream facilities in Canada, Pieridae US asserts that DOE/FE has no legal obligation to consider environmental impacts outside of the United States or its territories under NEPA. Rather, according to Pieridae US, any "downstream" environmental impacts associated with the construction and operation of the Goldboro LNG Project in Nova Scotia are properly subject to review by Canadian authorities pursuant to Canadian law. As discussed in Section IV.D above, Pieridae US notes that the Minister of Environment of Nova Scotia issued an EA Approval of the Goldboro LNG Project in March 2014, which Pieridae US states is the final environmental approval necessary for the Project.[74]

As to the upstream facilities located in the United States, Pieridae US asserts that DOE/FE's approval of natural gas exports by Pieridae US is subject to a categorical exclusion from the requirements of NEPA—specifically, categorical exclusion B5.7, *Import or export natural gas, with operational changes*.[75] Categorical exclusion B5.7 applies, in relevant part, to "[a]pprovals … of new authorizations … to … export natural gas under section 3 of the Natural Gas Act that involve minor operational changes (such as changes in natural gas throughput, transportation, and storage) but not new construction."[76] Pieridae US contends that this categorical exclusion applies because Pieridae, Pieridae US, and Pieridae CA will not construct, expand, or modify any pipeline facilities in the United States in conjunction with the proposed export of natural gas from the United States to Canada. According to Pieridae US, any potential

[73] *See id*. at 60.
[74] *See, e.g., id*. at 63 n.158.
[75] *See id*. at 59-70 ("Applicability of an Existing Categorical Exclusion").
[76] *See id*. at 59 (quoting 10 C.F.R. § Part 1021, Subpart D, Appendix B, Categorical Exclusion B5.7).

changes to the M&N US Pipeline "will depend on expected throughput by multiple customers that will potentially have offsetting demands on the system."[77] Pieridae US maintains that "M&N US will not be making changes specifically to accommodate Pieridae US, but rather … to meet the overall demand of the market."[78]

Pieridae US further asserts that there are no pipeline facilities being approved directly by DOE/FE or FERC in conjunction with Pieridae US's Application. And, according to Pieridae US, even if DOE/FE were to conclude that granting the Application would indirectly cause the expansion of any pipeline facilities, DOE/FE's prior LNG export decisions establish that "*anticipated* construction falls outside the scope of construction that must be accounted for in performing a NEPA review."[79] Pieridae US continues:

> [T]o date, the FERC has limited its review of the impacts of new facilities associated with LNG export facilities to [i] the facilities being applied for by the applicant, [ii] dedicated [FERC-approved] pipelines built to serve such facilities, … and [iii] certain FERC non-jurisdictional facilities being built or modified specifically to serve the FERC jurisdictional facilities being applied for by the applicant.[80]

Pieridae US states that DOE/FE has accepted this approach, as reflected in its LNG export decisions. Pieridae US further states that neither FERC nor DOE has examined, as part of its respective review, any improvements to third-party owned and operated natural gas pipelines that may be used to transport natural gas (for eventual liquefaction and export as LNG) but that are being constructed for broader purposes driven primarily by prevailing markets.

For these reasons, Pieridae US asserts that a categorical exclusion B5.7 is warranted here. In further support of this argument, Pieridae US argues that: (i) there are no extraordinary circumstances related to the Application that may affect the significance of the environmental

[77] *Id*. at 63-64.
[78] Pieridae US App. at 63.
[79] *Id*. at 64 (emphasis added) (citing, *e.g.*, *Sabine Pass*, DOE/FE Order No. 2961-A, at 14-15)
[80] *Id*. at 67-68.

effects of the proposal; (ii) the Application has not been "segmented" to meet the definition of a categorical exclusion; and (iii) there have been no violations of applicable statutory, regulatory, or permit requirements associated with the environment, safety, and health.[81]

V. 2012 LNG EXPORT STUDY

As noted above, in August 2011, with several 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. To address this issue, DOE/FE undertook a two-part study of the cumulative economic impact of LNG exports. The first part of the study was conducted by EIA and looked at the potential impact of additional natural gas exports on domestic energy consumption, production, and prices under several export scenarios prescribed by DOE/FE. The EIA Study did not evaluate macroeconomic impacts of LNG exports on the U.S. economy. The second part of the study, performed by NERA Economic Consulting, assessed the potential macroeconomic impact of LNG exports using its energy-economy model (the "NewERA" model). NERA built on the EIA Study requested by DOE/FE by calibrating the NERA U.S. natural gas supply model to the results of the study by EIA. The EIA Study was limited to the relationship between export levels and domestic prices without considering whether those quantities of exports could be sold at high enough world prices to support the calculated domestic prices. NERA used its Global Natural Gas Model (GNGM) to estimate expected levels of U.S. LNG exports under several scenarios for global natural gas supply and demand. A more detailed discussion of each study follows.

A. EIA Study, *Effect of Increased Natural Gas Exports on Domestic Energy*

[81] *Id*. at 68.

Markets

1. Methodology

DOE/FE asked EIA to assess how four scenarios of increased natural gas exports could affect domestic energy markets, particularly consumption, production, and prices. The four scenarios assumed LNG exports of:

- 6 Bcf/d, phased in at a rate of 1 Bcf/d per year (low/slow scenario);
- 6 Bcf/d phased in at a rate of 3 Bcf/d per year (low/rapid scenario);
- 12 Bcf/d phased in at a rate of 1 Bcf/d per year (high/slow scenario); and
- 12 Bcf/d phased in at a rate of 3 Bcf/d per year (high/rapid scenario).

According to EIA, total marketed natural gas production in 2011 was approximately 66 Bcf/d. Thus, exports of 6 Bcf/d and 12 Bcf/d represent roughly 9 and 18 percent of natural gas production in 2011, respectively.

DOE/FE also requested that EIA consider the above four scenarios of increased natural gas exports in the context of four cases from EIA's AEO 2011. These four cases are:

- The AEO 2011 Reference Case;
- The High Shale Estimated Ultimate Recovery (EUR) case (reflecting optimistic assumptions about domestic natural gas supply, with the EUR per shale gas well for new, undrilled wells assumed to be 50 percent higher than in the Reference Case);
- The Low Shale EUR case (reflecting pessimistic assumptions about domestic natural gas supply, with the EUR per shale gas well for new, undrilled wells assumed to be 50 percent lower than in the Reference Case); and
- The High Economic Growth case (assuming the U.S. gross domestic product will grow at an average annual rate of 3.2 percent from 2009 to 2035, compared to 2.7 percent in the Reference Case, which increases domestic energy demand).

Taken together, the four scenarios with different additional export levels imposed from the indicated baseline case (no additional exports) presented 16 case scenarios, listed in Table 1.

Table 1: Case Scenarios Considered By EIA in Analyzing Impacts of LNG Exports

	AEO 2011 Cases	Export Scenarios
1	AEO 2011 Reference	Low/Slow
2	AEO 2011 Reference	Low/Rapid
3	AEO 2011 Reference	High/Slow
4	AEO 2011 Reference	High/Rapid
5	High EUR	Low/Slow
6	High EUR	Low/Rapid
7	High EUR	High/Slow
8	High EUR	High/Rapid
9	Low EUR	Low/Slow
10	Low EUR	Low/Rapid
11	Low EUR	High/Slow
12	Low EUR	High/Rapid
13	High Economic Growth	Low/Slow
14	High Economic Growth	Low/Rapid
15	High Economic Growth	High/Slow
16	High Economic Growth	High/Rapid

EIA used the final AEO 2011 projections issued in April 2011 as the starting point for its analysis and applied the NEMS model. Because NEMS did not generate a projection of LNG export demand, EIA specified additional natural gas demand levels as a proxy for projected export levels consistent with the scenarios prescribed by DOE/FE.

EIA assigned these additional exports to the West South Central Census Division. This meant that EIA effectively assumed that the incremental LNG exports would be shipped out of the Gulf Coast states or Texas.

EIA also counted any additional natural gas consumed during the liquefaction process within the total additional export volumes specified in the DOE/FE scenarios. Therefore, the net volumes of LNG produced for export were roughly 10 percent below the gross volumes considered in each export scenario. By way of illustration, in the cases where cumulative export volumes are 6 Bcf/d, liquefaction would consume 0.6 Bcf/d with net exports of 5.4 Bcf/d.

EIA made other changes in modeled flows of gas into and out of the lower-48 United States where necessary to analyze the increased export scenarios.[82] Additionally, EIA assumed that a pipeline transporting Alaskan natural gas into the lower-48 states would not be built during the forecast period, thereby isolating the lower-48 states' supply response.

2. Scope of EIA Study

In the Preface to the EIA Study, EIA identifies several limiting factors governing use of the Study results:

> The projections in this report are not statements of what *will* happen but of what *might* happen, given the assumptions and methodologies used. The Reference case in this report is a business-as-usual trend estimate, reflecting known technology and technological and demographic trends, and current laws and regulations. Thus, it provides a policy-neutral starting point that can be used to analyze policy initiatives. EIA does not propose, advocate, or speculate on future legislative and regulatory changes.[83]

Additionally, the EIA Study recognizes that projections of energy markets over a 25-year period are highly uncertain, and that many events—such as supply disruptions, policy changes, and technological breakthroughs—cannot be foreseen. Other acknowledged limitations on the scope of the EIA Study include:

- The NEMS model is not a world energy model, and therefore does not address the interaction between the potential for additional U.S. natural gas exports and developments in world natural gas markets;
- Global natural gas markets are not integrated, and their nature could change substantially in response to significant changes in natural gas trading patterns;
- Macroeconomic results were not included in the analysis because energy exports are not explicitly represented in the NEMS macroeconomic module; and

[82] U.S. natural gas exports to Canada and U.S. natural gas imports from Mexico are exogenously specified in all the AEO 2011 cases. U.S. imports of natural gas from Canada are endogenously set in the model and continue to be so for this study. However, U.S. natural gas exports to Mexico and U.S. LNG imports that are normally determined endogenously within the model were set to the levels projected in the associated AEO 2011 cases for this study. EIA Study at 2-3.
[83] EIA Study at ii (emphasis in original).

The domestic focus of the NEMS model makes it unable to account for all interactions between energy prices and supply/demand in energy-intensive industries that are globally competitive.

3. Natural Gas Markets

The EIA Study recognized that natural gas markets are not integrated globally and natural gas prices span a wide range. EIA stated that the current large disparity in natural gas prices across major world regions is likely to narrow as markets become more globally integrated. However, key questions remain as to how quickly and to what extent convergence might occur.

U.S. market conditions are also variable, according to EIA, and lower or higher U.S. natural gas prices would tend to make additional exports more or less likely. EIA pointed out that prospects for LNG exports depend greatly on the cost-competitiveness of liquefaction projects in the United States relative to those at other locations.

EIA observed that relatively high shipping costs from the United States may add a cost disadvantage compared to exporting countries closer to key markets, such as in Asia. EIA notes that LNG projects in the United States would frequently compete not just against other LNG projects, but also against pipeline projects from traditional natural gas sources or projects to develop shale gas in Asia or Europe.

4. Results of EIA Study

EIA generally found that LNG exports will lead to higher domestic natural gas prices, increased domestic natural gas production, reduced domestic natural gas consumption, and increased natural gas imports from Canada via pipeline. The impacts of exports, according to EIA, included:

Increased natural gas prices at the wellhead. EIA stated that larger export levels would lead to larger domestic price increases; rapid increases in export levels would lead to large initial price increases that moderate somewhat in a few years; and slower increases in export levels would lead to more gradual price increases but eventually would produce higher average prices during the decade between 2025 and 2035.

Increased natural gas production and supply. Increased exports would result in a supply response, *i.e.,* increased natural gas production that would satisfy about 60 to 70 percent of the increase in natural gas exports, with a minor additional contribution from increased imports from Canada. Across most cases, EIA stated that about three-quarters of this increased production would come from shale sources.

Decreased natural gas consumption. Due to higher prices, EIA projects a decrease in the volume of gas consumed domestically. EIA states that the electric power sector, by switching to coal and renewable fuels, would account for the majority of this decrease but indicates that there also would be a small reduction in natural gas use in all sectors from efficiency improvements and conservation.

Increased end-user natural gas and electricity delivered prices. EIA states that even while consuming less, on average, consumers will see an increase in their natural gas and electricity expenditures.

Additional details regarding these conclusions are discussed in the following sections.

5. Wellhead Price Increases

EIA projects that natural gas prices will increase in the Reference Cases even absent expansion of natural gas exports. This baseline increase in natural gas prices bears an inverse relationship to projected increases in the volumes of natural gas produced from shale resources.

Thus, in the high shale EUR Reference Case, the long-term natural gas price is lower than it is in the low shale EUR case.

While EIA projected a rising baseline price of gas without exports, EIA also found that the price of gas will increase over the rising baseline when exports occur. Exports are projected to impact natural gas prices in two ways. First, the export scenarios that contained rapid growth in exports experienced large initial price increases that moderated in the long run, while cases projecting a slow growth in exports experienced more gradual price increases. Second, cases with larger cumulative exports resulted in higher prices in the long-term relative to those cases with lower overall export levels. The largest price increase over the baseline exists in the Low Shale EUR case. The High Shale EUR case yields the smallest price response.

6. Increased Natural Gas Production and Supply

EIA projected that most of the additional natural gas needed for export would be provided by increased domestic production with a minor contribution from increased pipeline imports from Canada. The remaining portion of the increased export volumes would be offset by decreases in consumption resulting from the higher prices associated with the increased exports.

7. Decreased Natural Gas Consumption

EIA projected that greater export levels would lead to decreases in natural gas consumption. Most of this projected decrease would occur in the electric power sector. Increased coal-fired generation accounts for about 65 percent of the projected decrease in natural gas-fired generation. However, EIA also noted that the degree to which coal might be used in lieu of natural gas depends on what regulations are in place. As noted above, EIA's projections reflected the laws and regulations in place at the time AEO 2011 was produced.

EIA further projected that small increases in renewable generation would contribute to reduced natural gas-fired generation. Relatively speaking, the role of renewables would be greater in a higher-gas-price environment (*i.e.*, the Low Shale EUR case) when renewables can more successfully compete with coal, and also in a higher-generation environment (*i.e.*, the High Economic Growth case), particularly in the later years.

EIA projected that increased natural gas exports would result in reductions in industrial natural gas consumption. However, the NEMS model does not capture the link between energy prices and the supply/demand of industrial commodities in global industries. To the extent that the location of production is sensitive to changes in natural gas prices, EIA acknowledged that industrial natural gas demand would be more responsive than shown in its analysis.

8. Increased End-User Natural Gas and Electricity Delivered Prices

EIA projected that, with increased natural gas exports, consumers would consume less and pay more on both their natural gas and electricity bills, and generally pay a little less for liquid fuels.

EIA projected that the degree of change to total natural gas bills with added exports varies significantly among economic sectors. This is because the natural gas commodity charge represents significantly different portions of each natural gas consuming sector's bill. However, EIA projected that natural gas expenditures would increase at the highest percentages in the industrial sector, where low transmission and distribution charges constitute a relatively small part of the delivered natural gas price.

EIA projected that average electricity prices would increase between 0.14 and 0.29 cents per kilowatt-hour (kWh) (between 2 and 3 percent) when gas exports are added. The greatest

projected increase in electricity prices occurs in 2019 under the Low Shale EUR case for the high export/rapid growth export scenario, with an increase of 0.85 cents per kWh (9 percent).

EIA projected that, on average between 2015 and 2035, total U.S. end-use electricity expenditures as a result of added exports would increase between $5 billion to $10 billion (between 1 to 3 percent), depending on the export scenario. The High Macroeconomic Growth case shows the greatest average annual increase in natural gas expenditures over the same time period, with increases over the baseline (no additional exports) scenario ranging from $6 billion to $12 billion.

9. Impact on Natural Gas Producer Revenues

As part of its analysis, EIA considered the impact of natural gas exports on natural gas producer revenues. According to EIA, total additional natural gas revenues to producers from exports would increase from 2015 to 2035 between $14 billion and $32 billion over the AEO 2011 Reference Case, depending on the export scenario. These revenues reflect dollars spent to purchase and move the natural gas to the export facility, but do not include any revenues associated with the liquefaction and shipping process.

EIA cautioned that these projected increases in natural gas producer revenues do not represent profits and a large portion of the additional revenues would be expended to cover the costs associated with increased production, such as for equipment (*e.g.*, drilling rigs) and labor. In contrast, the additional revenues resulting from the higher price of natural gas that would have been produced and sold to largely domestic customers even in the absence of the additional exports posited in the analysis would preponderantly reflect increased profits for producers and resource owners.

10. Impacts Beyond the Natural Gas Industry

EIA stated that, other than impacts on their energy expenditures, impacts on non-energy sectors were generally beyond the scope of its study. However, EIA did project impacts on total energy use and energy-related carbon dioxide (CO_2) emissions. EIA projected that annual primary energy consumption in the AEO 2011 Reference Case will average 108 quadrillion Btu between 2015 and 2035, with a growth rate of 0.6 percent. Also, cumulative CO_2 emissions are projected to total 125,000 million metric tons for that 20-year period.

According to EIA, the changes in overall energy consumption would largely reflect changes in the electric power sector. While additional exports would result in decreased natural gas consumption, changes in overall energy consumption would be relatively minor as much of the decrease in natural gas consumption would be replaced with increased coal consumption.

While lower domestic natural gas deliveries resulting from added exports are projected to reduce natural gas related CO_2 emissions, EIA projected that the increased use of coal in the electric sector would generally result in a net increase in domestic CO_2 emissions. Exceptions occur in scenarios where renewables are better able to compete against natural gas and coal. However, when also accounting for emissions related to natural gas used in the liquefaction process, EIA projected that additional exports would increase domestic CO_2 levels under all cases and scenarios, particularly in the earlier years of the projection period. EIA did not evaluate the effect of U.S. LNG exports on global CO_2 emissions.

B. NERA Study, *Macroeconomic Impacts of LNG Exports from the United States*

Because the NEMS model used by EIA did not account for the impact of energy price changes on global energy utilization patterns and did not include a full macroeconomic model, DOE/FE commissioned NERA to provide such an analysis. NERA developed a two-step approach. First, it modeled energy markets by drawing on several of the scenarios that EIA had

developed and adding global market scenarios developed through its GNGM model. Second, using its "N_{ew}ERA" energy-economy model, NERA drew conclusions regarding the domestic macroeconomic impacts of LNG exports. The impacts measured using the N_{ew}ERA macroeconomic model included price, welfare,[84] gross domestic product (GDP), aggregate consumption, aggregate investment, natural gas export revenues, sectoral output,[85] and wages and other household incomes. In addition, NERA identified impacts that would affect certain energy intensive, trade exposed (EITE) industries, as discussed below.

1. Overview of NERA's Findings

NERA's key findings include the following:

Net economic benefits across all scenarios. Across all the scenarios studied, 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. Scenarios with unlimited exports had higher net economic benefits than corresponding cases with limited exports. In all cases, the benefits that come from export expansion outweigh the losses from reduced capital and wage income to U.S. consumers, and hence LNG exports have net economic benefits in spite of higher domestic natural gas prices.

Net benefits to the United States would be highest if the United States is able to produce large quantities of gas from shale at low cost, if world demand for natural gas increases rapidly, and if LNG supplies from other regions are limited. If the promise of shale gas is not fulfilled and costs of producing gas in the United States rise substantially, or if there are ample supplies

[84] According to NERA, the measure of welfare used in its study is known as the "equivalent variation" and is the amount of income a household would be willing to give up in the case without LNG exports to achieve the benefits of LNG exports. NERA states that it measured welfare in present value terms, and therefore captures in a single number benefits and costs that might vary year by year over the period. NERA Study at 6, n.5 & 55.

[85] NERA evaluated seven key sectors of the U.S. economy: agriculture, energy intensive sector, electricity, natural gas, motor vehicle, manufacturing, refined petroleum products, and services. *Id*. at 9 & n.7.

of LNG from other regions to satisfy world demand, the United States would not export LNG. Under these conditions, allowing exports of LNG would cause no change in natural gas prices and do no harm to the overall economy.

Natural gas price increases. U.S. natural gas prices would increase if the United States exports LNG. However, the global market limits how high U.S. natural gas prices can rise under pressure of LNG exports because importers will not purchase U.S. exports if U.S. wellhead price rises above the cost of competing supplies.

Natural gas price changes attributable to LNG exports remain in a relatively narrow range across the entire range of scenarios. Natural gas price increases at the time LNG exports could begin range from zero to $0.33 per million cubic feet (Mcf) (2010$/Mcf). Price increases that would be observed after five more years of potentially growing exports could range from $0.22 to $1.11 (2010$/Mcf). The higher end of the range is reached only under conditions of ample U.S. supplies and low domestic natural gas prices, with smaller price increases when U.S. supplies are more costly and domestic prices higher.

Socio-economic impacts. How increased LNG exports will affect different socioeconomic groups will depend on their income sources. Like other trade measures, LNG exports will cause shifts in industrial output and employment and in sources of income. Overall, both total labor compensation and income from investment are projected to decline, and income to owners of natural gas resources will increase. Different socioeconomic groups depend on different sources of income; workers with retirement savings that include shares of natural resource companies will benefit from higher incomes to those companies. Nevertheless, impacts will not be positive for all groups in the economy. Households with income solely from wages or government transfers, in particular, might not participate in these benefits.

Competitive impacts and impact on employment. Serious competitive impacts are likely to be confined to narrow segments of industry. About 10 percent of U.S. manufacturing, measured by value of shipments, has both energy expenditures greater than 5 percent of the value of its output and serious exposure to foreign competition. Employment in these energy-intensive industries is about one-half of one percent of total U.S. employment.

LNG exports are unlikely to affect the overall level of employment in the United States. There will be some shifts in the number of workers across industries, with those industries associated with natural gas production and exports attracting workers away from other industries. In no scenario is the shift in employment out of any industry projected to be larger than normal rates of turnover of employees in those industries.

Additional discussion of the above key findings is offered below and in the NERA Study itself.

2. Overview of NERA's Methodology

NERA states that it attempted to answer two principal questions:

- At what price can various quantities of LNG exports be sold?
- What are the economic impacts on the United States of LNG exports?

To answer these questions, NERA used the GNGM model to estimate expected levels of U.S. LNG exports under several scenarios for global natural gas supply and demand. NERA also relied on the EIA Study to characterize how U.S. natural gas supply, demand, and prices would respond if the specified level of LNG exports were achieved. Further, NERA examined the same 16 scenarios for LNG exports analyzed by EIA but added additional scenarios to reflect global supply and demand. These additional scenarios were constructed on the basis of NERA's analytical model of global natural gas markets, as described below.

The resulting scenarios ranged from Reference Case conditions to stress cases with high costs of producing natural gas in the United States and exceptionally large demand for U.S. LNG exports in world markets. The three scenarios chosen for the U.S. resource outlook were the EIA Reference Case, based on AEO 2011, and two cases assuming different levels of EUR from new gas shale development. Outcomes of the EIA high demand case fell between the High and Low EUR cases and, therefore, would not have changed the range of results. The three different international outlooks were: (1) a Reference Case, based on EIA's International Energy Outlook 2011; (2) a Demand Shock case with increased worldwide natural gas demand caused by shutdowns of some nuclear capacity; and (3) a Supply/Demand Shock case that added to the Demand Shock a supply shock that assumed key LNG exporting regions did not increase their exports above current levels.

When the global and U.S. scenarios were combined with seven scenarios specifying limits on exports and export growth, NERA's analysis covered 63 possible scenarios. From these 63 scenarios, 21 scenarios resulted in some level of LNG export from the United States. Of these 21 scenarios, the GNGM model identified 13 "NewERA scenarios" that spanned the range of economic impacts from all of the scenarios and eliminated scenarios with essentially identical outcomes. As shown in Table 2 below, the 13 scenarios included:

Table 2: NewERA Scenarios Analyzed by NERA

	U.S. Scenarios	**International Demand and Supply Scenarios**	**Export Scenarios**
1	Reference	Supply and Demand Shock	Low/Rapid
2	Reference	Supply and Demand Shock	Low/Slow
3	Reference	Supply and Demand Shock	High/Rapid
4	Reference	Supply and Demand Shock	High/Slow
5	Reference	Demand Shock	Low/Rapid
6	Reference	Demand Shock	Low/Slow
7	Reference	Demand Shock	Low/Slowest

8	High EUR	Supply and Demand Shock	High/Rapid
9	High EUR	Supply and Demand Shock	High/Slow
10	High EUR	Supply and Demand Shock	Low/Rapid
11	High EUR	Supply and Demand Shock	Low/Slow
12	High EUR	Supply and Demand Shock	Low/Slowest
13	Low EUR	Supply and Demand Shock	Low/Slowest

To project the macroeconomic impacts of the above scenarios, NERA used its N_{ew}ERA model to compare the impacts of each of the 13 export scenarios to baselines with no LNG exports. NERA thus derived a range of projected impacts on the U.S. economy, including impacts on welfare, aggregate consumption, disposable income, GDP, and loss of wage income.

3. Scope of the NERA Study

NERA started its analysis with the domestic economic AEO 2011 cases and the export scenarios present in the EIA Study.[86] In addition to the export scenarios used by EIA, NERA added two export cases, including the "low/slowest case" and a "no restraints" case in which no regulatory restraints on exports existed. The low/slowest case assumed exports of 6 Bcf/d, with a growth rate of 0.5 Bcf/d per year, which is half the growth rate in the slow scenarios used by EIA.

Because NERA, unlike EIA, modeled the international gas market, NERA also created three international gas market scenarios not contained in the EIA Study. The first was a business as usual Reference Case. The second assumed an international demand shock with increased worldwide natural gas demand caused by shutdowns of some nuclear capacity. Finally, NERA created an international scenario that added to the demand shock a supply shock that assumed key LNG exporting regions did not increase their exports above current levels.

While these additional aspects of the analysis expanded the scope of the NERA Study relative to the study conducted by EIA, significant elements of the dynamics of the global natural

[86] For a full discussion of the scope, see pages 3-15 of the NERA Study, http://energy.gov/sites/prod/files/2013/04/f0/nera_lng_report.pdf.

gas trade and its domestic economic implications were outside the scope of the NERA Study or beyond the reach of the modeling tools used.[87] NERA expressly excluded the following factors from its analysis:

- The extent to which an overbuilding of liquefaction capacity could affect the ability to finance the projects and profitably export natural gas;
- The extent to which engineering or infrastructure limitations would impact the rate at which liquefaction capacity would come online, potentially impacting the cost of that capacity;
- The locations of the liquefaction facilities, or alternatives;
- The impacts of the liquefaction and exportation of natural gas on various regions within the United States;
- The extent to which the impacts of LNG export vary among different socio-economic groups; and
- The extent to which macroeconomic impacts to the United States would vary if the liquefaction projects were funded through foreign direct investment.

4. NERA's Global Natural Gas Model

The GNGM model is designed to estimate natural gas production, consumption, and trade in the major gas producing or consuming regions.[88] The model attempts to maximize the difference between surplus and cost, constrained by various factors including liquefaction capacity and pipeline constraints. The model divides the world into 12 regions and specifies supply and demand curves for each region. The regions are: Africa, Canada, China/India, Central and South America, Europe, Former Soviet Union, Korea/Japan, Middle East, Oceania, Sakhalin, Southeast Asia, and the United States. The GNGM model's production and consumption assumptions for these regions are based on projections contained in the Reference

[87] For a full discussion of the unexplored factors, see Appendix E of the NERA Study, http://energy.gov/sites/prod/files/2013/04/f0/nera_lng_report.pdf.
[88] For a full discussion of GNGM, see page 20 of the NERA Study, http://energy.gov/sites/prod/files/2013/04/f0/nera_lng_report.pdf.

Cases of EIA's AEO 2011 and International Energy Outlook 2011. NERA ran the GNGM model in five-year increments between 2015 and 2035.

According to NERA, the characteristics of a regional market will affect LNG trading patterns and the pricing of natural gas within the region. With respect to trading patterns, NERA observed that a significant portion of LNG, such as LNG moving to Europe, is traded on a long-term basis using dedicated supplies and dedicated vessels moving to identified markets. On the other hand, NERA stated that some LNG markets, particularly those in Asia, operate on the basis of open market competitive bids in which LNG is delivered to those who value it the most. NERA also found that Southeast Asian and Australian suppliers most often market LNG to Asian markets; African suppliers deliver LNG most often to Europe; and Middle Eastern suppliers deliver LNG both to Europe and Asia.

With respect to the pricing of LNG in global markets, NERA states that the price differential, or "basis," between two regions reflects the difference in the pricing mechanism for each regional market. If pricing for two market hubs were set by the same mechanism and there were no constraints in the transportation system, the basis would simply be the cost of transportation between the two market hubs. NERA asserts, however, that different pricing mechanisms set the price in each regional market, so the basis is often not set by transportation differences alone.

NERA offers the following example: Japan depends on LNG as its source for natural gas and indexes LNG prices to crude oil prices. For Europe, on the other hand, NERA states that LNG is only one of three potential sources of supply for natural gas. The others are interregional pipelines and indigenous production. According to NERA, the competition for market share between these alternative sources of supply will establish the basis for LNG prices in Europe.

NERA further states that within North America, pricing at Henry Hub has been for the most part set by competition between different North American supply sources and has been independent of pricing in Japan and Europe.

5. The N_{ew}ERA Macroeconomic Model

NERA developed the N_{ew}ERA model to forecast how, under a range of domestic and international supply and demand conditions, U.S. LNG exports could affect the U.S. economy.[89] Like other general equilibrium models, N_{ew}ERA is designed to analyze long-term economic trends. NERA explained that, in any given year, actual prices, employment, or economic activity may differ from the projected levels.

The version of N_{ew}ERA used in NERA's analysis considered all sectors of the U.S. economy. In short, the model:

- Contains supply curves for domestic natural gas,
- Accounts for imports of Canadian pipeline gas and other foreign imports,
- Recognizes the potential for increases to U.S. liquefaction capacity, and
- Recognizes changes in international demand for domestically produced natural gas.

As discussed below, the results of the N_{ew}ERA model address changes in demand and supply of all goods and services, prices of all commodities, and impacts from LNG exports to U.S. trade, including changes in imports and exports. As with the GNGM model, NERA ran the N_{ew}ERA model in five-year increments for 2015 through 2035.

6. Relationship to the EIA Study

As explained above, EIA's study focused on potential impacts of natural gas exports to domestic energy markets. Specifically, the study considered impacts to natural gas supply,

[89] For a full discussion of the N_{ew}ERA macroeconomic model, see pages 20 to 22 of the NERA Study, http://fossil.energy.gov/programs/gasregulation/reports/nera_lng_report.pdf

demand, and prices within the United States. To provide a fuller scope of analysis, DOE asked NERA to examine the net macroeconomic impact of domestic LNG exports on the U.S. economy. To conduct this analysis, NERA first modeled international demand for U.S. LNG utilizing its GNGM model. NERA then incorporated the results from the GNGM model into its NewERA model, using the same parameters governing natural gas supply and demand that EIA used in the NEMS model.

NERA concluded that, in many cases, the global natural gas market would not accept the full amount of exports assumed in the EIA scenarios at export prices high enough to cover the U.S. wellhead prices calculated by EIA. In these cases, NERA replaced the export levels and price impacts found in the EIA scenarios with lower levels of exports (and prices) estimated by the GNGM model. These lower export levels were applied to the NewERA model to generate projected impacts to the U.S. economy from LNG exports.

7. Key Assumptions and Parameters of the NERA Study

NERA implemented the following key assumptions and parameters, in part to retain consistency with EIA's NEMS model:

i. All scenarios were derived from the AEO 2011 and incorporated EIA's assumptions about energy and environmental policies, baseline coal, oil and natural gas prices, economic and energy demand growth, and technology availability and cost in the corresponding AEO cases.

ii. U.S. exports compete with LNG exports from other nations, who are assumed to behave competitively and to adjust their export quantities in response to prevailing prices. The single exception to this assumption is that the export decisions of the global LNG market's one dominant supplier, Qatar, were assumed to be independent of the level of U.S.

exports.

iii. Prices for natural gas used for LNG production were based on the Henry Hub price, plus a 15 percent markup (to cover operating costs of the liquefaction process).

iv. The LNG tolling (or reservation) fee—paid by the exporter to the operator of the liquefaction terminal for the right to reserve capacity—was based on a return of capital to the operator.

v. All financing of investment was assumed to originate from U.S. sources.

The United States is assumed to have full employment, meaning that U.S. unemployment rates and the total number of jobs in the United States will not change across all cases.

8. Results of the NERA Study

As a result of its two-step analysis, the NERA Study yielded two sets of results, reported in five-year intervals beginning with 2015.[90] First, the GNGM model produced information regarding the conditions that will support exports of natural gas from the United States. Second, the N_{ew}ERA model provided information about the domestic macroeconomic impacts of natural gas exports. NERA found:

LNG exports would result in higher U.S. natural gas prices. NERA found that the United States would only be able to market LNG successfully with higher global demand or lower U.S. costs of production than in the Reference Cases. According to NERA, the market limits how high U.S. natural gas prices can rise under pressure of LNG exports because importers will not purchase U.S. exports if the U.S. wellhead price rises above the cost of competing supplies. In particular, under NERA's modeling, the U.S. natural gas price does not become linked to oil prices in any of the cases examined.

[90] These calendar years are not actual, but represent modeling intervals after exports begin. For example, if the United States does not begin LNG exports until 2016, one year should be added to the dates for each year that exports commence after 2015.

Macroeconomic impacts of LNG exports are positive in all cases. NERA found that the United States would experience net economic benefits from increased LNG exports in all cases studied. Only three cases had U.S. exports greater than the 12 Bcf/d maximum exports allowed in the cases analyzed by EIA.[91] NERA estimated economic impacts for these three cases with no constraint on exports, and found that even with exports reaching levels greater than 12 Bcf/d and associated higher prices than in the constrained cases, there were net economic benefits from allowing unlimited exports in all cases.

Across the scenarios, NERA projected that U.S. economic welfare would consistently increase as the volume of natural gas exports increased, including in scenarios with unlimited exports. The reason given was that even though domestic natural gas prices are pulled up by LNG exports, the value of those exports also rises so that there is a net gain for the U.S. economy measured by a broad metric of economic welfare or by more common measures such as real household income or real GDP. Although there are costs to consumers of higher energy prices and lower consumption and producers incur higher costs to supply the additional natural gas for export, these costs are more than offset by increases in export revenues along with a wealth transfer from overseas received in the form of payments for liquefaction services. The net result is an increase in U.S. households' real income and welfare. NERA noted, however, that net benefits to the U.S. economy could be larger if U.S. businesses were to take more of a merchant role. NERA assumed that foreign purchasers would take title to LNG when it is loaded at a U.S. port, so that any profits that could be made by transporting and selling in importing countries accrue to foreign entities. In cases where exports are constrained to maximum permitted levels,

[91] The first case combined U.S. Reference natural gas production with an international supply and demand shock. The second combined the High EUR domestic case with an international demand shock. The third combined the High EUR domestic case with an international supply and demand shock. NERA Study at 4, 6.

this business model sacrifices additional value from LNG exports that could accrue to the United States.

Sources of income would shift. NERA states that at the same time that LNG exports create higher total income in the United States, exports would shift the composition of income so that both wage income and income from capital investment decline. NERA's measure of total income is GDP measured from the income side, that is, by adding up income from labor, capital, and natural resources and adjusting for taxes and transfers. According to NERA, expansion of LNG exports would have two major effects on income: it raises energy costs and, in the process, depresses both real wages and the return on capital in all other industries, but it also creates two additional sources of income. First, additional income would come in the form of higher export revenues and wealth transfers from incremental LNG exports at higher prices paid by overseas purchasers. Second, U.S. households also would benefit from higher natural gas resource income or rents. These benefits differentiate market-driven expansion of LNG exports from actions that only raise domestic prices without creating additional sources of income. According to NERA, the benefits that come from export expansion would more than outweigh the losses from reduced capital and wage income to U.S. consumers, and hence LNG exports would have net economic benefits in spite of higher natural gas prices. According to NERA, this is the outcome that economic theory describes when barriers to trade are removed.

Some groups and industries will experience negative effects of LNG exports. NERA concluded that, through retirement savings, an increasingly large number of workers will share in the higher income received by natural resource companies participating in LNG export-related activities. Nevertheless, impacts will not be positive for all groups in the economy. According to NERA, households with income solely from wages or transfers, in particular, might not

participate in these benefits. NERA stated that higher natural gas prices can also be expected to have negative effects on output and employment, particularly in sectors that make intensive use of natural gas, while other sectors not so affected could experience gains. There clearly would be greater activity and employment in natural gas production and transportation and in construction of liquefaction facilities. Overall, NERA projected that declines in output in other sectors would be accompanied by similar reductions in worker compensation in those sectors, indicating that there will be some shifting of labor between different industries. However, even in the year of peak impacts, the largest projected change in wage income by industry would be no more than one percent, and even if all of this decline were attributable to lower employment relative to the baseline, NERA concluded that no sector analyzed in its study would experience reductions in employment more rapid than normal turnover. In fact, NERA asserted that most of the changes in real worker compensation are likely to take the form of lower than expected real wage growth, due to the increase in natural gas prices relative to nominal wage growth.

Peak natural gas export levels (as specified by DOE/FE for the EIA Study) and resulting price increases are not likely. The export volumes selected by DOE/FE for the EIA Study define the maximum exports allowed in each scenario for the NERA macroeconomic analysis. Based on its analysis of global natural gas supply and demand, NERA projected achievable levels of exports for each scenario. The NERA scenarios that found a lower level of exports than the limits specified by DOE/FE are shown in Table 5 of the NERA Study, as modified from trillion cubic feet per year (Tcf/yr) to Bcf/d in Table 3 below.

Table 3: NERA Export Volumes in Bcf/d,
Adapted from Table 5 of the NERA Report

NERA Export Volumes (in Bcf/d)	2015	2020	2025	2030	2035
U.S. Reference Case with International Demand Shock and lower than Low/Slow export levels	***1.02***	2.69	3.92	3.27	***6.00***
U.S. Reference Case with International Demand Shock and lower than Low/Rapid export levels	2.80	2.69	3.92	3.27	3.76
U.S. Reference Case with International Supply/Demand Shock and lower than High/Slow export levels	***1.02***	6.00	10.77	***12.00***	***12.00***
U.S. Reference Case with International Supply/Demand Shock and lower than High/Rapid export levels	***3.02***	***8.00***	10.77	***12.00***	***12.00***
U.S. High Shale EUR with International Supply/Demand Shock at Low/Slowest export levels	***0.50***	2.69	3.92	3.27	3.76

The cells in bold italics indicate the years in which the model's limit on exports is binding. All scenarios hit the export limits in 2015 except the NERA export volume case with Low/Rapid exports. In no case does the wellhead price increase by more than $1.11/Mcf due to market-determined levels of exports. Even in cases in which no limits were placed on exports, competition between the United States and competing suppliers of LNG limits increases in both U.S. LNG exports and U.S. natural gas prices.

To match the characterization of U.S. supply and demand for natural gas in EIA's NEMS model, NERA calibrated its macroeconomic model so that for the same level of LNG exports assumed in the EIA Study, the NERA model reproduced the prices projected by EIA. Thus natural gas price responses were similar in scenarios where NERA export volumes were at the EIA export volumes. However, NERA determined that the high export limits were not

economical in the U.S. Reference Case and that in these scenarios there would be lower exports than assumed by EIA. Because NERA estimated lower export volumes than were specified by DOE/FE for the EIA Study, U.S. natural gas prices do not reach the highest levels projected by EIA. NERA states that this implies no disagreement with the EIA Study. Instead, it reflects the fact that at the highest wellhead prices estimated by EIA, world demand for U.S. exports would fall far short of the levels of exports assumed in the EIA Study. Additionally, NERA found that U.S. wellhead prices would not become linked to oil prices in the sense of rising to oil price parity in any of the cases analyzed, even if the United States were exporting to regions where natural gas prices are presently linked to oil. NERA asserts that costs of liquefaction, transportation, and regasification would keep U.S. prices well below those in importing regions.

Serious competitive impacts are likely to be confined to narrow segments of U.S. industry. NERA gave special attention to the potential impact of LNG exports on EITE industries. NERA examined impacts on manufacturing industries where energy expenditures are greater than 5 percent of the value of the output created and the industries face serious exposure to foreign competition. Such industries, according to NERA, comprise about 10 percent of U.S. manufacturing and employment in these industries is one-half of one percent of total U.S. employment. NERA did not project that such energy-intensive industries as a whole would sustain a loss in employment or output greater than one percent in any year in any of the cases examined and pointed out that such a drop in employment would be less than normal rates of turnover of employees in the relevant industries.

Even with unlimited exports, there would be net economic benefits to the United States. NERA estimated economic impacts associated with unlimited exports in cases in which even the High, Rapid limits were binding. In these cases, both LNG exports and prices were

determined by global supply and demand. Even in these cases, NERA found that U.S. natural gas prices would not rise to oil parity or to levels observed in consuming regions, and net economic benefits to the U.S. increased over the corresponding cases with limited exports. To examine U.S. economic impacts under cases with even higher natural gas prices and levels of exports than in the unlimited export cases, NERA also estimated economic impacts associated with the highest levels of exports and U.S. natural gas prices in the EIA analysis, regardless of whether those quantities could actually be sold at the assumed netback prices. The price received for exports in these cases was calculated in the same way as in the cases based on NERA's GNGM model, by adding the tolling fee plus a 15 percent markup over Henry Hub to the Henry Hub price. Even with the highest prices estimated by EIA for these hypothetical cases, NERA found net economic benefits to the United States, with the net economic benefits growing as export volumes rise. Addressing this finding, NERA explained that LNG export revenues from sales to other countries at those high prices would more than offset the costs of freeing that gas for export.

VI. APPLICANT'S PUBLIC INTEREST ANALYSIS

Pieridae US states that its requested authorization to re-export U.S.-sourced natural gas in the form of LNG from Canada to non-FTA countries is not inconsistent with the public interest, and therefore meets the statutory standard under NGA section 3(a). Citing DOE/FE precedent, Pieridae US states that section 3(a) creates a rebuttable presumption that an application for LNG export authority is in the public interest, and that such an application will be granted unless the presumption is overcome by opponents of the application. Pieridae US notes that DOE/FE applies its 1984 Policy Guidelines (discussed *supra* § III) in considering LNG export applications. Pieridae US states that the "longstanding principles" incorporated in the 1984

Policy Guidelines—minimizing federal control and involvement in natural gas markets—are particularly relevant in the context of its Application and existing natural gas market conditions.

To support its public interest analysis, Pieridae US addresses numerous factors. Under "Analysis of Domestic Need for Gas to be Exported," Pieridae US addresses: (i) the supply of natural gas in the United States, (ii) the regional supply of natural gas in the United States; (iii) national natural gas demand; (iv) the supply-demand balance; and (v) price impacts on natural gas. Discussing "Other Public Interest Considerations," Pieridae US cites: (i) the promotion of long-term stability in the natural gas markets; (ii) benefits to local, regional, and national U.S. economies; (iii) benefits from the stimulation of the natural gas industry; and (iv) international considerations. These factors are summarized below.[92]

A. Domestic U.S. Need for the Natural Gas to be Exported

Pieridae US states that, as a threshold matter, DOE/FE's grant of the requested authorization "will have no detrimental price impact on the US market as a whole, nor will it adversely affect the adequacy of supply for the US as a whole."[93] According to Pieridae US, even if DOE/FE were to deny Pieridae US's request, either Pieridae US or a Pieridae affiliate would consider proceeding with the development of the Goldboro LNG Project using Canadian natural gas to meet all of the Project's natural gas needs. Therefore, "[d]ue to the integrated nature of the US and Canadian gas supply and transportation industries, the total natural gas supply available to US markets would not change."[94]

[92] *See also* Pieridae US App. at 30-31 for a list summarizing the benefits from the proposed exports (and re-exports) that will, according to Pieridae US, meaningfully contribute to the public interest.
[93] *Id*. at 37.
[94] *Id*.

1. Supply of Natural Gas the United States

Pieridae US contends that the United States "has an inventory of recoverable natural gas resources sufficient to last beyond any practicable planning horizon."[95] According to Pieridae US, this inventory is expected to continue growing as further advancements in drilling technology are deployed to exploit additional shale gas development opportunities. In support of these assertions, Pieridae US cites EIA's assumptions, contained in the 2014 *Annual Energy Outlook* (AEO 2014),[96] that 2,266 trillion cubic feet (Tcf) of technically recoverable natural gas (dry gas) resources are available in the United States, as well as 611 Tcf of onshore shale gas technically recoverable resources in the lower-48 states.[97]

Pieridae US asserts that, with these "copious" reserves available, natural gas production is poised to rise with increases in demand.[98] Pieridae US also points to EIA's projection in AEO 2014 that onshore natural gas production for the lower 48 states would reach 13.33 Tcf in 2020, and notes that EIA increased its projection for 2035 from 15.33 Tcf to 18.50 Tcf. Pieridae US further asserts that domestic demand for natural gas will be met, while also allowing for more exports, because "U.S. natural gas production is projected to grow by an average rate of 1.6% per year from 2012 to 2040"—or more than double the 0.8% annual growth rate of total U.S. consumption over the same period.[99] Based on EIA's estimates, Pieridae US posits that U.S. natural gas production will exceed consumption by 2020, allowing the United States to transition from a net importer of natural gas to a net exporter.

---

[95] *See id*. at 40.
[96] U.S. Energy Information Administration, Annual Energy Outlook 2014 with Projects to 2040 (DOE/EIA-0383(2014) (Apr. 2014), *available at*: http://www.eia.gov/forecasts/aeo/pdf/0383(2014).pdf.
[97] Pieridae US App. at 38-39 (citing EIA, *Assumptions to the Annual Energy Outlook 2014, Oil and Gas Supply Module*, 115 tbl.9.2 (June 2014), http://www.eia.gov/forecasts/aeo/assumptions/pdf/oilgas.pdf).
[98] *Id*. at 39.
[99] *Id.*

Among other evidence, Pieridae US cites a paper published by ICF International for the Interstate Natural Gas Association of America Foundation, Inc. According to Pieridae US, this paper "reported [that] the North America natural gas resource base is sufficient to 'supply U.S. and Canadian gas markets for almost 150 years at current consumption levels.'"[100]

2. Regional Supply of Natural Gas in the United States

Pieridae US asserts that the proposed exports from the United States will be made through the M&N US Pipeline. Pieridae US states that it will have access to plentiful natural gas supplies available through the interstate and intrastate natural gas pipeline system. According to Pieridae US, the past expansions of the M&N Pipeline and current proposals to expand system capacity illustrate the natural gas transportation industry's ability to build and expand pipeline infrastructure as needed to ensure adequate regional supply of natural gas.

Pieridae US contends that the regional natural gas supply in the Marcellus reserve is adequate to meet both the domestic needs of the area and the demand for exported natural gas. Pieridae states that there are between 140 and 500 Tcf of natural gas in the Marcellus reserve, meaning that, at the current production rate of 14 Bcf/d, the reserve would not be exhausted for another 27 to 98 years.[101] According to Pieridae US, if its proposed exports were 100 percent additive to the current production rate, the reserve working life would still be 26 to 93 years.

3. National Natural Gas Demand

Pieridae US states that, over the past decade, the United States has experienced little growth in domestic demand for natural gas. Citing AEO 2014, Pieridae US contends that long-

[100] *Id.* at 40 (citing Interstate Natural Gas Ass'n of America Foundation, Inc., *North American Midstream Infrastructure through 2035: Capitalizing on Our Energy Abundance*, 5 (Mar. 18, 2014), http://www.ingaa.org/File.aspx?id=21498).
[101] *Id.* at 41 (citing Northeast Gas Assoc., *NGA Issue Brief: Supply Outlook March 2014*, http://www.northeastgas.org/nat_gas_supply_trends.php; Northeast Gas Assoc., *NGA Issue Brief: Marcellus Shale May 2014*, http://www.northeastgas.org/marcellus_shale.php).

term annual U.S. consumption growth is only 0.8%, with consumption expected to reach 30.44 Tcf in 2035 (compared to 24.38 Tcf of actual demand in 2011). According to Pieridae US, the EIA estimated in the AEO 2014 Reference case that natural gas consumption would rise from 25.6 Tcf in 2012 to 31.6 Tcf in 2040.

Pieridae US asserts that its proposed exports would amount to 5.84 Tcf over the 20-year term of the requested authorization, representing approximately one-quarter of one percent (0.25%) of the total estimated recoverable U.S. natural gas resources (2,226 Tcf).

4. The Supply-Demand Balance

Pieridae US states that the enormous available domestic supply of natural gas dwarfs current U.S. demand, even accounting for the full amount of its proposed exports. Pieridae US further asserts that rising domestic prices of natural gas would tend to reduce overall foreign demand for U.S. natural gas, while simultaneously inducing additional U.S. natural gas production, thereby helping to keep supply and demand in balance and ensuring that domestic and regional natural gas needs are satisfied.

5. Price Impacts on Natural Gas

Pieridae US argues that, despite the concern over price impacts of allowing U.S. natural gas exports, evidence suggests that "'price impacts will be moderate and unlikely to be driven by the volume of U.S. gas exported.'"[102] In support of this argument, Pieridae US cites a 2013 study by the Deloitte Center for Energy Solutions and Deloitte MarketPoint LLC, which

[102] Pieridae US App. at 43 (quoting U.S. House of Representatives – Committee on Energy and Commerce, Majority Staff, *Prosperity at Home and Strengthened Allies Abroad – A Global Perspective on Natural Gas Exports*, THE POLICY PAPER SERIES, 6 (Feb. 4, 2014)).

concluded that "[t]he projected increase of average U.S. [natural gas] prices from 2016 to 2030 is about $0.15/MMBtu …."[103]

B. Other Public Interest Considerations

1. Long-Term Stability in the Natural Gas Markets

Pieridae US maintains that its proposed exports will help to promote long-term stability in natural gas markets. First, Pieridae US asserts that current levels of decreased capital spending on dry natural gas drilling and development in the United States are due to lower U.S. natural gas prices. Pieridae US contends that exporting natural gas under the requested authorization would increase demand for natural gas produced in the United States, which, in turn, would contribute to a small increase in domestic natural gas prices. According to Pieridae US, these factors would encourage investment and therefore help to stabilize the natural gas industry.

Next, Pieridae US states that this stabilizing effect would occur on both the price and the availability of U.S. natural gas for use within the United States. Pieridae US argues that, by increasing the size and diversity of the demand for natural gas to include consumers in other nations (*e.g.*, Canada), the volatility in demand for natural gas would decrease, resulting in more stable prices in the United States. Pieridae US also maintains that an increased production base and upgraded natural gas transmission capabilities would present an opportunity for rapid, voluntary diversion of natural gas supply to domestic purposes, should domestic demand change rapidly.

[103] *Id.* at 44 (citing Deloitte Center for Energy Solutions and Deloitte MarketPoint LLC, *Exporting the American Renaissance Global Impacts of LNG Exports from the United States*, 2 (2013), http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/Energy_us_er/us_er_GlobalImpactUSLNGExports_AmericanRenaissance_Jan2013.pdf).

2. Benefits to Local, Regional, and National U.S. Economies

Pieridae US observes that "[e]very entity proposing to export LNG from the US and studying the issue to date has found that the proposed exports would benefit the economy at the local, regional and national level."[104] According to Pieridae US, the 2012 NERA Study supports this conclusion, finding that "'[a]ll export scenarios are welfare-improving for US consumers.'"[105]

Pieridae US submits that, even though the planned Goldboro LNG Project would be located in Canada, its proposed exports would still benefit New England consumers and the United States as a whole. According to Pieridae US, although "fees for liquefaction and marine services will be paid to the owner/operator of a Canadian … facility…, most of the benefits to the U.S. economy associated with LNG exports stem from the production and transportation of natural gas, not its liquefaction or the marine services associated with LNG exports."[106]

Pieridae US identifies several types of benefits that it considers likely to flow at least in part to the United States:

- A return on capital to equity investors;
- A return on capital to project lenders;
- Income from the sales of equipment and supplies—a "substantial portion" of which is "likely to be sourced in the United States";
- Job creation, with a portion of the project development labor force expected to originate in the United States; and
- The payment of taxes.

[104] *Id.* at 47.
[105] *Id*. at 31 (quoting NERA Study at 55); *see also id*. at 32 & n.55 (citing an "updated version" of the NERA Study produced by NERA in 2014, entitled *Updated Macroeconomic Impacts of LNG Exports from the United States* (NERA Update), which—according to Pieridae US—reached conclusions similar to those contained in the 2012 NERA Study).
[106] Pieridae US App. at 33.

Pieridae US maintains that these benefits are in addition to those benefits certain to come from stimulating demand for U.S. natural gas, as well as natural gas production and transportation infrastructure.[107] Pieridae US asserts, for example, that Pieridae US (and some affiliates) are contractually committed to procuring from one or more U.S. suppliers certain engineering services and much of the equipment, installation, and testing services necessary for the construction of the Goldboro LNG Project. Pieridae US states that the cost of the U.S.-sourced equipment, services, and technology is expected to be in the many hundreds of millions of dollars.

Pieridae US further argues that the "strong linkage between the U.S. and Canadian economies suggests that funds expended in Canada to construct and operate the Goldboro LNG Project will lead to increased commerce in the U.S."[108] In discussing the "'highly integrated'" nature of the U.S. and Canadian economies,[109] Pieridae US points out that the United States is Canada's largest trading partner and is the largest single investor in Canada.[110] In Pieridae US's view, "these [and other] factors support a reasonable expectation that the construction of, investment in, and operation of the Goldboro LNG Project will result in benefits to the US's economy, as well as Canada's."[111]

Pieridae US next asserts that the dollars paid for U.S. natural gas and gas transportation in the United States will "dwarf" the construction and operating costs of the Goldboro LNG Project.[112] Citing a study published in June 2012 by Michael Levi, Pieridae US argues that there could be as many as eight times more exploration production, transportation, and supply chain

[107] *See id*. at 34.
[108] *Id.* at 48.
[109] *Id.* at 48 (citing IAN F. FERGUSSON, UNITED STATES-CANADA TRADE AND ECONOMIC RELATIONSHIP: PROSPECTS AND CHALLENGES 1 (Congressional Research Service 2011), *available at* http://fas.org/sgp/crs/row/RL33087.pdf).
[110] *Id*. at 49.
[111] Pieridae US App. at 49.
[112] *Id*. at 50.

jobs created by the Goldboro LNG Project than would be required to complete the Project itself.[113] Finally, Pieridae US estimates that DOE/FE's approval of its Application would result in economic benefits to the United States of between $240 and $300 million per year.[114]

3. Benefits from the Stimulation of the Natural Gas Industry

Noting that the M&N US Pipeline anticipates increasing the capacity of its system, Pieridae US states that its long-term commitment to use a substantial amount of this capacity would support lower transportation units costs (by reducing the unit cost of transportation for all customers on the system) and would provide greater reliability for other system users.[115] Pieridae US also argues that its proposed exports are likely to stimulate additional development of natural gas resources by expanding the market for North American natural gas. According to Pieridae US, this development will involve sizable investment in exploration and production activity, thereby further stimulating the economy.

4. International Considerations

In addressing the various international considerations associated with the requested authorization, Pieridae US relies on a Policy Brief published by the Brookings Institution's Energy Security Initiative in May 2012 (Brookings Study). According to Pieridae US, the Brookings Study analyzed the international implications of LNG exports in three components: pricing, geopolitics, and the environment.[116]

With respect to pricing, Pieridae US quotes the Brookings Study in asserting that "'LNG exports will help to sustain market liquidity in what looks to be an increasingly tight LNG

[113] *Id.* at 50 (citing, Michael Levi, *A Strategy for U.S. Natural Gas Exports*, THE HAMILTON PROJECT 6 (June 2012), http://www.hamiltonproject.org/files/downloads_and_links/06_exports_levi.pdf).
[114] *Id*. at 51.
[115] *Id.* at 51.
[116] *Id.* at 52-54 (citing Charles Ebinger et al., *Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural Gas*, THE BROOKINGS ENERGY SECURITY INITIATIVE 38 (May 2012) [hereinafter the Brookings Study].

market beyond 2015.'"[117] According to Pieridae US, more liquid markets help to place downward pressure on the pricing terms of oil-linked contracts, which are common in the world markets for LNG. Pieridae US further contends, based on the Brookings Study, that lower prices for energy in Europe and elsewhere can contribute to an "uptick" in the world economy, resulting in increased trade with the United States. Pieridae US states that, by contrast, denying global trading partners a source of reliable, reasonably priced energy could harm the U.S. economy, given the "'increasingly integrated'" global economy.

Addressing the issue of geopolitics, Pieridae US refers to a conclusion of the Brookings Study that a large increase in U.S. LNG exports would have the potential to increase U.S. foreign policy interests in both the Atlantic and Pacific basins, namely by diversifying the natural gas supply for strategic U.S. allies.

With respect to the environment, Pieridae US addresses the possibility of using natural gas to displace more carbon-intensive fuels among other major energy users, including across the European Union and in Japan. Pieridae US points to the Brookings Study's findings that natural gas has the potential to reduce carbon dioxide emissions by 740 million tonnes in 2035 compared to coal and oil-based fuels, while at the same time producing lower emissions of pollutants such as sulfur dioxide, nitrogen oxide, and other particulates.[118]

Next, Pieridae US states that the exportation of natural gas would improve the U.S. balance of trade. Pieridae US cites statements by DOE/FE recognizing that natural gas exports

[117] Pieridae US App. at 52.

[118] *Id*. at 53 (citing Brookings Study). Pieridae US also addresses concerns in the Brookings Study that lower natural gas prices may lead to increased carbon dioxide emissions due to the displacement of nuclear and renewable energy by cheap natural gas. Pieridae US contends that these concerns are misplaced for the following reasons: (i) the export of U.S. natural gas would not have a substantial impact on the need for other energy sources to generate electricity; (ii) because destination markets must command a significant price premium to cover the cost of liquefaction, transportation and regasification, the potential for natural gas exported by Pieridae US to discourage the use of nuclear and renewable energy overseas is limited; and (iii) any loss of competitiveness of nuclear and renewable energy technologies abroad would be mitigated by the increased competitiveness of these technologies in the United States, as those technologies become more cost-effective. *See id*. at 54-55.

would have a positive role on U.S. trade with destination countries and reduce U.S. trade imbalances.[119]

Finally, Pieridae US states that DOE/FE "should … give consideration to the fact that Canada has historically authorized the export of natural gas from Canada to the U.S. without restricting what the U.S. does with such natural gas."[120] Pieridae US argues that a denial of the requested authorization would be contrary to the public interest because of the chilling effect it could have on the cooperative spirit between the United States and Canada.

VII. CURRENT PROCEEDING BEFORE DOE/FE

A. Preliminary Procedural Matters

1. Late-Filed Comments

The Notice of Application for Pieridae US, published on December 10, 2014, invited interested persons to submit protests, motions to intervene, and comments by 4:30 p.m. Eastern time on February 9, 2015.[121] In response to the Notice of Application, DOE/FE received 18 comments opposing the Application that were filed after the 4:30 p.m. deadline on February 9, 2015. However, because no party opposed the submission of these late-filed comments, and because the comments were all filed on February 9, 2015 (the day on which the comment period closed), we find that no party will be unduly prejudiced by our consideration of those comments. Accordingly, the late-filed comments are accepted for filing in the administrative record.[122]

2. Requests for Extension of Time to Comment and Intervene in Proceeding

Numerous commenters and proposed intervenors asked DOE/FE to extend the 60-day period to comment on Pieridae US's Notice of Application and/or to intervene in this proceeding. In its motion to intervene and protest, the Massachusetts Pipeline Awareness

[119] *See id*. at 55.
[120] *Id.*
[121] Pieridae US Notice of Application, 79 Fed. Reg. at 73,285-86.
[122] *See supra* n.17.

Network (MassPLAN) argued that the public interest would be served by affording a 30-day extension of the time because many organizations and individuals whose rights and interests would be impacted by approval of the Application were "only learning" of this proceeding on the final day of the comment period. Some commenters, such as Robert Douglas, criticized DOE/FE for not "properly announcing" the comment period for Pieridae US's Notice. Others, including Cathy Kristofferson and Ariel Elan, contended that DOE/FE's notices of LNG export applications should be more widely announced to allow all interested parties sufficient time and opportunity to participate in the comment period. Betsy Taylor-Kennedy, among others, added that many of the recently-elected state and federal officials in Massachusetts were not notified of Pieridae US's Application and deserve an opportunity to comment on it, particularly given that the proposed Project could adversely affect regional natural gas supply for millions of New England residents.

As discussed below, we are satisfied that the 60-day comment period provided in the Notice of Application, as published in the Federal Register, was both lawful and adequate. *See infra* § XI.A.1.

3. Procedurally Non-Compliant Motions for Leave to Intervene

DOE/FE received 31 motions for leave to intervene and/or protest Pieridae US's Application. As described in greater detail below, Pieridae US opposes 27 of these motions for lack of compliance with DOE/FE's regulations set forth in 10 C.F.R. § 590.103(b). Upon review, DOE/FE has determined that these 27 motions are, in fact, procedurally non-compliant. *See* infra § XI.A.2. Nonetheless, because these filings contain considerations that may be relevant to our analysis, DOE/FE accepts these 27 filings as comments opposing the Application.

Four remaining motions for leave to intervene and/or protests are procedurally compliant: (i) the Motion for Leave to Intervene of Saint John Gas Marketing Company, (ii) the Motion for Leave to Intervene of Northeast Energy Solutions, Inc. (NEES) (iii) the Motion to Intervene and Protest filed by MassPLAN, and (iv) the Motion to Intervene, Motion to Suspend, and Protest of the Industrial Energy Consumers of America (IECA). Saint John Gas Marketing Company does not express support or opposition for the Application; the other three movants oppose the Application.

B. Comments Supporting the Application

Three commenters—Tom E. McCormick, on behalf of Chicago Bridge and Iron N.V. (Chicago Bridge & Iron), Maurice E. May, and Phillip M. Rury—filed comments in support of the Application. Mr. McCormick states that he serves as President, Oil and Gas, of Chicago Bridge & Iron. He asserts that Chicago Bridge & Iron is the "most complete energy infrastructure focused company in the world," as well as a major player in the various locally-based businesses that support LNG operations globally. According to Mr. McCormick, Pieridae US's proposed exports will drive major economic benefits to American businesses and workers throughout the LNG energy supply chain. He asserts that proposed Goldboro LNG Project would be an "economic boost" for the New England and Atlantic coastal region, with capital expenditures for the Goldboro LNG Project as high as $8 billion (in U.S. dollars) and the creation of hundreds of regional jobs, including approximately 200 on-going operations and maintenance positions. Mr. McCormick also states that the Project would create a supplemental export market for natural gas that is not currently available.

Mr. May and Mr. Rury similarly support a grant of Pieridae US's Application. Mr. May contends that the export of LNG to world markets will help the United States to offset oil imports and become energy neutral.

C. Comments Opposing the Application

As discussed above, a total of 167 commenters oppose Pieridae US's Application, many of which are substantially similar or identical form letters. These commenters urge DOE/FE to deny Pieridae US's Application because, in their view, the proposed exports are not in the public interest. Their concerns generally relate to the following issues:

- Alleged impacts to the environment from exports of U.S.-sourced natural gas, including effects from hydraulic fracturing and contributions to climate change;
- Domestic need and supply of natural gas;
- Objections to pipeline use and construction, and limitations on pipeline capacity;
- Risks to human safety; and
- Pieridae US itself.

These concerns are summarized below. To the extent these comments are materially the same as comments submitted to DOE/FE in the context of the 2012 LNG Export Study, the Addendum, and/or the LCA GHG Report proceedings, and thus are discussed in other sections of this Order, we do not repeat them all here.

1. Environmental Concerns

The majority of commenters oppose Pieridae US's Application, at least in part, because of several concerns about the asserted environmental impacts associated with the proposed exports of LNG.

First, many commenters, including Anne O'Connor, Edith Kantrowitz, and Damascus Citizens for Sustainability, Inc. (Damascus Citizens), assert that the Application must be evaluated based on the "full life cycle of the gas from extraction, processing, transportation, shipping, liquefaction, re-gasification, and consumption."[123] These commenters, including

[123] *See, e.g.*, Comment of the Damascus Citizens for Sustainability, Inc.

Rebecca Roter and Cindy and Steve True, allege that the full life cycle of natural gas creates adverse impacts upon hundreds of American communities and thousands of Americans living in the "upstream" segments of natural gas systems, near the extraction fields and along the interstate transmission pipeline infrastructure. According to Ms. Kantrowitz, these upstream impacts include:

> [A]dverse health impacts, water contamination, air pollution, depletion of property values, noise, heavy truck traffic, loss of forests, wetlands, and parklands, creation of radioactive waste, soil depletion, loss of wildlife, general environmental degradation, and adverse impacts on local business sectors sensitive to environmental quality, such as agriculture and tourism.[124]

Mark Pezzati adds that the source of Pieridae US's proposed exports will be the Marcellus Shale, and that communities in the Marcellus region are being devastated economically, environmentally, and socially by hydraulic fracturing—an "extreme" form of resource extraction.

Mina Hamilton specifically criticizes the Application as being "faulty, misleading, and incomplete" insofar as Pieridae US makes the "unsubstantiated, … ludicrous claim that there will be no 'upstream' impacts associated with the export of 292 bcf of natural gas per year."[125] Ms. Hamilton explains:

> 'Upstream' [is] being defined here as any impacts up the pipeline from the pipelines and LNG terminal in Nova Scotia—which … constitutes the geographic direction of South on a … map. Thus, 'upstream' would include the [M&N] Pipeline, in addition to pipelines and attendant infrastructure in New England.[126]

Ms. Hamilton accuses Pieridae US of deliberately attempting to "sever the link" between the proposed exports and upstream consequences, which otherwise would subject the Application to the necessity of an Environmental Impact Statement under NEPA. As discussed below, Ms.

[124] Comment of Mevrian Thomas.
[125] Comment of Mina Ham, at 1.
[126] *Id*.

Hamilton argues that these upstream consequences will include the build-out of additional pipeline structure to support Pieridae US's proposed exports on the M&N Pipeline. Commenters including Food & Water Watch likewise maintain that DOE/FE must, in its review of Pieridae US's Application, examine all secondary and cumulative impacts associated with the Application, including encouraging the expansion of hydraulic fracturing of unconventional shale gas resources and the creation of natural gas infrastructure in the Northeast region.

Second, numerous commenters, including Rutilious B. Perkins III, Alan Weisman, Justin Adkins, and Martha Tirk, argue that the Application is not in the public interest because Pieridae US's proposed exports will increase domestic production and global combustion of natural gas, which they allege will exacerbate emissions of carbon dioxide and methane, contributing to climate change. They urge DOE/FE to avoid any continued or increased use of fossil fuels, including LNG. Many commenters, including Etta Davis and Rosemary Wessel, argue that leaks of methane are particularly potent—allegedly 86 times more potent than carbon dioxide. According to these commenters, leaks of methane during drilling for natural gas directly contribute to climate change, and make the total contribution of natural gas no better than coal when its lifecycle is taken into account (*i.e.*, drilling, transmission, and distribution).

Mr. Perkins acknowledges that the LCA GHG Report (discussed *infra*) was prepared for DOE/FE to consider the life cycle of U.S.-sourced LNG exported from the United States. However, Mr. Perkins disputes DOE/FE's conclusions from the LCA GHG Report, and asserts the following criticisms of the Report:

- The LCA GHG Report did not definitively determine that LNG from the United States has the lowest Global Warming Potential (GWP) of the four fossil fuel scenarios. Rather, the lowest end of the range for estimated GWP appears to be for the scenario of LNG from a nearer regional source (Algeria for Europe, and Australia for Asia), for both the 20- and 100-year horizons, although overlapping uncertainty bars make this a "less than certain" outcome;

- In the European case, overlapping uncertainty bars make it possible that either or both Algerian LNG or piped Russian natural gas would have lower GHG emission than LNG exported to Europe from the United States;

- In the Asian case, overlapping uncertainty bars make it possible that either or both Australian LNG or piped Russian natural gas would have lower GHG emissions than LNG exported to Asia from the United States;

- At the extremes of the ranges of uncertainties shown in the LCA GHG Report, in the Asian case, regional Chinese coal use for electricity generation might have lower life cycle climate change impacts than LNG exported from the United States, on the 20-year horizon;

- The LCA GHG Report does not weigh the climate change impacts of exporting U.S. LNG against non-fossil fuel scenarios for electricity generation in Europe or Asia which are likely to have even lower GWP.

Mr. Perkins argues that, in light of these alleged deficiencies in the LCA GHG Report, DOE/FE should ask, "Does exported U.S. LNG have a lower Global Warming Potential than renewable and other energy options for Europe and Asia?" Mr. Perkins maintains that, if DOE/FE concludes that other countries have energy options with lower GWP than exported U.S. LNG, DOE/FE should deny Pieridae US's Application as inconsistent with the public interest.

Third, some commenters, including Liz Fletcher, argue that NEPA requires agencies to examine the cumulative effects of all projects in the past, present, and foreseeable future, including the LNG export permits already approved by DOE/FE and the applications under review. These commenters further argue that the cumulative impacts of these projects must include their related pipeline and extraction infrastructure requirements.

Fourth, commenters argue that Pieridae US's Application and the Spectra pipeline expansions are interconnected and inter-related, and both violate the principle that NEPA reviews may not be segmented. They assert that Pieridae US must conduct a full Environmental Impact Statement that includes all related pipeline projects.

Fifth, commenters including Food & Water Watch and Foundation for a Green Future, Inc. assert that the construction of pipelines to support the proposed exports will cause a variety of other adverse environmental impacts, including health risks related to air emissions and increased sedimentation. According to Food & Water Watch, air emissions from compressor stations related to various pipeline projects include benzene, toluene, formaldehyde, and other chemicals that may cause severe impacts to human health. Food & Water Watch also alleges that these pipeline projects will cause sedimentation, erosion, and other potential contamination impacts to water bodies and wetlands, degrading the quality and quantity of water available to nearby residents. Foundation for a Green Future Inc. and 350CT also contend that the Kinder Morgan Northeast Energy Direct (NED) pipeline project is a greenfield project that would cross conservation lands and forests, and impinge upon the rights of landowners to enjoy their properties.

Cathy Buckley adds that any project that increases dependence on fossil fuels makes it difficult and more expensive to move to a clean, renewable energy future. Judy Eddy and Wes Ernsberger contend that DOE/FE should deny Pieridae US's Application and instead promote renewable energy projects.

2. Domestic Natural Gas Supply and Demand

Some commenters, including Phyllis J. Campbell, Warren Ondras, Robert Douglas, and Susi Westwood, question why the United States would choose to deplete its natural gas reserves for the profit of corporate energy companies, particularly when the United States is on the verge of energy independence. Micky McKinley and James S. Mellett, among others, assert that the proposed exports will weaken the American economy by lowering the supply of natural gas available for domestic use. Damascus Citizens further argues that estimates of domestic natural

gas supplies are greatly overestimated. Citing research published in October 2014 by the Post-Carbon Institute, Damascus Citizens states that the decline rate in the Marcellus Shale is approximately 75 percent in the first three years of a well's operation. According to Damascus Citizens, new Marcellus wells will have to be drilled at a faster rate than the old wells are played out, and the natural gas will need to be shipped and sold quickly. Damascus Citizens argues that Pieridae US seeks a permit for 20 years, but current depletion rates indicate that the United States does not have excess natural gas supplies to allow for export for this time period.

Rutilious B. Perkins III asserts that authorizing the proposed exports would raise domestic need and supply concerns, particularly in Massachusetts and the rest of New England, where any natural gas available at the origin point of the M&N US Pipeline (in Dracut, Massachusetts) would be diverted for export through Canada. Mr. Perkins argues that:

> In the absence of any newly constructed transmission supply pipelines to Dracut, MA (or even approval to construct the same), it would appear that any approval of Pieridae's Application … would therefore amount to approval to divert up to 0.8 Bcf/d of the existing gas transmission capability into Dracut from use by New England consumers and electricity generators, to instead be used for foreign export of natural gas as LNG out of Canada.[127]

Mr. Perkins further contends that, "[i]n order for Pieridae to export gas from Dracut, MA, it would have to use pipeline infrastructure into Dracut to supply the gas for export," and that "[s]uch a diversion of reportedly constrained pipeline infrastructure ... for the LNG export interests of a private Canadian corporation, would be inconsistent with the public interest …."[128] Jennifer Markens, Betsy Taylor-Kennedy, and Vincent E. Premus similarly argue that sending much or all of the proposed exports of U.S.-sourced natural gas (in the form of LNG) to Europe or Asia could adversely impact millions of New England residents by disrupting both winter supply in the Northeast energy markets and

[127] Comment of Rutilious (Rudy)Perkins III, Esq., at 8.
[128] *Id*. at 8-9.

grid reliability in the territory served by ISO New England, while further burdening rate payers. Curtis Nordgaard adds that, because Massachusetts is increasingly reliant on natural gas for heating and electricity production, we should be storing any available natural gas in Massachusetts to meet regional needs, not exporting it.

On the other hand, Susan Ross alleges that there is no need for any more natural gas in New England because residents of that region have access to Canadian hydropower and other energy sources.

3. Price Impacts

Mark Pezzati, Amy Pulley, Phyllis J. Campbell, and Robert Douglas, among others, contend that many foreign countries pay two to four times the price for natural gas that domestic consumers pay in the United States. They assert that increased exports of natural gas would force the price of domestic natural gas to rise in line with those same high prices, and question how it can be in the best interest of U.S. citizens to compete with foreign export markets. Food & Water Watch contends that exports of LNG could increase the domestic price of natural gas by as much as 47 percent—in addition to increases in electricity rates and decreases in the manufacturing sector. Marion E. Wheeler urges DOE/FE to carefully assess the price to be paid by U.S. citizens by allowing the export of domestic natural gas. Likewise, Food & Water Watch, Laura Kaye, and Judy Eddy assert that selling U.S. natural gas overseas will not be good for the U.S. economy or for the general public in the long run, and will profit only a small handful of people.

Focusing on impacts of higher natural gas prices in New England, the Foundation for a Green Future, Inc., the Dracut Pipeline Awareness Group, and Compressor-Free Franklin argue that approval of the Pieridae export plan could result in the depletion of natural gas winter

storage and peak supply that are critical to the New England region. Citing EIA data from 2014, these organizations argue that Pieridae US's proposed exports would result in lower inventories of natural gas, which, in turn, would contribute to higher New England gas prices than if these exports were not allowed.

4. Pipeline Construction, Expansion, and Capacity

The majority of comments received by DOE/FE in opposition to the Application raised concerns about Pieridae US's intent to export U.S.-sourced natural gas to Canada using the M&N Pipeline. These commenters oppose any export plan that could involve the construction or expansion of existing natural gas pipelines in the United States.

Some commenters, including Janet Clark, Cathy Kristofferson, Nick Miller, and Susan Ross, argue that exporting natural gas through a pipeline being built in or near their town is not in the public interest if it involves constructing a natural gas pipeline through Massachusetts or New Hampshire. For example, Shepard Foreman and Cindy and Steve True do not reference Pieridae US's Application, but instead state their strong opposition to a proposed pipeline through their state of Massachusetts. Mr. Foreman is particularly opposed to the pipeline being used for the political and economic purposes of exporting natural gas. Mr. Miller asserts that his house and property are in the direct path of the proposed NED pipeline, and that, if approved, the pipeline will deliver much more natural gas than is needed in New England, solely for purposes of exporting the natural gas to foreign markets.

Many commenters oppose Pieridae US's Application claim that the proposed exports are inextricably linked to the construction of new pipeline infrastructure. Anne Dicicco of the New Hampshire Pipeline Awareness Network, among others, asserts that Pieridae's export plans would likely depend on the completion of the NED project and/or an alternative plan by Spectra

Energy, such as the proposed Access Northeast and Atlantic Bridge pipelines. Jennifer Markens criticizes Pieridae US for "fail[ing] to clearly state which Northeast pipeline projects would be necessary to achieve the needed gas supply for exports via New England through the port of Goldsboro, Nova Scotia."[129] In Ms. Markens's view, Pieridae US does not fully acknowledge that its proposed exports, if approved, will create a demand for additional pipeline construction and likely will require significant greenfield buildout. Susan A. Van Dolsen claims that, if one looks at the information available from various sources, including the Spectra Energy website, the Goldboro LNG Project's website, and Pieridae US's Application, it is obvious that the Algonquin Incremental Market pipeline project and the Atlantic Bridge pipeline project are being developed to provide domestic gas for export, and thus should be considered (and denied) as part of Pieridae US's overall export plan.

Mina Hamilton similarly disputes Pieridae US's statement that "'no planned new pipeline or planned pipeline expansion will be implemented as a consequence of, or will be dependent upon Pieridae's decision to take capacity on that pipeline or pipeline expansion'"—a statement that Ms. Hamilton calls "invalid and false."[130] Ms. Hamilton charges that "it is patently false and absurd to claim that the amount of gas currently traveling via the Maritimes pipeline will be sufficient to reach the 292 cubic feet per year that Pieridae assets it will be exporting."[131] According to Ms. Hamilton:

> Absolutely without a doubt this sourced gas will be sourced from the build-out of additional pipeline infrastructure, such as the Kinder Morgan proposed Northeast 'greenfield' pipeline and multiple, toxic compressor stations, plus the proposed Spectra AIM and Atlantic Bridge pipeline expansions and multiple, toxic compressor stations.[132]

[129] Comment of Jennifer Markens, at 1.
[130] Comment of Mina Ham, at 1 (quoting Pieridae US App. at 8).
[131] *Id*. at 2.
[132] *Id*.

Ms. Hamilton asserts that Pieridae US's claim—that no planned new pipeline or planned pipeline expansion will be required as a result of its proposed exports—is a "clear and deliberate attempt to wave out of existence any 'upstream' buildout of pipeline infrastructure," as well as a "deliberate and brazen attempt to have the project exempt from an EIS."[133]

Numerous commenters, such as Cheryl Rose, Mina Hamilton, and Pramilla Malick, *et al.*,[134] note that the construction of new interstate pipeline projects in the New England region (including the Northeast Energy Direct, Algonquin Incremental Market, Constitution, and Atlantic Bridge pipeline projects) are not complete and face various legal challenges. Mr. Perkins points to Pieridae US's claim that it will transport natural gas using the M&N Pipeline without constructing or expanding any pipelines or contracting with others to do so, and maintains that DOE/FE's approval of Pieridae US's Application could amount to a prejudgment of the outcome of FERC's review of the proposed pipeline projects. According to James Carvalho, DOE/FE's approval of Pieridae US's Application will be used by Kinder Morgan to inflate the needed natural gas pipeline capacity as the "necessity" criteria for FERC's approval of the proposed Northeast Energy Direct pipeline.[135] Mr. Carvalho argues that DOE/FE should deny the Application because of the significant environmental consequences that will be associated with the pipeline construction and operation of the pipeline infrastructure, which he contends is a "direct effect" of Pieridae US's Project. Ms. Rose adds that if, as claimed, the construction of these new pipelines is intended to meet existing energy needs for New England, then the construction of a terminal to export much or all of this new natural gas supply to other countries would undermine this purported purpose.

---

[133] *Id*. at 1.
[134] This comment allegedly was submitted on behalf of 1,013 people, with Pramilla Malick listed first.
[135] Elaine Mroz similarly contends that, "[i]f Pieridae's application is approved Pieridae will most likely enter into precedent agreements for proposed new capacity, thus creating a perceived 'need' for this capacity …." Comment of Elaine Mroz.

Carolyn Sellars further asserts that Pieridae US's Application is incomplete because of Pieridae US's statements that: (i) the capacity of the M&N Pipeline export facilities (0.4 Bcf/d of natural gas) is insufficient to accommodate the full volume of the proposed exports (0.8 Bcf/d of natural gas), and (ii) Pieridae US does not have an agreement with M&N Pipeline or other U.S. pipeline companies to meet its capacity needs. According to Ms. Sellars, Pieridae US's requested authorization is premature, if not frivolous, due to the alleged lack of pipeline capacity, and therefore DOE/FE cannot approve the Application. Judy Eddy argues that DOE/FE should not approve a project, such as the Goldboro LNG Project, when the pipelines proposed to supply it have not been approved yet.

Pat Martin argues that, because Pieridae US must acknowledge that pipeline capacity sufficient for its plan does not currently exist, the environmental impact of a new pipeline construction must be considered under NEPA. Similarly, Elaine Mroz states that Pieridae US's statements in the Application demonstrate that the proposed exports "clearly depend[] on proposed enhancements to pipeline systems in the Northeast[,]" and therefore "Pieridae cannot seek a categorical exclusion from [an] EIS [where] it … depends on proposed enhancements that clearly have extensive environmental impacts."[136]

Finally, Robert Douglas, Deirdre Derchin Olson, Vincent Premus, and Thomas Wilder, among others, express concern about companies that rely on principles of eminent domain to take easements through private property for the construction of pipelines. Mr. Douglas argues that using eminent domain for pipelines to be used for the export of natural gas does not constitute a "public use" of the affected land under the Fifth Amendment to the U.S. Constitution.

[136] Comment of Elaine Mroz.

5. Risks to Human Safety

Arthur E. Douglas and Robert Douglas both oppose the Application because they believe that the proposed Project increases the risk of terrorism in the United States. Additionally, citing past pipeline disasters and concerns with the enforcement authority of the U.S. Pipeline and Hazardous Materials Administration, Food & Water Watch asserts that there is inadequate oversight of pipelines, and that the proposed exports will only increase potential hazards to the U.S. pipeline system. Commenters, including April Fawn Scheller, 350CT, and Food & Water Watch, further contend that certain proposed pipeline projects needed to support the proposed LNG exports, such as the NED pipeline project, would endanger the safety of residents due to the crossing of many highly developed towns where a future pipeline incident could prove catastrophic.

6. Corporate Management

Some commenters, including Mina Hamilton, assert that DOE/FE should deny the Application based on allegations against Pieridae US and/or its parent company, Pieridae Energy Limited, as corporate entities. They contend, for example, that Pieridae US: (i) is a privately-held company that is "without transparency;" (ii) lacks experience building complicated, potentially hazardous infrastructure associated with a LNG terminal; and (iii) has a history of "flipping" LNG facilities, and likely intends to sell its interest to a larger corporate entity (such as Exxon Mobil Corporation or Shell Oil Company) after the permitting process is complete, without actually building Trains 1 and 2 at Goldboro.

D. Motions for Leave to Intervene and/or Protest

1. Motion to Intervene of Saint John Gas Marketing Company

Saint John Gas Marketing Company (Saint John Gas) filed a Motion to Intervene on February 9, 2015.[137] Saint John Gas states that it is a Delaware corporation with its principal place of business in The Woodlands, Texas, and a wholly-owned subsidiary of Repsol St. John LNG, S.L., a Spanish corporation. Saint John Gas states that its affiliates are considering a natural gas liquefaction and LNG project to be located at the existing Canaport LNG terminal in Saint John, New Brunswick, Canada, and that Saint John Gas may act as the U.S. marketing agent for procuring U.S.-sourced natural gas. According to Saint John Gas, this potential project—like Pieridae US's proposed Goldboro project—may export natural gas by pipeline to Canada for subsequent export as LNG.

Saint John Gas asserts that good cause exists to approve its intervention in this proceeding. According to Saint John Gas, "DOE's regulatory approach to adjudicating applications to export natural gas by pipeline to an adjacent country for subsequent export as LNG appears to be a case of first impression."[138] For this reason, Saint John Gas states that it has a direct interest in both DOE/FE's public interest analysis for Pieridae US's Application and the outcome of this proceeding. Saint John Gas seeks to intervene as a party to this proceeding, but does not state its support or opposition to the Application.

2. Motion for Leave to Intervene of Northeast Energy Solutions, Inc.

Northeast Energy Solutions, Inc. (NEES) filed a Motion for Leave to Intervene on February 9, 2015.[139] As discussed below, NEES asks DOE/FE to either suspend consideration

[137] Motion to Intervene of Saint John Gas Marketing Co., FE Docket No. 14-179-LNG (Feb. 9, 2015) [hereinafter Saint John Gas Mot.].
[138] *Id*. at 3.
[139] Motion for Leave to Intervene of Northeast Energy Solutions, FE Docket No. 14-179-LNG (Feb. 9, 2015) [hereinafter NEES Mot.].

of the Application or to deny it as inconsistent with the public interest, among other requested relief.

NEES states that it is a nonprofit corporation comprised of energy, land, environmental, end-user, and related economic interests. NEES serves as an educational resource and advocacy group to ensure that economically viable and environmentally responsible energy projects account for its members' interests. NEES states that it is currently an intervenor before FERC, among other agencies, in proceedings involving capacity and infrastructure proposals in the northeast United States.

Motion to Intervene. NEES states that it is has a direct and substantial interest in this proceeding. In support of this argument, NEES quotes the Application, in which Pieridae US states that "no planned new pipeline or planned pipeline expansion will be implemented as a consequence of, or will be dependent upon, Pieridae's decision to take capacity on that pipeline or pipeline expansion," and that "it is anticipated that transportation services in Maine, Massachusetts and New Hampshire will be provided to Pieridae US primarily by the operations of the M&N US Pipeline …."[140] NEES argues that, these statements notwithstanding, Pieridae US "seemingly contradicts itself" by discussing the natural gas pipeline facility expansion plans in the Northeast that potentially will benefit from the Application.[141] NEES asserts that, in fact, Pieridae US states that its Project potentially will obtain capacity from those proposed projects. On this basis, NEES asserts that its interests will be directly affected by the outcome of this proceeding and requests leave to intervene in opposition to the Application.

Request to Suspend Non-FTA Approvals. NEES asks DOE/FE to suspend any further LNG export approvals to non-FTA countries. In support of this request, NEES states that EIA

[140] *Id*. at 2 (quoting Pieridae US App. at 8-9).
[141] *Id*.

issued an updated LNG export report in 2014, entitled *Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets*, but—allegedly by EIA's own admission—the NEMS model used by EIA "is not a system that uses a world energy model and does not address the interaction between the potential for additional U.S. natural gas exports and developments in world natural gas markets."[142] NEES asserts that DOE/FE should suspend its approval of LNG export applications to non-FTA countries until EIA is able to provide more accurate information that allows DOE/FE to determine whether additional LNG exports are in the public interest.

Request for Additional Procedures. Pursuant to DOE/FE's regulations (10 C.F.R. § 590.206), NEES asks DOE/FE to direct additional procedures concerning Pieridae US's Application. NEES submits that these procedures should include "the filing of supplemental written comments, written interrogatories and/or other discovery procedures, a conference, verbal presentation, and/or adjudication."[143] Alternately, under 10 C.F.R. § 590.310, NEES requests an opportunity to submit written interrogatories to Pieridae US.

In support of these requests, NEES contends that "there are numerous questions raised and left unanswered in Pieridae's application."[144] In NEES's view, these aspects of the Application hinder a thorough, deliberative review of Pieridae US's proposal.

Additionally, NEES argues that some of the assertions in the Application must be challenged for lack of evidence to support the claim. As one example, NEES cites Pieridae US's statement that "'the price impact of [the] proposed exports would not be material, and thus the proposed export would not be expected to negatively impact US consumption of natural gas to any significant degree.'"[145] According to NEES, the Application "does not substantiate such a

[142] *Id*.
[143] *Id*. at 3.
[144] NEES Mot. at 3.
[145] *Id*. (quoting Pieridae US App. at 11).

claim," and "is written in such a fashion to be potentially false without Pieridae's accountability for the statement." For these reasons, NEES asserts that DOE/FE will be "better enabled" to make a determination on the Application if NEES is afforded the opportunity for additional procedures, including interrogatories directed to Pieridae US.

3. Massachusetts Pipeline Awareness Network's Motion to Intervene and Protest

On February 9, 2015, MassPLAN filed a motion to intervene and protest of Pieridae US's Application, as well as a request for an extension of the 60-day comment period.[146] MassPLAN states that it is a coalition of organizations and groups allied to pursue a safe and sustainable energy infrastructure for Massachusetts. Individual members of MassPLAN's constituent organizations include electric and gas ratepayers, as well as individual landowners whose land allegedly would be adversely impacted and taken by eminent domain to construct one of the natural gas pipelines that would, if built, provide natural gas to the M&N Pipeline system. MassPLAN therefore claims a direct, immediate interest in this proceeding.

MassPLAN states that its member organizations have been working to educate the public about the NED pipeline project. According to MassPLAN, the NED pipeline, if constructed, will: (i) create new and expanded rights of way that would impinge upon the rights of hundreds of homeowners and landowners; (ii) cross conservation lands, forests, and water supplies of towns across the state; and (iii) create a safety risk to residents of many highly developed towns where a future pipeline incident could prove catastrophic.

MassPLAN contends that "[i]t is clear upon reading the Pieridae Application (page 20 & Appendix E) that [Pieridae US's] export plans would likely depend on the completion of the

[146] Motion to Intervene and Protest of the Massachusetts Pipeline Awareness Network and Request for Extension of Deadline for Stakeholders to Comment and Intervene, FE Docket No. 14-179-LNG (Feb. 9, 2015) [hereinafter MassPLAN Mot.].

Kinder Morgan NED project and/or an alternative plan by Spectra Energy."[147] MassPLAN acknowledges Pieridae US's statement that it has not contracted with any pipeline company for capacity, but counters that assertion: "[I]f approved, the intent of Pieridae is to contract for the new northbound capacity that would be made available as a result of the NED project."[148] MassPLAN argues that Pieridae US must acknowledge both the potential source of natural gas that it plans to export and the potential environmental impact of a new greenfield pipeline project like the Northeast Energy Direct pipeline.

MassPLAN next claims that approval of Pieridae US's Application "would not only drive the development of large pipelines, but … could result in the depletion of natural gas winter storage and peak supply that are critical to all of New England."[149] MassPLAN cites data from EIA in stating that, in 2014, natural gas inventories fell 1,000 Bcf below the five-year average in mid-April, and that this reduction in inventory was largely responsible for high spot prices for natural gas from January through October 2014. MassPLAN contends that exporting 292 Bcf/yr of natural gas from the New England region would result in lower inventories of natural gas and contribute to higher New England gas prices, which would not be in the public interest.

MassPLAN also protests the Application based on the alleged cumulative climate impacts of "extraction, combustion, and release of natural gas into the atmosphere, as well as the energy-intensive process of liquefaction and transport of natural gas for export."[150] MassPLAN urges DOE/FE to consider the cumulative impacts from all natural gas export plans together. According to MassPLAN, to view each proposed export terminal or pipeline separately would allow no one company or contract to be held responsible for the consequences of the combined

[147] *Id*. at 2.
[148] *Id*.
[149] *Id*.
[150] *Id*.

actions—which it characterizes as "an overall scheme of massive pipeline expansion and export of natural gas."[151]

To support its protest, MassPLAN provides a letter dated May 8, 2014, from U.S. Senator Edward Markey, and signed by 22 U.S. Senators in total, to President Obama. Quoting this letter, MassPLAN states that the total amount of natural gas approved by DOE/FE for export since May 2011 "'has far exceeded the level that DOE's own study said would increase domestic natural gas prices by more than 50 percent,'" which, it argues, underscores the need for DOE/FE to consider cumulative impacts of potential natural gas exports.[152]

4. Industrial Energy Consumers of America's Motion to Intervene, Motion to Suspend, and Protest

On February 9, 2015, the Industrial Energy Consumers of America (IECA) filed a Motion for Leave to Intervene, Motion to Suspend, and Protest.[153] IECA states that it is an association of leading manufacturing companies with $1.0 trillion in annual sales, over 2,900 facilities nationwide, and more than 1.4 million employees worldwide. IECA states that it is an organization created to promote the interests of manufacturing companies for which the availability, use and cost of energy, power or feedstock play a significant role in their ability to compete in domestic and world markets.[154]

Motion to Intervene. According to IECA, its membership represents a diverse set of industries, including but not limited to the chemical, plastics, steel, iron, aluminum, and fertilizer industries. IECA states that these "energy intensive, trade exposed" (EITE) industries regularly account for approximately three-quarters of all energy consumed by the U.S. manufacturing

[151] MassPLAN Mot. at 2.
[152] *Id*. (citation omitted).
[153] Motion for Leave to Intervene, Motion to Suspend, and Protest of the Indust. Energy Consumers of America, FE Docket No. 14-179-LNG (Feb. 9, 2015) [hereinafter IECA Mot.].
[154] *Id*. at 1.

sector, which itself accounts for more than one quarter of U.S. energy consumption.[155] IECA asserts that the price of natural gas is critical to its members, and that there are direct linkages between energy prices, manufacturing jobs, and the health of the U.S. economy. For this reason, IECA states that it has a direct and substantial interest in this proceeding that cannot be adequately represented by any other party.

Motion to Suspend Consideration of Application. In this portion of its pleading, IECA presents a generalized criticism of DOE/FE's procedures in processing and reviewing Pieridae US's Application and other LNG export applications. Specifically, IECA requests that DOE/FE reconsider its current practice for reviewing LNG export applications—set forth in its "Procedures for Liquefied Natural Gas Export Decisions" published on August 15, 2014 (DOE LNG Procedures)[156]—and establish comment dates for LNG export applications that reflect these procedural rules. IECA states that, under these Procedures, LNG export applications are ready for final action "'when DOE has completed the pertinent NEPA review process and when DOE has sufficient information on which to base a public interest determination.'" [157] IECA contends that, "[d]espite the fact that Pieridae Energy has not completed the required NEPA process for its proposed Project, DOE did not establish a comment date for interventions and protests of the Pieridae Energy Application timed to coincide with the expected completion of the NEPA review process."[158] IECA maintains that "DOE's failure to establish such a procedural schedule in this proceeding has forced IECA to file the instant protest at this time."[159]

IECA therefore urges DOE to modify its procedures—*i.e.*, to "delay the establishment of

[155] *See id*. at 2.
[156] U.S. Dep't of Energy, Procedures for Liquefied Natural Gas Export Decisions, 79 Fed. Reg. 48,132 (Aug. 15, 2014).
[157] IECA Mot. at 3 (quoting DOE LNG Procedures, 79 Fed. Reg. 48,132, 48,135).
[158] *Id*. at 3-4.
[159] *Id*. at 4.

a comment date until such applications are ready (or nearly ready) for final action so that commenters such as IECA will be permitted to submit pleadings that are based on data available at the time the application is ready for final review."[160]

Protest of Application. IECA states that DOE/FE cannot address Pieridae US's Application until DOE/FE considers the following four issues: (i) a "workable" definition of the statutory term "public interest"; (ii) new policy guidance designed for exports of natural gas; (iii) analytical methods free of bias; and (iv) an on-going process whereby DOE/FE monitors and adjusts LNG export authorizations.[161]

First, IECA states that DOE/FE has not articulated a definition of the statutory term "public interest" for purposes of reviewing LNG export applications under NGA section 3(a). IECA questions how DOE can make informed decisions without a definition of the term. According to IECA, "[g]iven the centrality of this term to the public policy decision of approving or not approving LNG export applications, this is a glaring omission if not a legal issue."[162]

IECA claims that DOE has relied on the NERA Study, issued as part of the 2012 LNG Export Study, to support its position that LNG exports are not inconsistent with the public interest. IECA states, however, that reliance on the NERA Study "is a deeply flawed proxy for a definition of the public interest."[163] Among its criticisms of the NERA Study, IECA claims that: (i) the NERA Study's metric of economic welfare is nothing more than the aggregated GDP; (ii) "the small increase in GDP is the result of a windfall for a small group of resource owners and export terminal owners being just large enough to offset the losses in lower incomes and higher

[160] *Id*.
[161] *See* IECA Mot. at 6-13.
[162] *Id*. at 6.
[163] *Id*. at 7.

energy prices inflicted upon the remaining bulk of the population";[164] and (iii) NERA's use of out-of-date information on EITE industries downplayed the impact of LNG exports to those industries. For these reasons, IECA maintains that LNG exports will place EITE industries at a particular global disadvantage.

IECA claims that compliance with NGA section 3(a) requires a workable definition of "public interest" that is both faithful to the intent of Congress and recognizes that exporting LNG is a choice. IECA suggests that DOE/FE add several considerations to its analysis of the public interest including, for example, the value added to the U.S. economy by exporting a raw material (here, LNG) versus the value added by exporting a finished manufactured good that uses the natural gas.

Second, IECA criticizes DOE's reliance on its 1984 Policy Guidelines as failing to comply with the spirit of the Natural Gas Act. IECA claims that the 1984 Policy Guidelines were designed to address impacts of natural gas imports, and thus are not relevant to LNG exports now, and will be even less relevant to LNG exports in 2020 or 2025. IECA recommends that DOE conduct a rulemaking to identify considerations relevant to exporting natural gas both now and in the future.

Third, IECA criticizes DOE/FE's reliance on allegedly biased forecasts produced by EIA, presumably as part of the 2012 LNG Export Study.[165] IECA claims that EIA's models and methods are inappropriate as a basis for its decision-making on LNG export applications because, in IECA's view, they include three distinct sources of bias against industrial consumers that significantly alter decisions for which they are used. IECA criticizes EIA's use of regression analyses calibrated with data not more recent than 2010— a time which IECA claims is "most

[164] *Id*.
[165] *Id*. at 11.

notable for the worst U.S. manufacturing slowdown in the recent past."[166] IECA claims that DOE/FE's reliance on this data severely understates the natural gas demand for industrial consumers, particularly EITE industries, and likewise severely understates the impact of LNG exports on domestic supply and prices of natural gas.

IECA next complains of EIA's practice of using a regression model based in the past to extrapolate assumed relationships in the future. IECA contends that this modeling practice "becomes increasingly questionable as the forecast horizon lengthens" and thus is prone to significant error. [167] IECA similarly criticizes EIA's "top-down approach to estimat[ing] industrial demand as a 'fill' or means to balance larger equations."[168] IECA believes it is doubtful that these equations accurately model how industrial demand will interact with a myriad of factors that did not exist in 2010 or earlier. IECA claims that these models are divorced from new industrial projects and accompanying energy demand that have been announced and are being built. IECA urges DOE to explicitly include the measurable demand expected from scheduled manufacturing projects, gas-fired power generation units, and other new sources of demand, just as it projects future levels of LNG export. IECA suggests that DOE could accomplish this objective by using a model that "estimates future demand from the bottom-up by capturing the data on large production projects."[169]

Finally, IECA urges DOE/FE to take a more active role in reviewing and "adjusting" non-FTA export authorizations. Quoting NGA section 3(a), IECA asserts that the NGA specifically anticipates that adjustments to LNG exports may be in the public interest. IECA claims, however, that "DOE has stated that once it issues [orders] regarding LNG exports, it will

[166] *Id*.
[167] *Id*.
[168] IECA Mot. at 12.
[169] *Id*.

not alter them"[170]—or (perhaps in the alternative) that it will do so only under extraordinary circumstances. Indeed, IECA claims that DOE has "promise[d] to never revisit or revise a 20- to 30-year [authorization] decision …."[171]

According to IECA, DOE/FE's apparent refusal to "adjust" existing LNG export authorizations "creates an obstacle to the exercise of its authority that is not in the law," such that "these DOE orders … will be fixed for decades."[172] In making this argument, IECA challenges EIA's estimates of domestic supply of natural gas. In conclusion, IECA recommends that DOE use its authority to review LNG exports periodically and, if necessary, to issue orders "that throttles [*sic*] LNG exports, consistent with the definition of public interest and the criteria for assessment."[173] IECA maintains that, until DOE/FE complies with the NGA in this way, DOE/FE cannot address Pieridae US's Application.

E. Consolidated Answer of Pieridae US

On February 23, 2015, Pieridae US filed a Consolidated Answer in Opposition to the Motions to Intervene, the Protests, the Comments, and the Requests for Extension of Deadline to Comment and Intervene Filed by Various Entities (Consolidated Answer). [174] The Consolidated Answer addresses the various filings and requests submitted in response to Pieridae US's Notice of Application, as summarized below.

Answer to Motions to Intervene and Protest – Alleged Procedural Non-Compliance.

Pieridae US asserts that the "vast majority" of the motions to intervene filed in this proceeding must be rejected for failure to comply with DOE/FE's procedural regulations set forth in 10

[170] *Id*. at 13.
[171] *Id*. at 14.
[172] *Id*. at 13.
[173] IECA Mot. at 15.
[174] Pieridae Energy (USA) Ltd., Consolidated Answer of Pieridae Energy (USA) Ltd. in Opposition to the Motions to Intervene, the Protests, the Comments, and the Requests for Extension of Deadline to Comment and Intervene Filed by Various Entities, FE Docket No. 14-179-LNG (Feb. 23, 2015) [hereinafter Consolidated Answer].

C.F.R. § 590.103(b).[175] Pieridae US states that these regulations require both "'a certified statement that the representative [signing the document] is a duly authorized representative" and that "[a]ll documents… be verified under oath or affirmation by the person filing, or by an officer or authorized representative of the firm having knowledge of the facts alleged.'"[176]

Specifically, Pieridae US first identifies 11 motions to intervene in this proceeding that purportedly were filed by a representative of an organization, but which fail to contain the certified statement required by 10 C.F.R. § 590.103(b).[177] Second, Pieridae US identifies 28 motions to intervene that, it claims, have not been verified under oath or affirmation, as required by 10 C.F.R. § 590.103(b).[178] Pieridae US contends that, "[w]ithout the required assurances of the bona fides of these filings and the accuracy of their contents, … DOE/FE does not have assurance that the filings represent the actual positions of the organization invoked or that the substance of the filings are accurate."[179] Third, Pieridae US identifies 25 motions to intervene that, in its view, fail to comply with DOE/FE's regulations regarding service of the filing, set

[175] *Id*. at 3.
[176] *Id*. (quoting 10 C.F.R. § 590.103(b)).
[177] *See id*. at 4. In Appendix A to the Consolidated Answer, Pieridae US provides a chart in which it lists each allegedly non-compliant motion to intervene, and identifies the name of the person or entity that filed the motion. According to Pieridae US, the following 11 movants failed to provide the required certified statement: Rich Cowan for Dracut Pipeline Awareness Group; Jeff Zimmerman for Damascus Citizens for Sustainability, Inc.; Wes Gillingham, Program Director for Catskill Mountainkeeper; Nisha Swinton for Food & Water Watch; Karen Weber for Foundation for a Green Future, Inc.; Ben Martin for 350CT; Eugene Marner for Compressor-Free Franklin; Jane Winn for Berkshire Environmental Action Team; Joan Tubridy for Citizens Energy and Economics Council of Delaware County, NY; Katy Eiseman for Massachusetts PipeLine Awareness Network; and Marilyn Learner and Anne Dicicco for the New Hampshire Pipeline Awareness Network.
[178] *See* Pieridae US Consolidated Answer at 4. According to Pieridae US, the following 28 movants failed to file a motion verified under oath or affirmation: Rich Cowan for Dracut Pipeline Awareness Group; Jeff Zimmerman for Damascus Citizens for Sustainability, Inc.; Wes Gillingham, Program Director for Catskill Mountainkeeper; Pramilla Malick; Nisha Swinton for Food & Water Watch; Barbara Clifford; Debby Lewis; Mark Pezzati; Julie Hawkowl; Karen Weber for Foundation for a Green Future, Inc.; Madeline Cronin; Ben Martin for 350CT; Julie Wernke; Eugene Marner for Compressor-Free Franklin; Sarah Partan; Andra Rose; Rebecca Roter; Karen Ribeiro Inner Fortune; Kathy McGhee; Vera Scroggins; Jane Winn for Berkshire Environmental Action Team; Joan Tubridy for Citizens Energy and Economics Council of Delaware County, NY; Katy Eiseman for Massachusetts PipeLine Awareness Network; Toby Woll; Andrea Doremus Cuetara; Judith Canepa; Marilyn Learner and Anne Dicicco for New Hampshire Pipeline Awareness Network; and Rebecca Roter for Breath Easy Susquehanna County.
[179] Pieridae US Consolidated Answer at 4.

forth in 10 C.F.R. § 590.107.[180] According to Pieridae US, "[these] Motions to Intervene were filed without service on Pieridae US or its duly authorized representative."[181] Pieridae US urges DOE/FE to reject each of the allegedly non-compliant motions.

Additionally, Pieridae US asserts that two motions to intervene—filed by Ty Johnson for Saint John Gas and Paul Cicio for IECA, respectively—include a certificate of service, yet neither Pieridae US nor its legal representative have a record of having received service of those motions.

Answer to Motions to Intervene and Protest – Substantive Response. Pieridae US next addresses the filings that it concedes are procedurally compliant but that "largely evidence a fundamental misunderstanding of … DOE/FE's statutory duties."[182]

First, Pieridae US asserts that the filers have submitted no relevant facts upon which DOE/FE could determine that proposed exports would be contrary to the public interest. Pieridae states that the filings demonstrate "a concern over the new construction or the expansion of natural gas pipeline facilities," but that "[s]uch concerns are not the province of the DOE/FE under the NGA."[183] Pieridae US states that FERC—not DOE/FE—has the statutory responsibility to evaluate "the public interest of the siting and construction of natural gas infrastructure used in interstate commerce."[184] Further, "[t]o the extent that the Filers have any valid concerns with respect to such matters, they must take them to the FERC in conjunction

[180] *See id.* 4-5. According to Pieridae US, the following 25 movants filed a motion without proper service: Rich Cowan for Dracut Pipeline Awareness Group; Jeff Zimmerman for Damascus Citizens for Sustainability, Inc.; Wes Gillingham, Program Director for Catskill Mountainkeeper; Pramilla Malick; Nisha Swinton for Food & Water Watch; Barbara Clifford; Debby Lewis; Mark Pezzati; Julie Hawkowl; Karen Weber for Foundation for a Green Future, Inc.; Madeline Cronin; Ben Martin for 350CT; Julie Wernke; Eugene Marner for Compressor-Free Franklin; Sarah Partan; Andra Rose; Rebecca Roter; Karen Ribeiro for Inner Fortune; Kathy McGhee; Vera Scroggins; Joan Tubridy for Citizens Energy and Economics Council of Delaware County, NY; Toby Woll; Andrea Doremus Cuetara; Judith Canepa; Rebecca Roter for Breath Easy Susquehanna County.
[181] Pieridae US Consolidated Answer at 4-5.
[182] *Id*. at 5.
[183] *Id*.
[184] *Id*. at 6.

with its proceedings regarding the specific physical facilities to which they object."[185] Pieridae US likewise contends that it would be both outside of DOE/FE's statutory purview for DOE/FE to consider the siting and construction of natural gas infrastructure, as well as enormous waste of administrative resources given that FERC will consider the same issues if and when a specific pipeline facility is proposed.

Second, addressing DOE/FE's responsibilities under NEPA, Pieridae US challenges the "generic nature of the issues raised by the Filers [*sic*], which go to pipelines in the northeast generally, and not to Pieridae US's proposed exports specifically."[186] According to Pieridae US, "[i]t is abundantly clear … that the issues raised by the Filers [*sic*] neither constitute foreseeable consequences nor would be causally related to a grant of the Application," such that DOE/FE would be responsible for understanding the environmental consequences of its proposed action.[187] Pieridae US counters the various pipeline-related arguments as follows:

- The filers fail to point to any pipeline route or facility with sufficient specificity for DOE/FE to engage in any meaningful review of the environmental consequences, even if such route or facility would be considered a result of DOE/FE's actions in granting the Application.

- The filers fail to recognize that Pieridae US will be a pipeline capacity taker. Pieridae US has no control over any entity proposing to construct pipeline infrastructure in the US, nor does Pieridae US propose to build any such capacity itself.

- It is not clear at this time which pipelines will provide service to Pieridae US, nor at what point Pieridae US will buy its natural gas. Instead, Pieridae US will take capacity as it becomes available, on whatever Pieridae US views as the optimal facilities available to it on favorable terms.

- The facilities from which Pieridae US will take capacity will be driven by the decisions of the pipeline owners, based on their view of the overall market for pipeline services in the region. The sizing, routing and timing of such facilities

[185] *Id*.
[186] *Id*. at 7.
[187] *Id*. at 6.

will be determined by the pipeline project sponsors based on their view of the market, which will involve multiple customers.

- References to the limited existing markets are not relevant because any new facilities will account for market demand that cannot currently be served.

Therefore, Pieridae US claims that "the development of additional LNG export facilities, and related LNG exports, do not automatically trigger a need [for DOE/FE] to review the environmental impacts of new or expanded upstream pipeline facilities that may supply the natural gas that will be consumed by such facilities and exported as LNG."[188]

Pieridae US further maintains that it is unaware of any instance in which FERC has "looked beyond" the facilities proposed by the applicant in its proceeding (*e.g.*, the LNG terminal and any new pipeline facilities constructed to connect the LNG terminal to third-party owned and operated pipelines) "to consider potential new or expanded upstream pipeline facilities."[189] In sum, Pieridae US reiterates that it is not proposing to build any pipeline facilities and, accordingly, there are no physical facilities for DOE/FE to review: "Any new or upgraded upstream U.S. pipeline facilities that Pieridae US may take advantage of will be reviewed by … FERC when they are proposed by the sponsor of such project. NEPA requires no more."[190] Pieridae US also charges the filers with mounting an "impermissible collateral attack" on DOE's and FERC's separate administrative processes under the Natural Gas Act.

Third, Pieridae US challenges the motions to intervene filed by NEES, MassPLAN, IECA, the Berkshire Environmental Action Team, Inc., and the New Hampshire Pipeline Awareness Network as failing to: (i) set out clearly and concisely the facts upon which the particular filer's claim of interest is based, and (ii) state the factual and legal basis for the filer's position, as required under 10 C.F.R. § 590.303(b) and (c), respectively. As one example,

[188] Pieridae US Consolidated Answer at 7.
[189] *Id*.
[190] *Id*.

according to Pieridae US, NEES fails to define its interests or explain how the issuance of the requested authorization could adversely affect those interests. As another example, Pieridae US maintains that the motions to intervene filed by MassPLAN, among others, assert that Pieridae US's proposal would likely depend on the completion of the Kinder Morgan project or alternative plans by Spectra Energy and cites the Application at page 20 and Appendix E for this statement. Pieridae US counters, however, that the citations do not support this point, but rather "illustrate … that pipeline transportation companies are reacting to the increased demand for natural gas in the region, not to Pieridae US seeking the Export Authorization."[191]

Pieridae US reiterates that certain proposed natural gas pipeline facility expansions, such as the proposed NED and Connecticut Express pipeline projects, "have not been initiated … to accommodate Pieridae US and its [export] plans …."[192] According to Pieridae US, "[a]s of the date of this Answer, Pieridae US has not entered into any agreement, or given any commitment, to secure natural gas pipeline transportation capacity with any third party," nor does Pieridae US "control through ownership or contract any pipeline infrastructure company in the United States."[193] Pieridae US states that, even if it purchased, and took delivery of, all of the U.S.-sourced natural gas at the Wright, New York, location, this action cannot be reasonably regarded as the "proximate cause" of the proposed expansion of the Tennessee Gas Pipeline under NEPA

[191] *Id*. at 9.
[192] *Id*. (emphasis in original).
[193] *Id*. Pieridae US explains that, of the four possible delivery points for its supply of U.S.-sourced natural gas, only one delivery point (in Wright, New York) is situated on the Tennessee Gas Pipeline, upstream of the proposed Northeast Energy Direct and Connecticut Express pipeline expansion projects. The Dracut, Massachusetts delivery point is downstream of those projects. Therefore, according to Pieridae US, the U.S. supplier of the natural gas—not Pieridae US—would be the entity obtaining capacity on upstream U.S. pipelines—*e.g.*, the Tennessee Gas Pipeline, those proposed pipeline expansions, and/or any other facilities available now or in the future to U.S. suppliers. *See id*. at 10.

because the expansion is occurring to accommodate market demand generally, not Pieridae US's proposed exports.[194]

Pieridae US next responds to claims by NEES, MassPLAN, and others that approval of the Application would contribute to higher gas prices than if the exports are not allowed. According to Pieridae US, these filers offer no evidence to support their assertions, whereas Pieridae US provides evidence that the regional natural gas supply is adequate to meet both the domestic needs for the region as well as the demand for exported natural gas.

Responding to IECA's Motion to Intervene, Pieridae US contests IECA's claim that DOE/FE should deny the Application because Pieridae US has not completed the required NEPA process for its proposed Project. Pieridae US counters that, because the Goldboro LNG Project will be located in Canada, approval of the Application "should not have any significant environmental consequences in the United Sates and certainly none which are relevant under NEPA."[195] Pieridae US also urges DOE/FE to deny IECA's Motion to Suspend as criticizing DOE/FE's procedures, rather than addressing the merits of the Application.

Answer to Requests for Extension of Deadline to Comment and Intervene. Pieridae US opposes the various requests to extend the deadline to comment and intervene, stating that such arguments are not supported by any rational argument on how the public interest would be served by an extension, or any demonstration that DOE/FE's process was prejudicial to any person. Pieridae US also argues that the motions filed by NEES, MassPLAN, and others were filed on the last day of the 60-day notice period, and did not state why the 60-day period was inadequate.

[194] *See id*. at 11.
[195] Pieridae US Consolidated Answer at 11-12.

Answer to NEES's Requests for Additional Proceedings and Suspension of Proceedings. Pieridae US opposes NEES's request urging DOE/FE to suspend further LNG approvals to non-FTA countries and to direct additional procedures concerning Pieridae's Application. Pieridae US asserts that it has provided sufficient information on which DOE/FE should base its decision, and that "any uncertainties that may exist should not be regarded as impediments to the deliberations required of the DOE/FE in respect of this Application."[196]

F. NEES's Motion for Leave to Reply

On February 27, 2015, NEES filed a Motion for Leave to Reply to Pieridae's Consolidated Answer.[197] NEES states that there is good cause for DOE/FE to grant its Motion for Leave to Reply, so that NEES can rebut misstatements of law and misrepresentations of NEES's arguments made by Pieridae US in its Answer.

First, NEES argues that Pieridae US makes sweeping generalizations in its Answer that show a lack of understanding of NEES's arguments and requests. For example, NEES disputes Pieridae US's assertion that NEES should be denied intervenor status because it has "'fail[ed] to define in any meaningful way' its interests in the Application."[198] Calling Pieridae US's statement a "flagrant misreading of [DOE's] regulations," NEES contends that "there are no … requirements [in DOE's regulations] equating to a 'meaningful' description" of NEES's interests. NEES restates its corporate mission in asserting that it "has an interest [in this proceeding] beyond that of the general public," and that Pieridae US's Application is directly related to NEES's mission, such that NEES should be granted intervenor status.

[196] *Id*. at 13.
[197] Motion for Leave to Reply of Northeast Energy Solutions, FE Docket No. 14-179-LNG (Feb. 27, 2015) [hereinafter NEES Reply].
[198] *Id*. at 2 (quoting Pieridae US Answer at 8) (emphasis in original).

Next, NEES argues that Pieridae US overstates the importance of the rebuttable presumption set forth in NGA section 3(a), 15 U.S.C. § 717b(a). In NEES's view, DOE's regulations offer interested parties, like NEES, the opportunity to challenge the facts, law, and policies offered in Pieridae US's Application.

NEES also disputes several of Pieridae US's rebuttal arguments set forth its Answer. For example, NEES disputes Pieridae US's contention that NEES's Motion to Intervene did not raise issues that are either foreseeable consequences of or causally related to the Application. NEES maintains that the issues covered by DOE/FE in recent LNG export orders involve the same points of contention raised by NEES—including concerns over U.S. natural gas exports in the world market and the merit of the proposed project. NEES also reiterates its position that EIA, in its updated LNG export study, used the NEMS model, which NEES claims "cannot and does not account for interactions between U.S. energy prices and the global economy."[199] NEES contends that this fact, based on EIA's own report, demonstrates that DOE/FE should suspend any further LNG export approvals to non-FTA countries until more accurate information is available from EIA.

NEES also contests Pieridae US's claim that NEES provides no evidence in its Motion to Intervene in support of its arguments.[200] NEES counters that "there is no evidence standard" for a movant set forth in DOE's regulations at 10 C.F.R. § 590.303(c). According to NEES, these regulations instead require the movant to provide the "'factual and legal basis' for its position 'in order to advise the parties' as to which issues it intends to raise or challenge."[201]

[199] *Id.* at 6.
[200] *Id*.
[201] *Id*. (quoting 10 C.F.R. § 590.303(c)).

Turning to its request for DOE/FE to authorize additional procedures, NEES argues that additional procedures are further warranted in this proceeding in light of "Pieridae's numerous false claims against NEES and its flagrant misinterpretation of the law."[202]

G. Saint John Gas's Motion for Leave to Reply

On March 9, 2015, Saint John Gas Marketing Company filed a Motion for Leave to Reply and Reply to Pieridae US's Consolidated Answer.[203] The Reply maintains that good cause exists to grant Saint John Gas's Motion for Leave to Reply, and notes that DOE/FE regularly has granted motions to reply in similar proceedings.

As to the merits of Pieridae US's Consolidated Answer, Saint John Gas asserts that, notwithstanding Pieridae US's statements, Saint John Gas's Motion to Intervene was properly served. Saint John Gas attaches its correspondence as exhibits to the Reply which, in its view, demonstrate that it properly and timely served Pieridae US's listed contacts and legal representatives, by mail and/or electronically, as required under DOE/FE's regulations at 10 C.F.R. § 590.107(b) and 590.103(b).

Saint John Gas states that Pieridae US does not otherwise challenge Saint John Gas's Motion to Intervene, and therefore DOE/FE should grant the Motion.

H. NEES's First Supplement to Motion for Leave to Reply

As discussed above in Section IV.D, Pieridae US filed its First Supplement to Application on May 8, 2015. On May 21, 2015, NEES filed a Supplement to its Motion for Leave to Reply, in which its addresses Pieridae US's First Supplement.[204]

---

[202] *Id*. at 8.
[203] Motion for Leave to Reply and Reply of Saint John Gas Marketing Co., FE Docket No. 14-179-LNG (Mar. 9, 2015) [hereinafter Saint John Gas Reply].
[204] Northeast Energy Solutions, Inc., Supp. to Motion for Leave to Reply of Northeast Energy Solutions, Inc., FE Docket No. 14-179-LNG (May 21, 2015).

In its Supplement, NEES states that Pieridae US's First Supplement introduces a redefined business plan that raises more "unanswered questions" about the Application, which (according to NEES) provides further support for its request for additional procedures. NEES claims that Pieridae US is vague about how its redefined business plan will affect the Goldboro LNG Project and the arrangements for the supply of natural gas to Goldboro. In NEES's view, there is not enough information provided in Pieridae's Supplement to allow DOE/FE to deliberate and assess the national interest. NEES maintains that, in light of this deficiency, DOE/FE should order additional procedures, including interrogatories and the requirement of supplemental information by Pieridae US.

I. NEES's Second Supplement to Motion for Leave to Reply

As discussed above in Section IV.D, Pieridae US filed its Second Supplement to the Application on August 17, 2015. On the same day, NEES filed a Second Supplement to its Motion for Leave to Reply, in which its addresses Pieridae US's Second Supplement.[205]

In the Second Supplement, NEES reiterates its request for DOE/FE to direct additional procedures concerning Pieridae US's Application. NEES contends that Pieridae US's Second Supplement introduces new information that raises additional concerns regarding Pieridae US's understanding of DOE/FE's role with respect to environmental matters.

According to NEES, Pieridae US asks DOE/FE in the Second Supplement to lodge in the public record of this proceeding the issuance of certain environmental approvals by Canadian Federal and Provincial agencies. Specifically, Pieridae US relies upon an Opinion Letter prepared by its Canadian counsel concerning the completeness and finality of the conditional environmental approval of the Goldboro LNG Project by the Minister of Environment of Nova

[205] Northeast Energy Solutions, Inc., Second Supp. to Motion for Leave to Reply of Northeast Energy Solutions, Inc., FE Docket No. 14-179-LNG (Aug. 17, 2015) [hereinafter NEES Second Supp.].

Scotia. NEES argues that neither Pieridae US nor DOE/FE can rely on the Opinion Letter because it is not based on an independent verification of the facts concerning the Goldboro Project. NEES quotes the Opinion Letter, in which Pieridae US's Canadian counsel states:

> 'Our only knowledge of the Project is what has been listed above. We have not taken steps to verify the correctness of this information. We provide this opinion based on the assumption that the information is accurate and correct and take no responsibility if the information is found to be inaccurate.'[206]

NEES argues that, unless DOE/FE undertakes an independent investigation as to the facts of the Canadian proceedings, DOE/FE cannot lodge the Minister's decision or any other materials in the underlying Canadian proceedings.

On this basis, NEES asks DOE/FE to: (i) deny Pieridae US's request to lodge the environmental materials in this proceeding (set forth in Pieridae US's Second Supplement); (ii) to provide for additional procedures in this matter or grant NEES's motion for additional procedures; and (iii) to suspend consideration of Pieridae US's Application or deny it as inconsistent with the public interest.

J. Tolling Order

On September 17, 2015, DOE/FE issued an order granting NEES's Motion for Leave to Reply and Pieridae US's Motion to Lodge (part of its Second Supplement to its Application) solely for the purpose of further consideration.[207] Under this Tolling Order, those two motions are not deemed denied by operation of law pursuant to DOE/FE's regulations, and instead are addressed herein (*see infra* § XI).

[206] NEES Second Supp. at 3 (quoting Pieridae US's Op'n Ltr.).
[207] *Pieridae Energy (USA) Ltd*., FE Docket 14-179-LNG, Order Granting Motion for Leave to Reply Filed by Northeast Energy Solutions, Inc., and Motion to Lodge Filed by Pieridae Energy (USA) Ltd. for the Purpose of Further Consideration (Sept. 17, 2015) [hereinafter Tolling Order].

VIII. COMMENTS ON THE 2012 LNG EXPORT STUDY AND DOE/FE ANALYSIS

In the NOA, DOE/FE sought public comment on the EIA and NERA Studies, including the modeling scenarios used in both. 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."[208] DOE noted that, "[w]hile this invitation to comment covers a broad range of issues, the Department may disregard comments that are not germane to the present inquiry."[209]

As explained above, DOE/FE spent several months reviewing the more than 188,000 initial and 2,700 reply comments received in response to the NOA. Given the volume of comments, it is neither practical nor desirable for DOE/FE to summarize each of them. Therefore, DOE/FE identifies below both: (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.[210]

A. Data Inputs and Estimates of Natural Gas Demand

1. Comments

Several commenters, including Sierra Club,[211] Dow Chemical Company (Dow), along with U.S. Representative Edward Markey, U.S. Senator Ron Wyden, Alcoa, Save Our Supplies,

[208] 77 Fed. Reg. at 73,629.
[209] *Id.*
[210] *See*, *e.g.*, *Public Citizen v. F.A.A.*, 988 F.2d 186, 197 (D.C. Cir. 1993).
[211] For purposes of this discussion, Sierra Club filed comments on the 2012 LNG Export Study 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 [hereinafter Sierra Club].

IECA, and Jannette Barth, challenge the data used as inputs to the 2012 LNG Export Study. Most of these commenters assert that NERA should have used projections from AEO 2012 or AEO 2013, rather than from AEO 2011, to produce a more accurate picture of the current and likely future state of the natural gas market and the likely macroeconomic impacts of LNG exports. These commenters assert that the AEO 2011 projections significantly underestimate actual and future demand for natural gas, especially in the U.S. electric, manufacturing, and transportation sectors, and in international markets. Some commenters identify additional factors, other than the vintage of the AEO 2011 data, to support their arguments that NERA underestimated present and future demand for natural gas. For example, Save Our Supplies argues that NERA underestimated international demand because the GNGM model did not appear to account for the continued growth of international LNG import infrastructure. Together, these commenters assert that the NERA Study underestimated future demand for natural gas and, consequently, underestimated the likely increases to natural gas prices from LNG exports.

A number of commenters, including Sierra Club, Dow, Senator Wyden, Representative Markey, Jannette Barth, and Save Our Supplies maintain that, as compared to AEO 2011, the AEO 2013 Early Release Overview projects a substantial increase in demand for natural gas in the industrial manufacturing sector.[212] Dow claims that there has been a manufacturing renaissance since completion of AEO 2011 involving announcements of approximately 100 capital investments representing some $95 billion in new spending and millions of jobs driven

[212] During the time of the comment period on the 2012 LNG Export Study, the AEO 2013 Early Release was the most current AEO available, and is therefore discussed in many of the comments. On May 2, 2013, after the comment period had closed, EIA issued its final AEO 2013 projections. *See* U.S. Energy Information Administration, *Annual Energy Outlook 2013 with Projections to 2040* (April 2013), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2013).pdf [hereinafter AEO 2013]. This Order references both the final projections from AEO 2013 and more recent EIA projections, as noted.

largely by the supply and price outlook for natural gas. These investments, according to Dow, will add about 5 million new jobs and 6 Bcf/d of industrial gas demand by 2020, which Dow states is nearly a 30 percent increase in industrial demand relative to 2009, the baseline year for AEO 2011.

Dow also asserts that projections of future natural gas demand by industry are more than double the demand predicted in AEO 2011's High EUR case, which includes significantly higher demand than the Reference Case. In addition to significantly higher projections of demand for manufacturing, Dow refers to projections from Wood Mackenzie, CERA, and others that indicate a potential increase of transportation demand from 0.2 to 1.5 Bcf/d from 2013 to 2020. This compares to AEO 2011's projection of a modest increase for natural gas demand in the transportation sector of 0.1 to 0.2 Bcf/d of natural gas. Dow states that the higher level of demand derived from Wood Mackenzie and CERA is the result of a projection of fleet vehicles converting to LNG and compressed natural gas.

According to Dow, AEO 2011 projects that natural gas demand for power generation will decrease through the end of the decade, whereas Wood Mackenzie and CERA predict that natural gas use in the power sector will increase 14 percent by 2020, ultimately resulting in 24.7 Bcf/d of power sector demand. This projected increase is due to unidentified, anticipated changes in carbon policy, renewables policy, and nuclear policy favoring the use of natural gas in the power sector.

In addition to criticizing the projections of demand based on AEO 2011, Dow maintains that the level of exports authorized to date and additional exports that may be authorized in the future will drive up demand levels even higher. Specifically, Dow asserts that NERA's conclusion that prices will not increase by more than $1.11/Mcf is based on a faulty assumption

that natural gas exports will never rise above 6.72 Tcf/yr, or roughly 18.5 Bcf/d by 2025. Dow points out that authorized exports to FTA nations as of January 1, 2013, had already reached approximately 28 Bcf/d. Dow complains that NERA did not consider what would happen if exports attained the authorized levels. In that event, Dow asserts that domestic gas prices undoubtedly would spike. Other commenters, such as Citizens Against LNG, make similar arguments. Citizens Against LNG alleges that the NERA Study is flawed because it failed to estimate the impact of the full potential volume of exports of approximately 31.41 Bcf/d to FTA nations and 24.80 Bcf/d to non-FTA nations.

Contrary to the above arguments, several commenters, such as Dominion Cove Point LNG, LP, Lakes Charles Exports, and Gulf LNG Liquefaction Company, LLC (Gulf LNG), argue that NERA reasonably relied on data from AEO 2011. These commenters state that NERA used the AEO 2011 data because the EIA portion of the 2012 LNG Export Study used that data, and DOE/FE sought to ensure consistency across both parts of the 2012 LNG Export Study. Further, a number of commenters, including American Petroleum Institute (API), America's Natural Gas Alliance, Exxon Mobil Corporation (ExxonMobil), Golden Pass Products LLC, former Secretary of Energy Spencer Abraham, Carl Foster, and the Western Energy Alliance, argue that NERA's use of the AEO 2011 data does not undermine the results of the 2012 LNG Export Study. These commenters contend that the AEO 2013 Early Release data show higher production of natural gas and a more elastic supply of natural gas than the AEO 2011 data used by NERA, indicating that the domestic resource base could more easily accommodate increasing domestic demand as well as demand from new LNG export projects.

With respect to Dow's claim that there is $95 billion of new investment in domestic manufacturing, Lake Charles Exports, LLC and Secretary Abraham argue that many of the

projects listed by Dow are currently under consideration and not projected to commence operation until far into the future. These commenters assert that Dow provided no information as to when or whether these projects will materialize. The commenters conclude that there is no reasonable basis to believe that these domestic manufacturing investments will lead to an additional 6 Bcf/d in domestic natural gas demand as claimed by Dow.

2. DOE/FE Analysis

a. Use of AEO 2011 Projections

DOE's basis for relying on AEO 2011. The 2012 LNG Export Study was based on AEO 2011 projections, which were the most recent, final projections available in August 2011 when DOE commissioned the EIA Study, and also in October 2011 when DOE commissioned the NERA Study. As explained above, the NERA Study was designed so that NERA would use the results from the EIA Study as inputs to the NERA model to ensure congruence between the two studies, which together formed the single 2012 LNG Export Study. If both studies had not relied on the same data, meaningful comparison and cross-analysis of the two studies would have been impossible.

Although some commenters have asserted that DOE should have required EIA and NERA to use newer projections than those in AEO 2011, this argument does not acknowledge either the timing of the AEO publication cycles, or the lead time required of EIA and NERA to conduct their work. Using the final AEO 2011 projections, EIA published its study on January 19, 2012. Only four days later, on January 23, 2012, EIA published the 2012 AEO "Early Release Overview," which was a preliminary, abridged version of EIA's forthcoming AEO 2012. It would not have been possible for EIA to use the 2012 Early Release projections in its study without starting over once that data had been published.

Indeed, EIA did not publish the final AEO 2012 until June 2012, six months after EIA had published its study for this proceeding. By that time, the NERA Study was well underway. NERA published its final report in December 2012—the same month that EIA released the AEO 2013 Early Release Overview. As stated above, EIA did not publish the final AEO 2013 projections until May 2, 2013.

In an undertaking of this scope and magnitude, it was perfectly reasonable to base the 2012 LNG Export Study on AEO 2011, which contained the best, most authoritative economic projections available when DOE/FE commissioned the EIA and NERA Studies. Once both studies were underway, a decision to use AEO 2012 or AEO 2013 Early Release projections would have required EIA and NERA to abandon their existing work and redo much, if not all, of their analyses.

Courts have repeatedly recognized that agencies are not required to redo a study simply because newer data become available, "particularly given the many months required to conduct full [analysis] with … new data."[213] Requiring DOE to start over with new data "would lead to significant costs and potentially endless delays."[214] Moreover, under the commenters' rationale, DOE's 2012 LNG Export Study and administrative process would run indefinitely, as DOE would have to start over with new AEO projections whenever they became available. As the Supreme Court has observed, if an agency were required to rehear new evidence before it issues a final administrative decision, "there would be little hope that the administrative process could ever be consummated in an order that would not be subject to reopening."[215]

No material change using post-AEO 2011 projections. Further, we are not persuaded

[213] *Theodore Roosevelt Conserv. P'ship v. Salazar*, 616 F.3d 497, 511 (D.C. Cir. 2010) (quotations and citations omitted) (alteration in original).
[214] *Sierra Club v. U.S. Envtl. Prot. Agency*, 356 F.3d 296, 308 (D.C. Cir. 2004) (upholding EPA's decision to use an existing computer model in lieu of a newly-released version).
[215] *Vermont Yankee Nuclear Power Corp. v. Natural Res. Def. Council*, 435 U.S. 519, 554-55 (1978).

that using post-AEO 2011 EIA projections would have materially affected the findings of the 2012 LNG Export Study. Commenters point to the fact that AEO 2012 and the AEO 2013 Early Release Overview forecast greater domestic natural gas consumption in the years ahead than did AEO 2011. The commenters are correct in this observation, but it is also true that AEO 2012 and the AEO 2013 Early Release Overview projected much greater domestic natural gas production than did AEO 2011. For example, in the 2012 LNG Export Study proceeding, Jordan Cove submitted an analysis from Navigant correctly noting the increasing gas production projections in the later EIA analyses: For the period of 2013-2035, there was an average percentage increase in forecast total domestic natural gas consumption between AEO 2011 and AEO 2013 of 5.6 percent, while the increase in forecast total natural gas production was 16 percent. This important context helps explain why the AEO 2013 assumptions actually indicate the beneficial market impacts that come from LNG exports.[216]

Using the later-published final AEO 2013 Reference Case (see Table 4 below) illustrates that, although total natural gas consumption projected for 2035 was projected to increase by 6 Bcf/d between AEO 2011 and 2013 (from 72.7 Bcf/d to 78.7 Bcf/d), total domestic dry gas production was projected to increase by more than twice that amount, increasing by 13.8 Bcf/d (from 72.1 Bcf/d to 85.9 Bcf/d). In addition, the projected 2035 Henry Hub price declined from $7.07 per million British thermal units (MMBtu) to $6.32/MMBtu, despite net exports (including both pipeline and LNG exports) rising from -0.5 Bcf/d in AEO 2011 to +7.0 Bcf/d in AEO 2013. Although the data used in Table 4 for "AEO 2013 Reference Case" refer to the final AEO 2013 projections, the data are unchanged from EIA's projections in the AEO 2013 Early Release Overview. As the table shows, the final AEO 2013 Reference Case projects domestic supply and demand conditions that are more, not less, favorable to exports.

[216] Comments of Navigant Consulting, Inc., at 6 (attached to Initial Comments of Jordan Cove Energy Project, L.P.).

Likewise, on April 14, 2015, EIA issued its most recent update, the Annual Energy Outlook 2015 (AEO 2015), with projections to 2040.[217] As depicted in Table 4, projections from that report reflect net LNG exports from the United States in a volume equivalent to 9.0 Bcf/d of natural gas in 2035.[218] This estimate compares with projected net LNG imports of 0.4 Bcf/d in the lower-48 states for 2035 in the AEO 2011 Reference Case. The 2035 Henry Hub price in the AEO 2015 Reference Case is $6.50/MMBtu, down from $7.31/MMBtu in the AEO 2011 Reference Case (both in 2012 dollars).

Table 4 also compares the AEO 2015 Reference Case to the AEO 2013 Reference Case, indicating that:

- Total natural gas consumption for 2035 is projected to increase by 0.3 Bcf/d, from 78.7 Bcf/d to 79.0 Bcf/d;
- Net exports (including both pipeline and LNG exports) are projected to increase by 7.2 Bcf/d, from 7.0 Bcf/d to 14.2 Bcf/d; and
- The projected 2035 Henry Hub price is projected to increase by $0.17/MMBtu, from $6.43/MMBtu to $6.50/MMBtu (in 2012 dollars).

Indeed, in comparing the AEO 2015 Reference Case and AEO 2013 Reference Case projections, total domestic dry gas production is projected to rise by 7.6 Bcf/d of natural gas, from 85.9 Bcf/d to 93.5 Bcf/d. For these and other reasons, these post-AEO 2011 projections in no way undermine our conclusion regarding the consistency of the proposed exports with the public interest.

[217] U.S. Energy Information Administration, *Annual Energy Outlook 2015* (April 14, 2015), *available at* http://www.eia.gov/forecasts/aeo/ [hereinafter AEO 2015].
[218] *See* AEO 2015 at A-27, Table A13.

Table 4: Comparison of AEO Cases

Projections for 2035	AEO 2011 Reference Case	AEO 2012 Reference Case	AEO 2013 Reference Case	AEO 2015 Reference Case	AEO 2011 High Shale EUR Case
Total Natural Gas Consumption (Bcf/d)	72.7	73.0	78.7	79.0	81.2
Electric Power Sector Consumption (Bcf/d)	21.6	24.5	25.9	25.1	26.4
Transportation Sector Consumption (Bcf/d)	0.4	0.4	1.6	0.8	0.7
Domestic Dry Gas Production (Bcf/d)	72.1	76.5	85.9	93.5	82.5
Net Natural Gas Exports by Pipeline (Bcf/d)	-0.1	1.9	3.0	5.2	1.9
Net Natural Gas Exports as LNG (Bcf/d)	-0.4	1.8	4.0	9.0	-0.4
Henry Hub Price, $/MMBtu (Reference Basis)	$7.07 (2009$)	$7.37 (2010$)	$6.32 (2011$)	$6.60 (2013$)	$5.35 (2009$)
Henry Hub Price (2012$ Basis)	$7.31/MMBtu	$7.62/MMBtu	$6.43/MMBtu	$6.50/MMBtu	$5.53/MMBtu

We again note that NERA also modeled a wide range of possible future supply and demand conditions, thereby reducing the dependence of its results on the accuracy of the AEO 2011 Reference Case. The AEO 2011 High Shale EUR case, for example, is represented in Table 4 above showing EIA's AEO 2011 assumption of no new LNG exports. The AEO 2011 High Shale EUR case projected natural gas consumption growth that was even greater than the AEO 2013 Reference Case and domestic natural gas production growth that was less than the AEO 2013 Reference Case. Using the AEO 2011 High Shale EUR as a baseline, NERA modeled LNG exports across a range of international market conditions and found positive economic benefits to the U.S. economy in all cases where LNG exports were economically

viable.[219] The inclusion of the AEO 2011 High Shale EUR case in NERA's analysis reinforces our conclusion that there is no reason to believe that using AEO 2013 Reference Case projections (or the more recent AEO 2015 projections) would have altered the central conclusion of the 2012 LNG Export Study.

Further, as reflected in the comments submitted by Lake Charles Exports[220] and Secretary Abraham,[221] Dow does not substantiate its claim that $95 billion of new investment in the manufacturing sector has led (or will lead) to an increase of 6 Bcf/d in incremental domestic consumption of natural gas by 2020. In making these estimates, Dow includes many projects that merely have been announced or that are under consideration with start dates far into the future. Dow provides no information as to when or whether these projects will be constructed or will begin operations.

b. Significance of Prior FTA Authorizations

Dow argues that the 28 Bcf/d of exports authorized to FTA countries (as of the date of Dow's comment) shows that the 2012 LNG Export Study underestimated future demand for natural gas.[222] However, the volume of authorized exports to FTA countries is by no means a reliable predictor of the number and capacity of LNG export facilities that will ultimately be financed, constructed, and placed in operation.[223] Indeed, while many of the FTA authorizations

[219] NERA Study at 6.
[220] Reply Comments of Lake Charles Exports, LLC at 12-13.
[221] Reply Comments of Secretary Spencer Abraham at 8.
[222] As of December 4, 2015, DOE had granted 48 long-term authorizations totaling 46.07 Bcf/d to export lower-48 states domestically-produced LNG to FTA countries.
[223] As America's Natural Gas Alliance explains, when domestic gas supply was forecast to be insufficient to meet domestic demand, many LNG import facilities were proposed, but few were constructed. Specifically, from 2000 through 2010, over 40 applications to build new LNG import facilities were submitted to federal agencies, but only eight new facilities were built. The increase in domestic natural gas production had reduced the need for imported LNG. Further, of those import facilities constructed, public records show their use has declined. In 2004, the United States imported 244 cargoes of LNG at the four terminals existing at that time. By comparison, in 2013, only 36 cargoes were imported at five of the 12 then-existing terminals (note that the U.S. Department of Transportation's Maritime Administration terminated the license for Gulf Gateway Energy Bridge on June 28, 2013). Seven of the 12 existing terminals did not receive any cargoes in 2013. *See*

have been in place for several years, DOE/FE is aware of only one application submitted to date in which a liquefaction facility was planned with the sole purpose of exporting LNG to FTA countries. Therefore, we are not persuaded that the current FTA authorizations undermine the assumptions of the 2012 LNG Export Study.

We note also that applicants typically request both FTA and non-FTA export authorizations for the entire output capacity of their proposed export facilities. Thus, as we explained above, the FTA and non-FTA authorizations are not additive. Citizens Against LNG contends that the NERA Study failed to consider the full potential volume of exports of 31.41 Bcf/d to FTA nations and 24.80 Bcf/d to non-FTA nations, but this argument is incorrect insofar as Citizens Against LNG is claiming that FTA and non-FTA authorization volumes must be added to calculate demand caused by LNG exports. Nevertheless, it bears mention that NERA did remove export constraints in its model for several of the cases evaluated. NERA found that, at the price required in the United States to free up 55 Bcf/d for export, there would be zero global demand for U.S. exports under any combination of domestic and international supply and demand conditions evaluated. Thus, the 55 Bcf/d case was found to be infeasible and was not included in the macroeconomic analysis.

B. Distributional Impacts

1. GDP Versus Welfare

a. Comments

Several commenters, including Sierra Club, allege that the NERA Study overstated the likely macroeconomic benefits from LNG exports. The National Resources Defense Council

---

http://www.marad.dot.gov/ports_landing_page/deepwater_port_licensing/deepwater_port_licensing.htm; http://www.ferc.gov/industries/gas/indus-act/lng.asp; *Natural Gas Imports and Exports Fourth Quarter Report 2004*, DOE/FE-0485, Office of Natural Gas Regulatory Activities, Office of Fossil Energy, U.S. Department of Energy; *Natural Gas Imports and Exports Fourth Quarter Report 2013*, DOE/FE-0563, Office of Natural Gas Regulatory Activities, Office of Fossil Energy, U.S. Department of Energy;http://energy.gov/fe/listings/lng-reports.

(NRDC), Sierra Club, and Clean Ocean Action, among others, maintain that NERA incorrectly conflated growth in GDP with growth in welfare. By concluding that LNG exports would create a net benefit to the economy, NERA also allegedly relied too much on the fact that exports would increase GDP and failed to give adequate weight to projected natural gas price increases and to deleterious socio-economic, sectoral, and regional impacts on consumers, households, and the middle class, including wage-earners.

A number of other commenters, including API, Paul Eikelboom, Gary Lambert, and Helen Rice, assert that LNG exports will create jobs and boost the economy. For example, API states that a report by ICF International shows that LNG exports will result in a net gain in employment in the United States and that the job impacts of LNG exports will grow larger as export volumes rise.

b. DOE/FE Analysis

The NERA Study presented the macroeconomic impacts of LNG exports using the different statistical measures noted above—price, welfare, GDP, aggregate consumption, aggregate investment, natural gas export revenues, sectoral output, and wages and other household incomes. NERA did not confuse the concepts of welfare growth and GDP growth. The study clearly shows that NERA distinguished these concepts and separately examined the macroeconomic impacts of LNG exports using both measures.[224] Welfare is a term of art in economics that measures the well-being of consumers and reflects changes in the value placed on consumption and leisure by individuals. NERA calculated welfare in the study as the "equivalent variation," which measures the amount of money that, if taken away from the average household, would make the household no better off with LNG exports than without.[225]

[224] NERA Study at 6.
[225] *Id*.

GDP, as NERA explained, is "another economic metric that is often used to evaluate the effectiveness of a policy by measuring the level of total economic activity in the economy."[226] NERA thus acknowledged the distinction between GDP and welfare, yet used both metrics, among others, to ensure that its conclusions were robust across various measures.

2. Sectoral Impacts

a. Comments

Numerous commenters debate whether LNG exports will impact the domestic EITE sectors disproportionately, at too high of a cost to the U.S. economy to justify exporting LNG. Specifically, Dow, the Fertilizer Institute, Alcoa, and other commenters assert that higher natural gas prices caused by the demand for LNG exports will make it difficult for U.S. manufacturing to compete in global markets, reversing the gains these industries have made in recent years due to low domestic gas prices. According to these commenters, LNG exports will lead to lost jobs and lower wages in the EITE sectors—such as the chemical, fertilizer, and primary metal manufacturing sectors. These commenters, together with the Aluminum Association, the American Iron and Steel Institute, and others, contend that EITE jobs tend to be high-paying, highly-skilled, and of strategic national importance, whereas they allege that jobs created due to LNG exports will be short-lived and potentially of lower value to the U.S. economy. In this regard, Alcoa, Representative Markey, and IECA, among others, charge that NERA failed to analyze the unique tradeoffs between the domestic natural gas industry—which obviously stands to benefit from LNG exports—and EITE industries, which they argue will feel the brunt of higher gas prices and price volatility brought on by LNG exports.

In addition, Dow argues that the NERA model should have addressed industry-specific impacts. Dow submits that NERA erred by positing that the impact of expanded natural gas

[226] *Id.* at 56.

exports will affect the chemical, paper, and plastic industries in the same ways. It contends that the single bundled sector represented in the NERA model as the energy intensive sector is actually comprised of five sectors, and that NERA mistakenly assumed that average behavior from the EITE sector is representative of each of the five sectors:

> By bundling these industries, NERA applies the same labor, capital, fuel, and other material inputs in the same way across industries. Such an aggregation mutes the true impact to the industries, especially the chemical products industry. The chemical products subsector varies significantly from the other four industries in terms of value added to the economy (GDP) and energy consumption by fuel source ….[227]

According to Dow, the chemical industry is composed of dozens of different business models with different inputs and outputs. Consequently, Dow contends that "[s]hoe horning the chemical industry into an aggregated [energy intensive sector] is not appropriate for studying the impact of LNG exports on the economy."[228]

More broadly, Dow maintains that NERA gave significant weight to a narrow economic benefit from LNG exports, but did not consider the greater economic value (the "value-added multiplier effect") when natural gas is used in the United States to manufacture finished goods for export, instead of being exported as LNG. Similarly, the Fertilizer Institute offers a study prepared at its request by Charles Rivers Associates to support its claim that NERA underestimated the economic value of the fertilizer industry to the broader economy. Dow also contends that "take-or-pay" contracts used in the international trade of LNG will cause export activities to continue even if not economically warranted, thereby prolonging higher domestic gas prices.[229]

Senator Wyden, Representative Markey, Dow, and others contend that NERA

[227] Initial Comments of Dow Chem. Co. at 27.
[228] *Id*. at 28.
[229] *Id*. at 16-17.

misinterpreted a government-prepared 2009 Interagency Report that evaluated the effects of proposed greenhouse gas cap-and-trade legislation on EITE industries. According to these commenters, the findings in the Interagency Report led Congress to conclude that it was unacceptable to raise energy prices on EITE manufacturers because of the adverse employment implications across the economy. These commenters charge that the NERA Study, while borrowing heavily from the Waxman-Markey congressional debate, did not address the predictions of adverse employment impacts. Dow cites statistics from the Bureau of Economic Analysis indicating that, in 2011, total employment in the oil and gas industry was 171,000 while the chemical industry employed 785,000, the plastic and rubber industry employed 635,000, and the paper industry employed 388,000.[230] In addition, the Fertilizer Institute claims that the NERA Study should have assumed that the fertilizer industry directly supported 7,565 jobs while the NERA Study states that there were 3,920 jobs directly supported by the fertilizer industry.

On the other hand, a number of commenters, including API, ExxonMobil, the Energy Policy Research Foundation, Inc., and General Electric Oil & Gas dispute these arguments. They specifically challenge the notion that an LNG export industry cannot co-exist with a growing domestic manufacturing base, and that EITE industries should be given priority, whether directly or indirectly, over the LNG industry.

ExxonMobil supports NERA's conclusion that exports will yield net economic benefits to the United States, and states that, in fact, NERA understated those benefits because (among other reasons) NERA did not factor in the greater supply of natural gas liquids (NGLs) that will be produced in conjunction with increased natural gas production due to exports. The Institute for 21st Century Energy (an affiliate of the U.S. Chamber of Commerce) and API, among others,

[230] *Id*. at 28 (Dow table citing figures from the U.S. Bureau of Economic Analysis, *Gross Domestic Product by Industry Data*).

note that additional production of NGLs will benefit chemical companies with U.S. plants because NGLs, such as ethane, are critical feedstock in chemical manufacturing processes. These commenters state that an increase in the supply of NGLs will exert downward price pressure on the cost of manufactured goods that use NGLs as a feedstock, thereby at least in part offsetting for those industries (primarily EITE industries) any increases in domestic natural gas prices associated with LNG exports.

ExxonMobil, API, Shell Oil Company, and many other commenters emphasize the size and productivity of the U.S. natural gas resource base, stating that there is an abundance of natural gas to support both LNG export demand and continued growth in the EITE industries. According to ExxonMobil, Western Energy Alliance, Energy Policy Research Foundation, Inc., and others, the vast supply of natural gas in the United States will continue to support current gains in domestic manufacturing, even as LNG exports take place. They state that LNG exports will both sustain and increase domestic production of natural gas, which, in turn, will provide EITE industries with a greater supply of natural gas at more stable prices, allowing them to stay globally competitive. According to these commenters, opponents of LNG exports are incorrect in speculating that natural gas used for export otherwise would be used for domestic manufacturing when, in fact, the natural gas likely would not be extracted if there is not increased demand created by LNG exports.

Further, 110 members of the U.S. Congress,[231] ExxonMobil, and others maintain that there would be serious consequences to hindering the export of LNG. If exports are prohibited or constrained, they believe the United States will lose economic benefits that other countries will capture as those countries begin extracting their shale gas resources and competing in the global LNG export market. Numerous commenters, including ExxonMobil, the National

[231] 110 members of the U.S. House of Representatives filed a single set of comments in support of LNG exports.

Association of Manufacturers, and the Energy Policy Research Foundation, Inc., similarly assert that it would not be in the public interest for DOE to limit LNG exports, in contravention of U.S. free trade principles. As noted above, these commenters state that restricting exports of natural gas would subsidize domestic manufacturing at the expense of the larger U.S. economy. They contend that the U.S. Government should not suppress trade in one industry to benefit other industries.

b. DOE/FE Analysis

With respect to the argument that natural gas confers greater value on the U.S. economy when used in manufacturing than when produced for export, we observe that more natural gas is likely to be produced domestically if LNG exports are authorized than if they are prohibited. There is no one-for-one trade-off between gas used in manufacturing and gas diverted for export. Although commenters are correct that such a trade-off may exist at the margin, this competition between the demand for natural gas for domestic consumption and the demand for natural gas for export is captured in the N_{ew}ERA model. The model projected that under the majority of scenarios examined, no exports would occur, thereby indicating that, for those scenarios, the gas was of greater value to domestic consumers than to foreign ones. On the other hand, in supply and demand conditions where exports were projected to occur and were not prohibited or limited, the model found that greater economic value was being placed on the LNG by foreign markets and, at the same time, greater economic benefits, both in terms of welfare and GDP accrued to the U.S. economy due to those exports.

NERA grouped the U.S. economy into a workable number of supply and demand sectors as appropriate for a macroeconomic model of this nature. NERA divided the EITE industries into five categories: paper and pulp manufacturing, chemical manufacturing, glass

manufacturing, cement manufacturing, and primary metal manufacturing, including iron, steel and aluminum. NERA projected that the overall impact across these categories will be relatively muted, with no individual industry experiencing a dramatic negative impact:

Serious competitive impacts are likely to be confined to narrow segments of industry. About 10 percent of U.S. manufacturing, measured by value of shipments, has both energy expenditures greater than 5 percent of the value of its output and serious exposure to foreign competition. Employment in industries with these characteristics is about one-half of one percent of total U.S. employment. LNG exports are not likely to affect the overall level of employment in the U.S. There will be some shifts in the number of workers across industries, with those industries associated with natural gas production and exports attracting workers away from other industries. In no scenario is the shift in employment out of any industry projected to be larger than normal rates of turnover of employees in those industries.[232]

Some commenters contend that NERA grouped the EITE industries too broadly and assert that greater economic harms could have been identified by focusing more narrowly on the most gas-dependent industries. While we take these concerns seriously, ultimately we are guided by the principle that the public interest requires us to look to the impacts to the U.S. economy as a whole, without privileging the commercial interests of any industry over another. Similarly, with respect to the argument that some industries derive greater economic value from natural gas than others, we continue to be guided by the long-standing principle established in our Policy Guidelines that resource allocation decisions of this nature are better left to the market, rather than the Department, to resolve.

[232] NERA Study at 2.

The Fertilizer Institute charges that the industry-specific employment data used by NERA is erroneous. The Fertilizer Institute claims that NERA underestimated employment directly supported by the nitrogen fertilizer industry and should have used a figure of 7,565 positions. However, NERA drew industry-specific employment data from the U.S. Census Bureau's Economic Census for 2007, which remains the most recent Economic Census data available. In estimating 3,920 positions directly supported by the nitrogen fertilizer industry, NERA selected a figure that is reasonably supported by an authoritative source.[233]

With respect to the Interagency Report prepared for the Waxman-Markey bill, we note that NERA used that report solely as a means of identifying industry segments that would be most acutely affected by higher energy costs, not as a way of determining the magnitude of such impacts. Therefore, although we acknowledge that the Interagency Report was prepared in a different context, we find nothing unreasonable in NERA's use of the Interagency Report.

3. Household and Distributional Impacts

a. Comments

Several commenters maintain that, for most citizens, the macroeconomic benefits of LNG exports, if any, will be minimal. These commenters contend that the main beneficiaries of LNG exports will be a narrow band of the population, chiefly wealthy individuals in the natural gas industry, foreign investors, and those holding stock or having retirement plans invested in natural gas companies.

Other commenters assert that a majority of Americans will experience negative economic impacts, such as higher gas and electric bills, due to LNG exports. Senator Wyden, Dow, and Sierra Club, among others, contend that the NERA Study examined impacts on the labor market in terms of wages but failed to consider employment levels in terms of job equivalents or

[233] *Id*. at 69.

employment income. According to Clean Ocean Action, Dow, and Sierra Club, NERA also incorrectly assumed full employment and overestimated the positive job impacts associated with LNG exports. Dow, among others, charge that the NERA Study failed to adequately consider the cost of LNG exports in terms of lost jobs in the manufacturing sector and the cost of retraining workers for the LNG industry.

Several commenters support the 2012 LNG Export Study and argue that the macroeconomic impacts of LNG exports favor the public interest. ExxonMobil, the Center for Liquefied Natural Gas, and others, including several applicants for LNG export authorizations, submit that the NERA Study is comprehensive and rigorous and that LNG exports are in the public interest. ExxonMobil supports NERA's conclusion that exports will yield net economic benefits but asserts that the study understates the potential employment benefits from LNG exports. ExxonMobil argues that, because the NERA model assumed full employment, it did not identify the positive impact LNG exports would have on jobs. ExxonMobil observes that the economy is far from full employment, with forecasts prepared by the Congressional Budget Office in 2012 showing the unemployment rate above a full employment level through most of this decade. By exporting LNG, ExxonMobil argues, the U.S. economy can reach full employment faster than it can without exports. ExxonMobil also contends that the lingering effects of the recession mean that capital is underutilized today; and that, where there is significant slack in the economy, there is no necessary trade-off between jobs in one sector versus another.

b. DOE/FE Analysis

NERA examined three components of household income directly affected by natural gas exports: income from wages, income from capital holdings (stocks, etc.), and income from

resource ownership (royalties, rents, etc.). The NERA Study projected that for the economy as a whole, increases in resource income earned in the natural gas production process more than offset reductions in wage and capital income earned from all other activities outside of the natural gas production process. The NERA Study acknowledged, however, that exports would be accompanied by a shifting of income sources, and stated that some segments of the economy are likely not to participate in the benefits of LNG exports but are likely to face increased energy costs.

DOE believes that the public interest generally favors authorizing proposals to export natural gas that have been shown to lead to net benefits to the U.S. economy. While there may be circumstances in which the distributional consequences of an authorizing decision could be shown to be so negative as to outweigh net positive benefits to the U.S. economy as a whole, we do not see sufficiently compelling evidence that those circumstances are present here. None of the commenters advancing this argument has performed a quantitative analysis of the distributional consequences of authorizing LNG exports at the household level. Given the finding in the 2012 LNG Export Study that exports will benefit the economy as a whole, and absent stronger record evidence on the distributional consequences of authorizing Pieridae US's proposed exports, we cannot say that those exports are inconsistent with the public interest on these grounds.

4. Regional Impacts

a. Comments

Many commenters addressed the issue of negative and positive regional impacts potentially associated with LNG exports. Commenters including Alice Zinnes, Keith Schue, Jannette Barth, the American Public Gas Association, Alex Bomstein, and Sierra Club assert that

shale gas production associated with increasing LNG exports will trap local communities in a "boom-and-bust" cycle associated with extractive natural gas drilling. In a phenomenon they refer to as the "resource curse," they argue that natural gas production will cause long-term economic damage to local communities, leaving the communities poorer once the gas resource is depleted. Jennifer Davis, Dina DeWald, Andrew Goff, and others agree that shale gas development and production will have a negative impact on local industries that are incompatible with extraction-related activities, such as agriculture and tourism. Numerous commenters, including Hope Punnett, Robert M. Ross, the Environmental Working Group, Citizens Against LNG, and Sierra Club, enumerate specific ways in which they allege local communities near shale gas production areas or pipelines could be adversely affected if LNG exports lead to increased natural gas production. They cite increased noise, property devaluation, degradation of infrastructure, environmental and public health issues, and safety risks, among other issues.

Many other commenters seek to rebut these concerns by identifying the positive regional benefits associated with LNG exports, both in regions where shale development and production occur, and the regions in which LNG export terminals may be located. Commenters including Freeport LNG Expansion, L.P., *et al.* (also called FLEX), the Independent Petroleum Association of America, and scores of local, state, and federal political leaders—including 110 Members of the U.S. House of Representatives and several U.S. Senators[234]—cite regional economic benefits associated with each LNG project, including the potential for thousands of new jobs, substantial direct and indirect business income, and millions of dollars in new tax revenue. Further, U.S. Representative Charles W. Boustany, Jr., 14 members of the Ohio House of Representatives, and

[234] U.S. Senators James Inhofe, Lisa Murkowski, David Vitter, Mary Landrieu, Heidi Heitkamp, and John Cornyn submitted comments generally supporting LNG exports.

numerous other commenters assert that authorizing exports of LNG will help to sustain natural gas exploration and production efforts, which will mitigate any local "boom-bust" cycle.

Finally, several other commenters, including Southern LNG Company, L.L.C., and Gulf LNG, assert that any general consideration of regional impacts is outside the scope of the NERA Study and is most appropriately considered by DOE/FE in reviewing individual export applications.

b. DOE/FE Analysis

We agree with the commenters who contend that a general consideration of regional impacts is outside of the scope of the 2012 LNG Export Study, and that regional impacts are appropriately considered by DOE/FE on a case-by-case basis during the review of each LNG export application.

C. Estimates of Domestic Natural Gas Supplies

1. Comments

Several commenters assert that, in addition to underestimating the demand for domestically produced natural gas, the NERA Study overestimated future domestic supplies of natural gas. Representative Markey, for example, argues that current projections provide for only 20 to 40 years of domestic natural gas supplies but NERA did not adequately consider these projections. Senator Wyden, the Fertilizer Institute, and others maintain that the NERA Study purports to treat the United States and Canada as a single North American market, but its assumptions ignore the potential effect of Canadian LNG exports to international markets.[235] These commenters are largely concerned that NERA has overestimated domestic supplies and

[235] In his comments, Senator Wyden stated that Canada's National Energy Board has approved two LNG export projects in British Columbia and is considering a third. According to Senator Wyden, these projects could result in LNG exports totaling 9 Bcf/d of natural gas. DOE/FE notes that Canada has approved the third LNG export project mentioned by Senator Wyden—the Royal Dutch Shell Plc project.

that having lower supplies than estimated will exacerbate the likely price increases due to exports.

Contrary to these arguments, many commenters, such as API and Shell, argue that the United States has abundant domestic natural gas reserves. Center for LNG and Cheniere Energy, Inc., argue that EIA and NERA underestimated the domestic natural gas resource base and, therefore likely overestimated the price impacts of LNG exports.

Dow, however, is concerned about certain indirect impacts that could arise if domestic supplies are exported. It asserts that domestic gas production would be unable to keep up with the demand required to meet unlimited LNG exports and that one-third of new shale gas production will be required to replace a decline in conventional gas production. Dow maintains that, as a consequence, gas production will have to ramp up significantly and this development will mean that gas supply will be diverted away from domestic industrial and other sectors of the economy:

> There would need to be rapid deployment of new drilling rigs, increased steel pipe manufacturing and an expanded work force throughout the value chain to be able to service such unprecedented growth in [natural gas] production. With an already well-documented skills shortage in the labor market, basic supply and demand economics will prevail and drive labor prices higher, which would in turn have a chilling impact on investment in the manufacturing sector.[236]

Other commenters take a somewhat longer view of the potential indirect impacts of LNG exports on domestic energy supplies. These commenters contend that, to become energy independent, the United States must preserve its supply of finite domestic energy resources, not export them. They argue that authorizing LNG exports will hasten the depletion of this country's natural gas resource base, the size of which is uncertain. Moreover, they assert, investment in LNG exports will take away from potential investment in renewable energy

[236] Initial Comments of Dow Chem. Co. at 16.

supplies, which will compound this country's dependency on fossil fuels.

Some commenters, such as Dow, IECA, and Citizens Against LNG, maintain that the NERA Study does not address significant policy changes that could impact domestic natural gas supply. These comments are focused in two areas: availability of energy production tax credits and uncertainty surrounding future environmental regulation regarding hydraulic fracturing. Specifically, Dow points to the possible elimination of energy production tax credits and states that elimination of this tax credit could result in a 5 percent decline in natural gas production and the loss of nearly 60,000 barrels per day of oil production. Dow, along with Jannette Barth, IECA, and Citizens Against LNG, argue that potential state and federal environmental regulations pertaining to hydraulic fracturing should have been considered by NERA. These commenters assert that these potential additional regulatory costs and could lower supply, increase demand, and raise prices of natural gas.

2. DOE/FE Analysis

a. Measures of Supply

Before turning to a consideration of the specific comments, it is important to clarify the various measures of supply used by commenters. DOE/FE notes that, by three measures of supply, there are adequate natural gas resources to meet demand associated with the requested authorization. Because these supply estimates have changed over time, however, DOE/FE will continue to monitor them to inform future decisions. These estimates include:

i) AEO natural gas estimates of production, price, and other domestic industry fundamentals. As shown in Table 4 above, the Reference Case projection of dry natural gas production in 2035 increased significantly (by 21.4 Bcf/d) in AEO 2015 compared with AEO 2011, while projections of domestic natural gas consumption in 2035 also increased in AEO

2015 compared with AEO 2011 (by 6.3 Bcf/d). Even with higher production and consumption, the 2035 projected natural gas market price in the Reference Case declined from $7.31/MM Btu (2012$) in AEO 2011 to $6.50/MM Btu (2012$) in AEO 2015. The implication of the latest EIA projections is that a greater quantity of natural gas is projected to be available at a lower cost than estimated four years ago.

ii) Proved reserves of natural gas. Proved reserves of natural gas have been increasing. Proved reserves are those volumes of oil and natural gas that geologic and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions. The R/P ratio measures the number of years of production (P) that proved reserves (R) represent at current production rates. Typically industry maintains proved reserves at about 10 years of production, but as Table 5 below demonstrates, reserves have increased from 9.2 years of production in 2000 to 13.7 years of production in 2010 (the latest year statistics are available). Of particular note is that, since 2000, proved reserves have increased 72 percent to 304,625 Bcf, while production has increased only 16 percent, demonstrating the growing supply of natural gas available under existing economic and operating conditions.

Table 5: U.S. Dry Natural Gas Proved Reserves[237]

	Proved Reserves (R)		U.S. Dry Natural Gas Estimated Production (P)		
Year	**(Bcf)**	**Percent change versus year 2000**	**(Bcf)**	**Percent change versus year 2000**	**R/P Ratio - Years**
2000	177,427	--	19,219	--	9.2
2005	204,385	15	18,458	-4	11.1

[237] EIA, *U.S. Dry Natural Gas Proved Reserves* (Aug. 2, 2012), *available at* http://www.eia.gov/dnav/ng/ng_enr_dry_dcu_nus_a.htm (additional calculations conducted to produce percentage change and R/P ratios).

2010	304,625	72	22,239	16	13.7

iii) Technically recoverable resources (TRR). Technically recoverable resources have also increased significantly. Technically recoverable resources are resources in accumulations producible using current recovery technology but without reference to economic profitability. They include both proved reserves and unproved resources.[238]

DOE/FE notes that EIA's natural gas TRR estimates have varied from below 2,000 Tcf in AEO 2010 to more than 2,500 Tcf in AEO 2011 and 2,266 Tcf in AEO 2015.[239] These TRR estimates include proved and unproved TRR shale gas resources, which have fluctuated in recent AEOs, as the EIA continues to monitor and estimate this resource base. For example, in AEO 2010, unproved shale gas TRR was estimated at 347 Tcf, which increased to 827 Tcf in AEO 2011, and was revised to 489 Tcf in AEO 2015.

b. Supply Impacts

Although TRR estimates in AEO 2011 were higher than the AEO 2015 estimates, we do not agree that NERA employed overly optimistic projections of domestic gas supply. The EIA and NERA Studies conclude that for the period of the analysis, the United States is projected to have ample supplies of natural gas resources that can meet domestic needs for natural gas and the LNG export market. Additionally, most projections of domestic natural gas resources extend beyond 20 to 40 years. While not all TRR is currently economical to produce, it is instructive to note that EIA's recent estimate of TRR equates to nearly 90 years of natural gas supply at the 2014 domestic consumption level of 27.12 Tcf. Moreover, given the supply projections under

[238] Unproved resources are generally less well known and therefore less precisely quantifiable than proved reserves, and their eventual recovery is less assured.
[239] *See* U.S. Energy Information Administration, *Assumptions to the Annual Energy Outlook 2014* (June 2014), Table 9.2. Technically recoverable U.S. dry natural gas resources as of January 1, 2012, at 114, *available at*: http://www.eia.gov/forecasts/aeo/assumptions/pdf/0554(2014).pdf.

each of the above measures, we find that granting the requested authorization is unlikely to affect adversely the availability of natural gas supplies to domestic consumers such as would negate the net economic benefits to the United States.

We further find that, given these estimates of supply, the projected price increases and increased price volatility that could develop in response to a grant of the requested LNG export authorization are not likely to negate the net economic benefits of the exports. This issue is further discussed below. With regard to the adequacy of supply, however, it bears noting that while Dow contends that U.S. natural gas production would not be able to meet unlimited LNG exports and domestic demand, the NERA Study supports a different conclusion. The NERA Study included scenarios in which LNG exports were unconstrained. In these cases, LNG exports from the United States compete with LNG exports from all other international natural gas sources. Should the U.S. resource base be less robust and more expensive than anticipated, U.S. LNG exports would be less competitive in the world market, thereby resulting in lower export levels, and, in some instances, no exports, from the United States. By way of example, NERA modeled a number of Low EUR scenarios, which had U.S. resources that were less robust and more expensive than other cases. In these Low EUR scenarios, U.S. wellhead natural gas prices were driven up by higher production costs to meet domestic demand, and in those cases prices increased to a level that choked off demand for exports so that LNG exports were limited or disappeared, leaving the available natural gas for domestic use. In other unconstrained cases evaluated with the High EUR scenarios, domestic natural gas production was able to keep up with the demand required to meet the unconstrained LNG export scenario. In this case, the EIA scenarios reflect the changes that would occur in the domestic market and reflect the limitations, as modeled in the NEMS model, of domestic natural gas production and consumption by

different sectors of the economy. In all of these cases, the supply and price response to LNG exports did not negate the net economic benefit to the economy from the exports.

c. Supply Impacts Related to Alternative Energy Sources

To the degree that natural gas prices may increase, alternative sources of energy will become more attractive to consumers and investors. Accordingly, in nearly every year in which natural gas exports were reflected in the EIA Study, electricity from renewable energy resources increased compared to the no export case. Therefore, we do not agree with the suggestion that LNG exports would diminish investment in renewable energy.

d. Supply Impacts Related to Canadian LNG Exports

DOE/FE also disagrees with the argument that the NERA Study erred in its treatment of potential Canadian LNG exports to international markets. Although DOE/FE did not ask NERA to evaluate potential LNG exports from Canada, we note that LNG exports from Canada would compete with U.S. exports, thereby most likely reducing U.S. exports. Therefore, treating U.S. and Canadian LNG exports as those from a single market is a reasonable assumption, and would be consistent with the unconstrained LNG export cases evaluated by NERA, with the price impact more or less in line with the cases evaluated by NERA. DOE/FE would expect that benefits estimated to accrue to the United States from U.S. LNG exports likely would be similar to the benefits that would accrue to Canada resulting from Canadian LNG exports.

The 2012 LNG Export Study did not evaluate the steps to become energy independent, as that was not part of the criteria evaluated. However, the NERA Study concluded that the United States has ample supplies of natural gas resources that can both meet domestic needs for natural gas *and* allow for participation in the LNG export market, without a significant impact on supplies or prices for the period of the analysis under the assumptions made.

e. Supply Impacts Related to Tax Law and Environmental Policy

NERA stated that the NewERA macroeconomic model includes a simple tax representation in which indirect taxes are included in the output values and not explicitly modeled.[240] NERA thus assumed no changes specific to existing law governing production tax credits. EIA did the same. On the other hand, at DOE/FE direction, NERA and EIA accounted for potential variability in domestic natural gas supply such as would occur due to changes in environmental regulation and other factors, including changes to production tax credits. They did so by incorporating the High EUR and Low EUR scenarios into their model.[241]

We find that it was reasonable for EIA and NERA to use the High EUR and Low EUR cases to capture a range of factors that may impact domestic natural gas supply. We further find that, given the range of scenarios studied, the decision not to specifically model the possible revocation of production tax credits or changes to environmental regulation does not lessen the reliability of the EIA or NERA Studies. As a practical matter, EIA and NERA were required to establish certain key assumptions as a foundation for their analyses. They reasonably evaluated alternative scenarios that would capture possible changes that would affect natural gas supplies.

D. Modeling the LNG Export Business

1. Comments

Some commenters complain that NERA failed to capture accurately the business model being employed by those involved in the business of LNG exports. Sierra Club states that NERA erroneously modeled the fossil fuel industry by assuming a zero-profit condition. Some commenters, including NRDC, maintain that NERA failed to consider that LNG exports will take place pursuant to long-term, *e.g.*, 25-year, contracts containing take-or-pay provisions,

[240] NERA Study at 110.
[241] *Id.* at 25.

rather than contracts containing flexible or market-sensitive pricing provisions. IECA makes a similar argument in its reply comments. According to these commenters, the take-or-pay provisions in long-term contracts will inhibit the free flow of price signals. The commenters argue that NERA incorrectly assumed that: (1) exports of LNG from the United States would cease if the gap in prices between domestic and foreign supplies is closed; and (2) a foreign country will cease purchases of U.S.-sourced LNG if the country gains access to less expensive supplies. These commenters maintain that take-or-pay provisions in long-term contracts will have the effect of driving LNG exports even under circumstances when it would be more economical for the same natural gas to be sold in the domestic market. In this regard, Dow criticizes NERA's assertion that the global market for natural gas will limit how high U.S. natural gas prices can rise as a result of export activity because importing nations will not purchase U.S. supplies if U.S. wellhead prices rise above the cost of competing supplies. Dow contends that this arbitrage phenomenon may occur in competitive markets but does not make sense in the global LNG market due to the broad use of long term take-or-pay contracts.

Additionally, several commenters, including Representative Markey, NRDC, Sierra Club, Citizens Against LNG, and Alcoa, charge that NERA incorrectly assumed that the financing of investments in natural gas supplies for export and in the LNG export projects that will be used for export operations would originate from U.S. sources. These commenters assert that, in fact, a substantial portion of the investment is being made by foreign entities and these foreign entities, not domestic corporations, will reap the benefits of export activity in the form of royalties, tolling fees, income, and tax proceeds from the resale of LNG overseas. Contrary to these arguments, FLEX and Lake Charles Exports argue that foreign financing of LNG export projects is beneficial. These commenters argue that foreign direct investment in the U.S. LNG industry

frees up domestic capital for other investments. These commenters conclude that, as a result, NERA's results likely underestimate the benefits to the U.S. economy that will result from LNG exports.

Another commenter, Save Our Supplies, contends that the structure of international markets for natural gas and LNG and the high cost of building international LNG export infrastructure will give a cost advantage to U.S. LNG exports. This cost advantage, coupled with greater international demand than projected by NERA, allegedly will exacerbate the projected price increases within the United States due to LNG exports. More generally, Save Our Supplies claims that NERA made a series of incorrect assumptions concerning the structure of international natural gas markets. These include erroneously assuming that international natural gas markets are competitive. Save Our Supplies identifies the following three considerations: (1) the international market is not perfectly competitive because there are barriers to entry, trade, and foreign investment due in part to the participation of state-sponsored enterprises; (2) there is an international oligopoly in oil that, because of a link between the international price of oil and the international price of natural gas in certain markets, makes it impossible for the international market in natural gas to be perfectly competitive; and (3) NERA erroneously assumed that natural gas is a "perfect substitute" for oil in all circumstances.[242] Based on these comments, Save Our Supplies challenges the NERA Study for allegedly assuming that Qatari and Russian suppliers of natural gas will cut their prices to compete with the lower priced supplies available from the United States. Save Our Supplies argues that such price competition will not be significant and, therefore, that there will be greater demand for U.S.-exported LNG. According to some commenters, NERA's asserted underestimate of international demand for natural gas was also exacerbated by its failure to account for the construction of natural gas infrastructure on

[242] Initial Comments of Save Our Supplies at 34, 41.

a global basis. These commenters assert that NERA appears to underestimate both the supply cost of international LNG projects and the magnitude and trajectory of global LNG demand. They further claim that NERA appears to underestimate U.S. natural gas demand and potentially the elasticity of the U.S. natural gas supply curve.

A number of commenters take an opposing position by arguing that the domestic natural gas resource base is sufficient to meet both the domestic and international demand for U.S. natural gas. Center for LNG, Cheniere Energy, and others go further by arguing that EIA and NERA underestimated the size of the resource base, and therefore overestimated the potential domestic price impacts of LNG exports. Dominion Cove Point LNG, America's Natural Gas Alliance and others argue that the international market will constrain the total volume of natural gas exported from the United States.

Several commenters, including Sierra Club and Dow, argue that NERA overestimated LNG transaction costs (*e.g.*, costs of liquefaction, transportation, and insurance). Sierra Club argues that NERA overstated the transportation costs associated with the export of U.S. gas by assuming all LNG would be exported from the Gulf Coast. Sierra Club states that several export terminals are planned for the West Coast, where it will be less expensive to transport gas to the Asian market than it would be from the Gulf Coast. Dow states that NERA's estimate of transportation and insurance costs for shipping LNG to Asia would be on the order of $2.60/Mcf. Dow claims that official trade statistics published by the U.S. Census Bureau, however, establish that these costs would be closer to $0.50/Mcf. Commenters such as Dow and Sierra Club state that had NERA properly accounted for LNG transaction costs, the foreseeable volumes of LNG exports would have exceeded those predicted by NERA, thereby intensifying the impact of LNG exports on U.S. natural gas prices. For this reason, Sierra Club and Dow argue that NERA's

projected price ceiling on domestic natural gas is too low. In addition, numerous individual members of the Sierra Club contend that NERA appears to have misrepresented the amount of natural gas used by LNG terminals in the liquefaction process, which understates the demand associated with exports.

2. DOE/FE Analysis

As explained below, we find that the NERA Study reflects an accurate understanding of the contractual terms and market environment affecting the fossil fuel industry and, more narrowly, provides a plausible future scenario of international trade in LNG with U.S. exports. It is also DOE/FE's view that NERA's conclusions of the impact of LNG exports would not have materially changed with alternative international market assumptions. In this regard, we note that NERA included one scenario in which LNG exports reached 23 Bcf/d, with a positive impact on the U.S. economy. We find as follows:

a. Zero Profit Condition

Sierra Club's charge that NERA erroneously modeled the fossil fuel industry by assuming a zero-profit condition appears to reflect a misunderstanding of the term "zero-profit" as used by NERA. The "zero-profit condition" assumed in the NERA Study does not mean that firms in the natural gas industry will not make a "profit" as that word is ordinarily used. Rather, the zero-profit condition means only that firms will not make a profit above the risk-adjusted cost of capital. The assumption of a zero-profit condition is another way of saying that the model assumes a competitive market for natural gas, because in competitive markets new firms can enter and drive any profits above a risk-adjusted cost of capital down to zero. The assumption of a competitive market for natural gas production in the United States is valid given

that natural gas wellhead prices have been deregulated for more than 30 years.[243] Moreover, Sierra Club and other commenters have not provided any evidence to suggest a lack of competition in the market for U.S. natural gas production.

b. Contract Terms

We disagree with the contention that NERA erred in the assumptions it used to model the export contracts that will be used by authorization holders. NERA assumed that these contracts will include payments to the exporting facility in the form of a tolling charge that is fixed based on the total export capacity reserved under the tolling agreement plus 115 percent of the Henry Hub price for each unit of gas that is liquefied. Because there is neither a throughput obligation nor a fixed commodity price in the commercial arrangements assumed by NERA, the supplies of natural gas or LNG subject to the contracts are not locked up for the export market. Instead, as NERA has properly assumed for purposes of its model, foreign and U.S. purchasers will compete for domestically produced supplies and, if the domestic price rises, the owners of the gas (in most cases, either the authorization holder or the foreign purchasers that are party to the export-related contracts) will have an incentive to sell the gas into the domestic market rather than the international market.

Commenters criticizing NERA's model on these assumptions have not submitted evidence to support their position that contracts will lock up natural gas for export. Moreover, we find it unlikely that a broad cross-section of commercial parties would lock themselves permanently into arrangements whereby LNG will be exported from the United States even when it is uneconomical to do so. Even contracts entered improvidently may be amended when

[243] Natural Gas Policy Act of 1978, 15 U.S.C. § 3301, *et seq.* (establishing a policy for phasing out the regulation of wellhead prices).

there is a possibility for mutual benefit in doing so, as there would be in a case where domestic gas prices exceed netback prices.

c. Foreign Direct Investment

As described above, several commenters charge that the NERA Study incorrectly assumed that the financing of investments in natural gas supplies for export and in LNG liquefaction and export facilities would come from domestic sources. An examination of the NERA Study indicates that claim is not valid as to natural gas supplies. Early in the Study, NERA noted as follows:

> Net benefits to the U.S. economy could be larger if U.S. businesses were to take more of a merchant role. Based on business models now being proposed, this study assumes that foreign purchasers take title to LNG when it is loaded at a United States port, so that any profits that could be made by transporting and selling in importing countries accrue to foreign entities. In the cases where exports are constrained to maximum permitted levels, this business model sacrifices additional value from LNG exports that could accrue to the United States.[244]

On the other hand, the commenters are correct to the extent they argue that the NERA Study assumed that the financing for the liquefaction and export facilities associated with LNG exports would come solely from domestic sources. The NERA Study indicates that the timing of macroeconomic effects could be affected as a consequence:

> In this report it is assumed that all of the investment in liquefaction facilities and in increased natural gas drilling and extraction come from domestic sources. Macroeconomic effects could be different if these facilities and activities were financed by foreign direct investment ("FDI") that was additional to baseline capital flows into the U.S. FDI would largely affect the timing of macroeconomic effects, but quantifying these differences would require consideration of additional scenarios in which the business model was varied.[245]

In the above statement, NERA has indicated that the timing of the impacts of LNG exports could change due to FDI. On the other hand, NERA has not stated that the nature of the

[244] NERA Study at 6-7.
[245] *Id.* at 211.

impacts will change and no commenter has introduced evidence that FDI will produce negative economic benefits. Indeed, Lake Charles Exports explains why FDI may enhance the economic benefits to the United States:

> NERA thus acknowledged the possibility that investment necessary for LNG exports may come from foreign sources. The NERA model's assumption of domestic investment explicitly fails to capture the macroeconomic benefits that will result from the injection of any foreign investment into natural gas production and infrastructure.
>
> The United States has the leading economy in the world in part because the US is the leading destination of international flows of capital. Each dollar of new foreign investment capital into the US results in an equivalent increase in US GDP. The main positive components of GDP are private consumption, investment, government expenditures, and exports. Any foreign direct investment stemming from the development of a US LNG industry would not decrease domestic capital investment, but would merely free up such domestic capital for other investments. Therefore the total amount of investment in the US would increase, dollar-for-dollar, with foreign investment, increasing US GDP by the same amount. If that foreign investment earns a return and, after taxation by US local, state and federal governments, some of that return is repatriated, this reflects a small countervailing outflow (which seems to be what, for example, Representative Markey is focusing on). Nonetheless, foreign direct investment remains a major net contributor to the US economy. The 2012 LNG Export Study's simplifying assumption regarding the source of investment in LNG production infrastructure fails to capture the benefits of any capital provided from foreign sources and thus understates the impact of such investment on US GDP.[246]

Accordingly, while FDI may be used to finance purchases of natural gas for export as LNG and the construction of LNG liquefaction and export facilities, we are not persuaded that the inflow of foreign capital for these purposes would be inconsistent with the public interest or would lessen the net economic benefits projected in the 2012 LNG Export Study.

d. International Natural Gas Markets

We are not persuaded by Save Our Supplies' claim that a projected cost advantage to exports of LNG from the United States as opposed to exports from other gas producing nations

[246] Reply Comments of Lake Charles Exports at 31 (citations omitted).

will necessarily exacerbate projected price increases within the United States due to LNG exports. This argument assumes that LNG will be available for export at a landed price overseas that is competitive with the international price set by foreign competitors. But NERA concluded that in many cases, the world natural gas market would not accept the full amount of exports assumed in the EIA scenarios at prices high enough to cover the U.S. wellhead domestic prices calculated by the EIA. Alternatively, foreign competitors supplying natural gas and LNG in international markets may match or, possibly, undercut the landed price of LNG exported from the United States.

With respect to the competitiveness of global LNG markets, NERA assumed that the production decisions of the world's dominant producer, Qatar, would be fixed no matter what the level of U.S. exports and that, generally, "there is a competitive market with exogenously determined export limits chosen by each exporting region and determined by their liquefaction capacity."[247] NERA described these assumptions as a "a middle ground between assuming that the dominant producer will limit exports sufficiently to maintain the current premium apparent in the prices paid in regions like Japan and Korea, or that dominant exporters will remove production constraints because with U.S. entry their market shares fall to levels that do not justify propping up prices for the entire market."[248] We find this to be a reasonable simplifying assumption and note further that even imperfectly competitive markets are not static. The arrival of new entrants, such as U.S.-based LNG exporters, may well have a disruptive impact on markets where competition may presently be constrained.

Finally, we note that NERA also modeled a "supply shock" case that assumed key LNG exporting regions did not increase their exports above current levels. NERA found positive

[247] NERA Study at 34.
[248] *Id*. at 34-35.

economic benefits to the United States in each supply shock scenario in which the United States exports LNG. These results strengthen our conclusion that the prospect of non-competitive behavior in global LNG markets is unlikely to have a material impact on the central conclusions of the 2012 LNG Export Study.

e. Estimates of LNG Transaction Costs

We disagree with the comments from Sierra Club and Dow arguing that NERA overestimated LNG transaction costs, including liquefaction, transportation, insurance, and the like. NERA based its liquefaction, shipping costs and regasification costs on a review of publicly available literature, including the International Group of LNG Importers 2010 LNG Industry report and other sources referenced in the NERA Study.[249]

With respect to transportation costs, Dow states that NERA's estimate of shipping cost to Asia was on the order of $2.60/Mcf, while statistics presented by Dow claim these to be $0.50/Mcf. In presenting this figure, Dow relies on trade statistics reported by the U.S. Census Bureau based on the average cost of insurance and freight expenses associated with U.S. *imports* of LNG in 2010 and 2011. As NERA points out, however, LNG transportation costs in large measure are a function of the distance traveled. Therefore, data on LNG imports, which largely travel shorter distances,[250] do not furnish a reliable basis for drawing inferences regarding transportation costs for LNG exports to Asia. Further, NERA provided a detailed description of the assumed transportation cost buildup, which is based on a daily charter rate of $65,000, and other reasonable assumptions.[251] Dow does not provide evidence challenging the accuracy of the

[249] *Id.* at 84-90.
[250] DOE/FE statistics show that the majority of LNG imports to the United States for 2010 and 2011 came from Atlantic Basin/North African sources. More than one-third of U.S. LNG imports in 2010 and 2011 came from Trinidad and Tobago, and none came from East Asia. *See* DOE/FE 2010 LNG Import Annual Report and DOE/FE 2011 LNG Import Annual Report, *available at* http://fossil.energy.gov/programs/gasregulation/publications/.
[251] NERA Study at 87.

information used by NERA or NERA's method of calculating transportation costs. Nor does Dow provide other evidence of daily charter rates.

As for the cost of natural gas consumed in the liquefaction process, NERA's model assumes a consumption level equal to 9 percent of the natural gas feedstock, a cost that is included in the NERA model. NERA based this assumption on publicly available information of liquefaction costs. Similarly, EIA assumed that 10 percent of feedstock was consumed in the liquefaction process.

Therefore, we find that NERA's cost build-up is appropriate and that the estimated costs for delivering LNG to end users considered in the NERA Study are reasonable.

E. Cost of Environmental Externalities

1. Comments

Sierra Club, along with Delaware Riverkeeper Network,[252] Jannette Barth, NRDC, Dow, and Save Our Supplies, among others, maintain that LNG exports will increase demand for natural gas, thereby increasing negative environmental and economic consequences associated with natural gas production. These commenters assert that NERA failed to consider the cost of environmental externalities that would follow such exports. The externalities identified by these commenters include:

- Environmental costs associated with producing more natural gas to support LNG exports, including the costs, risks, and impacts associated with hydraulic fracturing and drilling to produce natural gas;

- Opportunity costs associated with the construction of natural gas production, transport, and export facilities, including the costs of investing in shale gas infrastructure to support LNG exports, as opposed to investing in renewable or sustainable energy infrastructure;

- Costs and implications associated with eminent domain necessary to build new pipelines to transport natural gas; and

[252] Delaware Riverkeeper Network filed comments on behalf of itself and more than 80 other organizations.

- Potential for switching from natural gas-fired electric generation to coal-fired generation, if higher domestic prices cause domestic electric generation to favor coal-fired generation at the margins.

2. DOE/FE Analysis

Insofar as relevant to this proceeding, we have addressed these issues in the Discussion and Conclusions below. *See infra* § XI.D.

F. Prices and Volatility

1. Natural Gas Price Volatility

a. Comments

Several commenters, such as Huntsman Corporation, address potential natural gas price volatility associated with LNG exports. Janette Barth, Dow, Sierra Club, and Save Our Supplies, among others, state that NERA did not account for price volatility. Sierra Club points to the results of the 2012 LNG Export Study, which project higher domestic natural gas price impacts when exports phase in rapidly. Additionally, Sierra Club argues that, pending the pace of DOE/FE approvals, demand for domestic natural gas may increase more rapidly than production, leading to periods of scarcity and price spikes. Sierra Club also contends that there is little evidence that domestic natural gas price volatility will be reduced by LNG exports.

America's Natural Gas Alliance argues that there is no evidence that LNG exports will increase volatility. According to the Alliance, LNG exports will lead to increased investment in domestic gas production, which will help protect against price volatility. API contends that the NERA and Brookings studies project natural gas prices to remain in a narrow, low range through 2030 in all scenarios. Further, API points out that in October 2009, a Dow representative testified before the Senate Energy and Natural Resources Committee that the U.S. chemical industry could operate successfully if natural gas prices remain in the $6-8 MMBtu range. API

asserts that recent studies projecting natural gas prices—even with high, unconstrained levels of LNG export—do not forecast natural gas prices higher than that range. Several commenters, including America's Natural Gas Alliance and API, further assert that the market will have significant advanced notice of LNG export facilities. As a result, natural gas producers will be able to adjust supply to meet anticipated increases in demand. API also argues that, because the facilities and liquefaction trains at each facility will be built in sequence, a market buffer will be created where supply will grow incrementally and supply shocks will not be created in the market. Additionally, Lake Charles Exports argues that Dow's analysis of domestic natural gas exports is incorrect, and the additional investment in domestic natural gas reserve development associated with increases in LNG exports will insulate the United States from natural gas price volatility.

The Bipartisan Policy Center, through its own analysis, forecasts that LNG exports are unlikely to result in large domestic price impacts. The Bipartisan Policy Center states that the results of its analysis indicate that LNG exports are likely to have only modest impacts on domestic natural gas prices—and that LNG export levels will adjust as domestic prices rise or fall.

b. DOE/FE Analysis

Natural gas price volatility can be measured in terms of short term changes—daily or monthly volatility—or over longer periods. Short term volatility is largely determined by weather patterns, localized service outages, and other factors that appear unlikely to be affected substantially by DOE export authorization decisions. Moreover, the NERA Study was a long-term analysis covering a 20-year period that correctly did not focus on short term shocks or volatility.

To the extent commenters are concerned about the risk of large upward price spikes sustained over longer periods, such as those that occurred in 2005 and 2008, we do not agree that LNG exports will necessarily exacerbate this risk. First, as noted above, when domestic wholesale gas prices rise above the LNG netback price, LNG export demand is likely to diminish, if not disappear altogether. Therefore, under some international market conditions, LNG export facilities are likely to make natural gas demand in the United States more price-elastic and less conducive to sustained upward spikes. Second, in light of our findings regarding domestic natural gas reserves explained above, we see no reason why LNG exports would interfere with the market's supply response to increased prices. In any capital intensive industry, investments are made based on observed and anticipated market signals. In natural gas markets, if prices or expected prices rise above the level required to provide an attractive return on investment for new reserves and production, industry will make that investment to capture the anticipated profit. These investments spur development of reserves and production and increase availability of natural gas, exerting downward pressure on prices. This is part of the normal business cycle that has been captured in EIA's supply curves and, consequently, in NERA's analysis. On balance, we are not persuaded that LNG exports will substantially increase the volatility of domestic natural gas prices.

2. Linking the Domestic Price of Natural Gas to World Prices

a. Comments

Several commenters, including the American Public Gas Association, Dow, and IECA, argue that LNG exports could link domestic natural gas prices to the price of natural gas in the world market, and that this could exacerbate the potential increase in domestic natural gas prices as well as increase price volatility. A number of other commenters, however, contend that

domestic prices would not become linked to world prices. Citing the importance of the domestic natural gas price in determining the level of exports, the Bipartisan Policy Center and Southern LNG Company argue that domestic natural gas prices will remain independent of international prices.

In its reply comments, Dow expands on its argument that domestic natural gas prices will become linked to international prices. Dow argues that exports to Asia, where natural gas prices are "oil-indexed," will invariably lead to increases in domestic price. Dow also argues that it is incorrect to assume liquefaction, transportation and regasification costs will act as a buffer against world prices, pointing to the experience in Australia in which LNG exports resulted in a tripling of domestic natural gas prices. In reply comments, API and several LNG export applicants (and/or authorization holders) argue that natural gas prices will not rise to global prices because the market will limit the amount of U.S. natural gas that will be exported, since liquefaction, transportation and regasification costs act as a cushion. These commenters argue that if this cushion disappears and the U.S. export price rises to the global LNG price, market forces will bring U.S. exports to a halt. Several LNG export applicants also contend that the availability of bi-directional terminals will serve to limit domestic price increases.

b. DOE/FE Analysis

The NERA Study examined whether LNG exports from the United States will cause domestic prices to rise to the level of international prices and found that such a result is unlikely. NERA asserts that there will always be a difference between the international LNG price and the U.S. market price. That difference will be represented by the cost of inland transportation, liquefaction, shipping, and regasification. NERA's model assumes competition among different suppliers such that Asian buyers would have no incentive to buy natural gas from the United

States if the delivered price after liquefaction and transportation is higher than the alternative delivered LNG price from other sources. DOE/FE agrees that a competitive market would behave in this manner and U.S. natural gas prices would be lower than international LNG prices in such a market by at least the costs previously described. Further, the introduction of LNG exported from the United States into the international market would tend to exert downward pressure on the prevailing higher delivered price for LNG in those foreign markets and could weaken the "oil-indexed" pricing terms.

In addition, all proposed LNG exports from the United States in applications DOE/FE has received to date would be pursuant to long-term contracts. To the extent that these contracts supply end-users in foreign markets, these exports represent a base-load demand for U.S. natural gas. As a base load, the United States market would adjust to this increased demand through increases in production, and plan for its delivery utilizing the significant production and storage infrastructure that exists. On average, prices would rise to levels that provide incentives for full marginal cost recovery for the incremental production of natural gas needed to meet this demand.

Hence we agree with those commenters, such as the Bipartisan Policy Center, that maintain that LNG exports from the United States will have difficulty competing with LNG exports from other countries unless domestic U.S. natural gas can be produced much cheaper. They point out that the international supply of natural gas is growing, and the mobility of that supply is increasing as other countries develop their own LNG export capabilities. Further, there is no evidence before us that demonstrates that the prices of natural gas or LNG in the international market are more volatile than the prices in the U.S. domestic market.

G. Integrity of the 2012 LNG Export Study

1. Comments

Several commenters, such as Clean Ocean Action and Sierra Club, argue that DOE/FE cannot rely on the NERA Study unless DOE/FE discloses more details about the process by which DOE/FE selected NERA to conduct the study, DOE/FE's funding mechanism for paying NERA, and DOE/FE's involvement (if any) in guiding the study or reviewing drafts of the study prior to publication. In addition to Sierra Club, commenters Eugene Bruce, Ellen Osuna, Dow, and IECA assert that DOE/FE cannot rely on the NERA Study because NERA has not disclosed all technical details of its proprietary N_{ew}ERA model to the public. According to Sierra Club, DOE/FE "has refused to make [all of] this information available for review during the public comment period."[253] Further, Sierra Club, Save Our Supplies and several other commenters argue that, due to this alleged lack of transparency, DOE/FE should conduct a new study of the potential cumulative impacts of granting LNG export licenses for shipment to non-FTA countries. Sierra Club and other commenters also contend that NERA and/or NERA's Vice President (and the principal author of the NERA Study) Mr. David Montgomery may be biased in favor of LNG exports, which they argue necessitates a new study by a different contractor.

2. DOE/FE Analysis

DOE has evaluated all submissions in this proceeding on their own merits, including the 2012 LNG Export Study and the arguments and analyses submitted by commenters. NERA conducted the Study within DOE/FE's requested parameters (which are included as Appendix F to the NERA Study) and provided detailed information regarding its assumptions, model design and methodology, and results. This information is set forth at length in the NERA Study and is discussed in Section V.B.2 and 5 of this Order. As evidenced by the number of detailed

[253] Reply Comments of Sierra Club at 20.

comments received, including additional studies offered by several of the commenters, NERA's explanation of its modeling design, methodology, and results has provided a sufficient basis both for the public to provide meaningful comments and for the Department to evaluate NERA's conclusions.

H. Peer Review

1. Comments

Dow, along with Eugene Bruce, IECA, and others, charge that the NERA Study is invalid because NERA failed to validate its proprietary N_{ew}ERA model by means of technical peer review. These commenters argue that technical peer review is required by the Office of Management and Budget's (OMB) guidance entitled, "Final Information Quality Bulletin for Peer Review" (OMB Bulletin).[254] The OMB Bulletin establishes that "important scientific information shall be peer reviewed by qualified scientists before it is disseminated by the Federal government." Dow asserts that the NERA Study should be considered "highly influential scientific information," subject to the highest standards outlined in the OMB Bulletin, and/or subject to internal DOE peer review guidelines. Due in part to these concerns, several commenters, including Sierra Club and Save Our Supplies, urge that DOE/FE commission a new study by another independent contractor.

Cameron LNG, LLC, in its reply comments, counters that the OMB Bulletin does not apply to adjudications or permit proceedings such as this one. Cameron LNG therefore asserts that the public comment period held by DOE/FE on the 2012 LNG Export Study is more than adequate for DOE/FE to obtain constructive review of both the EIA and NERA Studies.

[254] Final Information Quality Bulletin for Peer Review, 70 Fed. Reg. 2664 (Jan. 14, 2005).

2. DOE/FE Analysis

The OMB Bulletin establishes a framework for independent, expert review of influential scientific information before the information is publicly disseminated. It defines "scientific information" as "factual inputs, data, models, analyses, technical information, or scientific assessments based on the behavioral and social sciences, public health and medical sciences, life and earth sciences, engineering, or physical sciences."[255] "Scientific information" does not include opinions where the presentation makes it clear the information is "opinion rather than fact or the agency's views."[256] Further, the OMB Bulletin, while applicable to rulemakings, provides that "official disseminations that arise in adjudications and permit proceedings" are exempt from peer review, unless "the agency determines that peer review is practical and appropriate …."[257]

We have considered commenters' request for peer review in light of the OMB Bulletin. Because this proceeding is an adjudication, peer review is not required unless DOE/FE determines that such review is appropriate. After consideration, we find that peer review is not required because the conclusions reached in the 2012 LNG Export Study are in the nature of expert opinion, not scientific fact, and also because the principal purpose of peer review of government-sourced documents—ensuring the government is well-informed by independently produced expert analyses—was accomplished in this proceeding.

Both the EIA and NERA Studies use market assumptions to project a range of possible future results. No claim is made by the authors of either study that the studies contain scientific fact. To the contrary, both studies caution the reader on the limits to their economic projections. The EIA Study states: "The projections in this report are not statements of what *will* happen but

[255] *Id*. at 2675.
[256] *Id*.
[257] *Id*. at 2677.

of what *might* happen, given the assumptions and methodologies used."[258] Similarly, the NERA Study was developed around assumptions of future scenarios and repeatedly acknowledges the uncertainties that could shift the results within the range of likely outcomes.[259]

Further, the procedures followed by DOE/FE in this proceeding have allowed numerous commenting parties and third-party experts to offer differing analyses. The comments included several expert studies critiquing the 2012 LNG Export Study. For example, Professor Wallace Tyner of Purdue University submitted results from a study that shows different results from NERA's. Sierra Club submitted a study by Synapse Energy Economics, Inc., that examined NERA's study and pointed out alleged "problems and omissions" in NERA's analysis.[260] Conversely, Southern LNG Company, Gulf LNG, and Jordan Cove Energy Project each submitted a study by Navigant that concluded that NERA's analyses were sound.[261]

DOE/FE has carefully weighed these competing analyses and viewpoints, and has conducted its own internal review of the 2012 LNG Export Study. In so doing, DOE/FE has recognized that its ultimate decision on the pending export applications would benefit from a public exchange of judgments and expert opinions.[262] The major purpose motivating the OMB Bulletin—to ensure that the government is well-informed by independent, expert analysis—was accomplished in this proceeding without the need for peer review.

---

[258] EIA Study at ii.
[259] *See*, *e.g.*, NERA Study at 25-26.
[260] Synapse Energy Economics, Inc., *Will LNG Exports Benefit the United States Economy?* (Jan. 23, 2013), at 1, submitted with Initial Comments of Sierra Club.
[261] *See*, *e.g.*, Navigant Consulting, Inc. and Navigant Economics, Analysis of the Department of Energy's LNG Export Study (Jan. 24, 2013), App. A of Initial Comments of Gulf LNG.
[262] *See* 77 Fed. Reg. at 73,628 ("The LNG Export Study and the comments that DOE/FE receives … will help to inform our determination of the public interest in each case.")

I. Procedural Arguments

1. Comments

Several commenters, including Sierra Club, Senator Wyden, NRDC, and others argue that the current public interest standard, which focuses on meeting the nation's "essential domestic needs" for natural gas, is too narrow and that DOE/FE must undertake a rulemaking to establish criteria for making such a determination under the NGA. Similarly, Sierra Club, Alcoa, IECA, and CarbonX Energy Company, Inc., argue that DOE/FE should articulate, in the context of a separate rulemaking proceeding, the framework it will use in making its public interest determinations for individual export applications. Dow makes a related comment, stating that each of the individual LNG export dockets contains an insufficient record on which to base a public interest determination on the cumulative impact of LNG exports, and therefore DOE/FE is required to conduct a notice and comment rulemaking before it decides on any of the pending LNG export applications.

Dow, Sierra Club, Save Our Supplies, and other commenters contend that DOE/FE should conduct a public hearing regarding the applicable public interest standard in light of the cumulative impacts of LNG exports. Additionally, several commenters request that DOE/FE reopen the dockets of LNG export applicants to solicit additional public comment. Commenter Mary Altmann argues that DOE/FE should invite public comment on individual LNG applications before approving exports. IECA argues that many commenters could not reasonably have been expected to intervene in individual license proceedings at the time license applications were filed, since they had no way of anticipating that more than 20 applications would eventually be filed. IECA argues that DOE/FE, therefore, has no alternative other than to allow every interested party to intervene in each proceeding. Along these same lines, CarbonX

requests that its comment on the 2012 LNG Export Study be incorporated into the dockets for each pending LNG export applications.

Several commenters raise issues associated with their ability to comment on economic studies conducted by third parties and whether DOE/FE may rely on such studies in making a determination. Regarding DOE/FE's request for public comment in the NOA, Sierra Club, IECA, and others argue that DOE/FE narrowly instructed parties to address only the EIA and NERA Studies. Proponents of this argument assert that DOE/FE cannot assess whether it is in the public interest to issue additional LNG export permits by addressing only one aspect of the public interest analysis (*i.e.*, potential impacts on energy costs). Similarly, Sierra Club, IECA, CarbonX, and others, assert that citations to third-party studies in the record do not discharge DOE/FE's responsibility to evaluate the public interest because the studies are based on undisclosed proprietary data and models with limited information regarding their development and age.

Other commenters argue that DOE/FE should act now to decide each pending export application. These commenters contend additional administrative process is neither necessary nor appropriate as DOE/FE has already provided the "opportunity for hearing" required under NGA section 3(a) to make its public interest determination. Commenters such as ExxonMobil and the Center for Liquefied Natural Gas argue that the initial and reply comments submitted in response to the 2012 LNG Export Study do not change the NGA statutory and regulatory requirements that place the burden of proof on opponents to demonstrate, with sufficient evidence, that each application is inconsistent with the public interest. These commenters argue that the record before DOE/FE regarding each individual application is sufficient for DOE/FE to determine whether LNG exports have been shown to be inconsistent with the public interest.

2. DOE/FE Analysis

Fundamentally, all of the above requests for procedural relief challenge the adequacy of the opportunity that we have given to the public to participate in this proceeding and the adequacy of the record developed to support our decision in this proceeding.

With respect to opportunity for public participation, we find that the public has been given ample opportunity to participate in this proceeding, as well as the other pending LNG export proceedings. Within this proceeding, the Notice of Application contained a detailed description of the Application, and invited the public to submit protests, motions to intervene, notices of intervention, and comments.[263] As required by DOE regulations, similar notices of application have been published in the Federal Register in each of the other non-FTA export application proceedings. Additionally, in December 2012, DOE/FE published the NOA for the EIA and NERA Studies in the Federal Register.[264] As explained above, the NOA described the content and purpose of the EIA and NERA Studies, invited the public to submit initial and reply comments, and stated that these comments will be part of the record in each individual docket proceeding.[265] DOE/FE thus has taken appropriate and necessary steps by offering the public multiple opportunities to participate in the non-FTA LNG export proceedings.

We also find the record is adequate to support the action we are taking in this Order. DOE/FE has reviewed all of the submissions made in this proceeding. Moreover, this Order sets out the reasons that support each of the determinations contained herein. Consequently, we do not find it is necessary or appropriate to delay issuance of this Order to augment the record, either through a rulemaking or public hearing. In this regard, we note that DOE/FE retains broad discretion to decide what procedures to use in fulfilling its statutory responsibilities under the

[263] *See* Pieridae US Notice of Application, *supra* n.16.
[264] 77 Fed. Reg. at 73,627.
[265] *Id*. at 73,628.

NGA,[266] and our view is that the record is sufficient to support the actions that we are taking. The requests for additional procedures summarized above are denied.

IX. 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.[267] DOE provided a summary of the comments received and responses to substantive comments in Appendix B of the Addendum.[268] 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 Study, published as part of the 2012 LNG

[266] *See, e.g., Process Gas Consumers v. FERC*, 930 F.2d 926, 929 (D.C. Cir. 1991).
[267] Addendum at 3.
[268] *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.[269]

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.[270] 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, Table 6 captures differences in water intensity across energy sources.

[269] *See* 2012 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).
[270] Addendum at 10.

Table 6: Water Intensity[271]

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 (*in situ*)	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."[272] Table 7 shows the variation in the proportion of water usage by activity in shale gas regions:

[271] *Id*. at 11 (Table 2).
[272] *Id*. at 12.

Table 7: Water Usage in Shale Gas Regions[273]

Play	Public Supply (%)	Industry & Mining (%)	Power Generation (%)	Irrigation (%)	Livestock (%)	Shale Gas (%)	Total Water Use (Bgals/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."[274]

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.[275] The Addendum acknowledges, however, that while unconventional natural gas formations are thousands of feet below aquifers associated with public

[273] *Id.* at 12 (Table 3) (citations omitted).
[274] *Id.* at 13.
[275] 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).

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.[276]

The fluid used for hydraulic fracturing consists of over 98 percent water, but also may include several different chemical compounds.[277] 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.[278] Further, chemical additives may contaminate groundwater should the integrity of the casing or cement seal of the well be compromised.[279]

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.

Concluding its discussion of water resources, the Addendum observes that "[u]nconventional natural gas production, when conforming to regulatory requirements,

---

[276] *Id.* at 14.
[277] *Id.* at 14-15.
[278] *Id.* at 18.
[279] *Id.*

implementing best management practices, and administering pollution prevention concepts, may have temporary, minor impacts to water resources."[280] 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."[281]

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 Table 8 below:

Table 8: Source Categories of Airborne Emissions from Upstream Natural Gas Activities (EPA, 2013) [282]

Category	Type of Emissions	Sources of Emissions
Combustion Emissions	Nitrogen oxide (NO_x) and carbon monoxide (CO) resulting from the burning of hydrocarbon (fossil) fuels. Air toxics, particulate matter, un-combusted volatile organic compounds (VOCs), and methane (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.

[280] Addendum at 19.
[281] *Id.* at 19.
[282] *Id.* at 23 (Table 6).

The Addendum describes the existing regulatory framework relating to such emissions, as well as the EPA's 2012 New Sources Performances Standards for hydraulically fractured natural gas wells[283] and EPA's 2013 update to those standards covering storage tanks.[284] 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 hazardous air pollutants. 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. As more data become available, a better understanding of trends in local and regional air quality and potential impacts may emerge.[285]

C. Greenhouse Gas Emissions

The Addendum includes a discussion of greenhouse gas (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

[283] *Id*. at 20-22.
[284] *Id*. at 22.
[285] *Id*. at 32.

oil and gas sector, including completions and ongoing production of hydraulically fractured oil wells, compressors, pneumatic valves, liquids unloading, and leaks.[286] 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.[287]

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 "emissions of GHGs from the upstream industry are of similar magnitude for both conventional and unconventional sources."[288]

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."[289] 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

[286] Addendum at 22 (*citing* U.S. Envtl. 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).
[287] *Id.* at 44.
[288] *Id.* at 40.
[289] *Id.* at 51.

result that fluid pressures can be increased within a large area surrounding the injection well."[290] 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.[291]

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."[292] 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."[293] 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.

---

[290] *Id*. at 52.
[291] *Id* at 55-56 (citing *Induced Seismicity Potential in Energy Technologies*. National Research Council. The National Academies Press, Washington, D.C. (2013) at 5).
[292] Addendum at 62.
[293] *Id*.

X. 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 (CO_2) and methane (CH_4), 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 decision-making 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 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*.[294] On June 4, 2014, DOE/FE provided notice of the documents in the *Federal Register* and invited public comment.[295] 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

[294] *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*].

[295] 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*.

conclusions. Below, we summarize the public comments on the Report and respond to those comments. *See infra* § X.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:

- 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.[296]

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 in Table 9 below:

[296] 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 9: LCA GHG Scenarios Analyzed by NETL[297]

Scenario	Description	Key Assumptions
1	• 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	• 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	• Natural gas is produced in the Yamal region of Siberia, Russia, using conventional extraction methods.[298] • 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	• 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

[297] The four scenarios are set forth in the LCA GHG Report at 2.
[298] Yamal, Siberia, was chosen as the extraction site because that region accounted for 82.6% of natural gas production in Russia in 2012.

		coal. Additionally, U.S. mining data and U.S. plant operations were used as a proxy for foreign data.

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 (CO_2e), which convert GHG gases to the same basis: an equivalent mass of CO_2. CO_2e is a metric commonly used to estimate the amount of global warming that GHGs may cause, relative to the same mass of CO_2 released to the atmosphere. NETL chose CO_2e using the Global Warming Potential (GWP) of each gas from the 2013 Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) (IPCC, 2013).[299] The LCA GHG Report applied the respective GWPs to a 100-year and a 20-year time frame.

At the time that NETL selected the GWP values and other parameters for its LCA GHG Report, the working group papers for the IPCC's Fifth Assessment Report[300] 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

[299] 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. Envtl. Protection Agency, *Understanding Global Warming Potentials*, http://www.epa.gov/climatechange/ghgemissions/gwps.html (last updated Sept. 11, 2015).

[300] 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.

an adder for climate-carbon feedbacks. Based on a perception of uncertainty 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.

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.[301] 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 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

[301] *See* LCA GHG Report at 3 (*citing* NETL, *Life Cycle Analysis of Natural Gas Extraction and Power Gener*ation).

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,[302] (3) coal type (sub-bituminous or bituminous),[303] (4) the flaring rate for natural gas,[304] (5) transport distance (ocean tanker for LNG transport, and rail for coal transport),[305] 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 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.[306] 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

[302] 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.
[303] The modeling parameters and values for the coal scenarios are provided in Table 5-3. *See* LCA GHG Report at 6.
[304] 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 CO_2. *See id*. at 7.
[305] The distances used for pipeline transport of Russian gas are provided in Table 5-2. *See id*. at 6.
[306] *See* LCA GHG Report at 5.

case (Scenario 3).[307]

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.[308] 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).[309]

7. Results of the LCA GHG Report

NETL states that two primary conclusions may be drawn from the LCA GHG Report.[310] First, use of U.S. LNG exports to produce electricity in European and Asian markets will *not* increase GHG emissions on a life cycle perspective, when compared to regional coal extraction and consumption for power production. As shown below in Figures 1 and 2, 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.[311] (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

[307] The methane leakage breakeven analysis is described in the LCA GHG Report at 14 and 15.
[308] *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.
[309] The study limitations are described in the LCA GHG Report at 18.
[310] NETL's detailed study results, with corresponding figures, are set forth on pages 8 through 18 of the LCA GHG Report.
[311] 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.

cases other than the LNG transport distance from the United States and the pipeline distance from Russia.

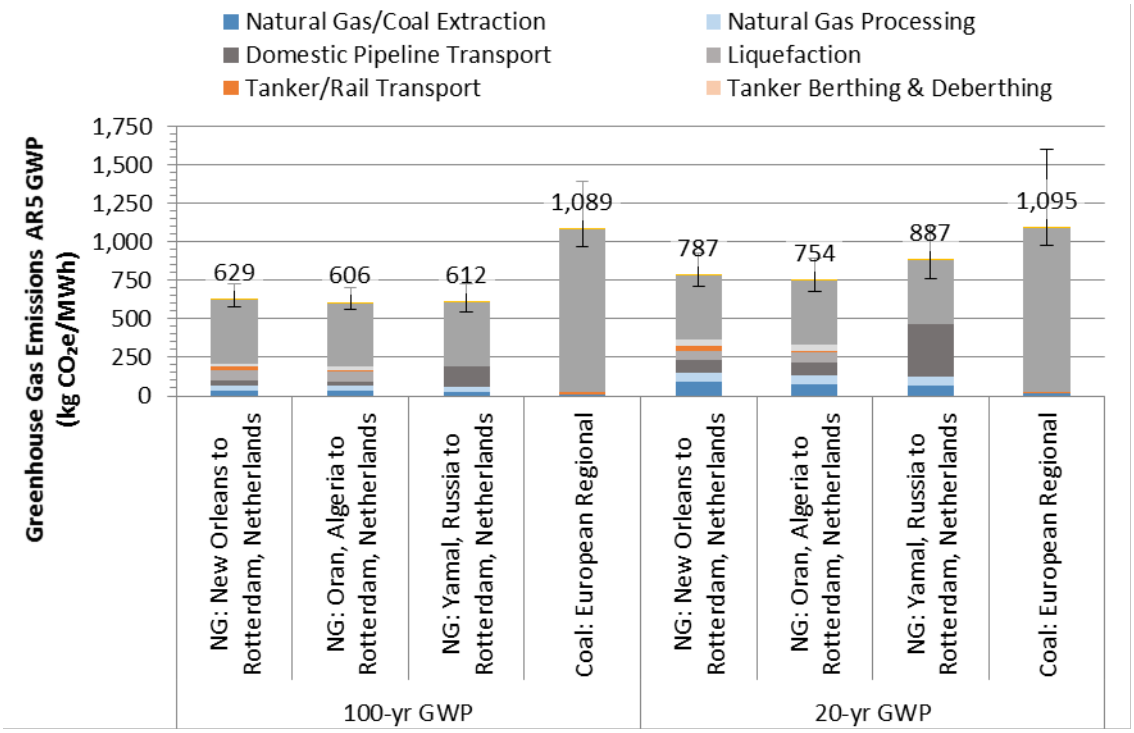

Figure 1: Life Cycle GHG Emissions for Natural Gas and Coal Power in Europe[312]

[312] LCA GHG Report at 9 (Figure 6-1).

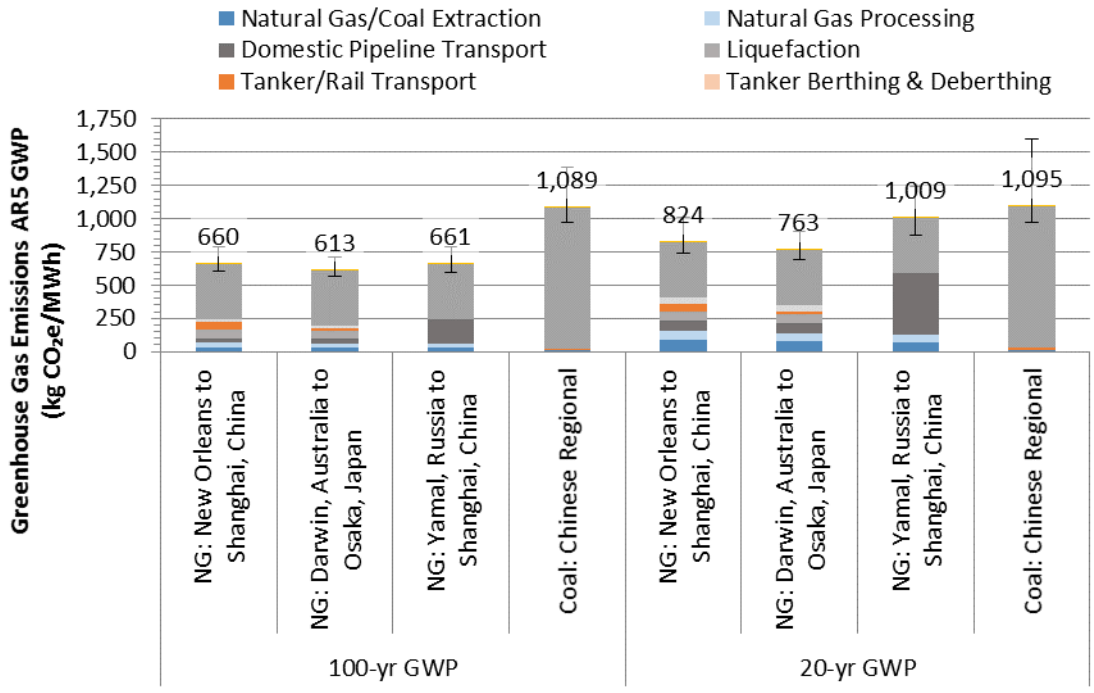

Figure 2: Life Cycle GHG Emissions for Natural Gas and Coal Power in Asia[313]

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 Report, DOE/FE identified 18 unique submissions received from the general public, interest

[313] LCA GHG Report at 10 (Figure 6-2).

groups, industry, and academia/research institutions, which DOE/FE categorized into seven distinct comments.[314]

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 CO_2 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 12 below, [(415 – 1,063)/1,063 x 100]). The life cycle of baseload 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.

[314] 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.

Table 10 shows the life cycle GHG emissions of carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and sulfur hexafluoride (SF_6) 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 10: Life Cycle GHG Emissions from Natural Gas and Coal Systems (kg CO_2e/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, Netherland**	**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,[315] Food & Water Watch,[316] 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.

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

[315] 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.
[316] Food & Water Watch submitted comments in the form of a letter signed by 85 individuals representing various national, state, and local public interest groups.

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.[317]

[317] 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 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. Envtl. 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.

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 LNG, and FLEX, each of which has been granted one or more non-FTA LNG export orders by DOE/FE. According to API, these proposed facilities will produce 0.26, 0.29, and 0.12 tonnes of CO_2e 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 CO_2e per tonne of LNG; this GHG intensity is representative of a facility that consumes 12% of incoming natural gas as plant fuel.[318]

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

[318] 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.

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.[319] 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.

(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,[320] after NETL's model had been finalized and during the time that NETL was completing the LCA GHG Report. These

[319] *See id.*
[320] U.S. Envtl. 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.

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.[321] They also match the factors used by EPA's 2013 GHG inventory.[322]

NETL's current model accounts for liquids unloading emissions from conventional wells, but does not account for liquids unloading from unconventional wells. Applying liquids 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.[323] When liquids unloading is added to unconventional natural gas in the 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,

[321] *Characterizing Pivotal Sources of Methane Emissions from Natural Gas Production: Summary and Analysis of API and ANGA Survey Responses*. Final Report (Sept. 21, 2012).
[322] U.S. Envtl. Prot. Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2011 (Apr. 12, 2013).
[323] *See* NETL, *Life Cycle Analysis of Natural Gas Extraction and Power Generation*.

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 CO_2, 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 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 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.[324] 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 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.[325] Future versions of the Report will correct these duplicate

[324] U.S. Envtl. 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.

[325] U.S. Envtl. 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.

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.[326] 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 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 CO_2e/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.

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

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%.[327] One reason for this broad range of leakage rates is the fact 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 CO_2 and thus reduces methane venting to the atmosphere. Similarly, the combustion of natural gas by reboilers in a natural gas processing plant or by

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

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 percent, which DOE/FE believes 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 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, processing, and transmission of 1 kg of natural gas[328] 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 rate 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.

Next, 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

[328] 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.

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.[329] 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.[330] We have reviewed Weber et al.'s work and do not see any mention of leakage rate.

It is 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

[329] 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.
[330] 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 Colorado[331] do not match the bottom-up calculations by NETL and other analysts.[332] 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.

With the above concepts in mind, DOE's judgment is that, based on the scientific studies available at the time the analysis in this proceeding was performed, 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. The top-down

[331] 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).

[332] For 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.

studies cited by Sierra Club represent valuable research that advance our understanding of methane emissions, but they do not form a robust basis for estimating the leakage rate from U.S. natural gas systems in the aggregate. For these reasons, we do not agree that using a top-down approach would have yielded a more reasonable methane leakage rate.

DOE has also determined that NETL's upstream natural gas results are not lower than those calculated by other bottom-up studies. When cradle-through transmission boundaries are enforced and uncertainty is accounted for, NETL's natural gas results are comparable to the results from other studies. In fact, Weber et al. study 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. For these reasons, we do not agree that NETL's methane leakage rate is significantly lower than those used or calculated by other bottom-up studies.

Another commenter, 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.[333] 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).

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

[333] 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.

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.[334]

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

[334] Based on current knowledge concerning the methane GWPs, DOE/FE believes that using 20- and 100-year methane GWPs of 87 and 36 would be most appropriate today, and that climate carbon feedbacks should be captured in the GWP values for methane. *See supra* at § X.A.3 (discussing basis for NETL's selection of methane GWPs during analysis for LCA GHG Report). We emphasize, however, that using these values would not have materially affected the conclusions of the LCA GHG Report. 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.

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.

XI. DISCUSSION AND CONCLUSIONS

In reviewing Pieridae US's Application, DOE/FE has considered both its obligations under NEPA and its obligation under NGA section 3(a) to ensure that Pieridae US's proposed re-exports of U.S.-sourced natural gas in the form of LNG are not inconsistent with the public interest. To accomplish these purposes, DOE/FE has examined a wide range of information addressing non-environmental and environmental factors, including:

- Pieridae US's Application and Supplements to the Application;
- The submissions of intervenors, protestors, and commenters in response to the Application and related filings;
- The 2012 LNG Export Study, including comments received in response to the 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.

To avoid repetition, the following discussion focuses on arguments and evidence presented by Pieridae US and the intervenors, protestors, and commenters in this proceeding, to the extent that DOE/FE has not already addressed the same or substantially similar arguments herein in its responses to comments on the 2012 LNG Export Study, the Addendum, or the LCA GHG Report.

A. Procedural Issues

1. Requests for Extension of Time to Comment and Intervene in Proceeding

As discussed above, numerous commenters filed substantive comments opposing Pieridae US's Application, yet also requested an extension of the 60-day period to comment on Pieridae US's Notice of Application and/or move to intervene or protest in this proceeding. One commenter, Pramilla Malick, submitted a petition allegedly on behalf of 1,013 people requesting an extension of the comment period, while also opposing the Application. Additionally, proposed intervenor MassPLAN submitted, as part of its filing, a request for a 30-day extension of the deadline to comment and intervene in this proceeding.

These requests constitute motions to extend the comment period. These motions, however, were denied by operation of law when DOE/FE did not rule on the requests within 30 days after the requests were made. 10 C.F.R. § 590.302(c). Moreover, even if the requests had not been denied by operation of law, we do not find good cause for granting the requested extensions. We note that DOE/FE published the Notice of Application for Pieridae US's Application in the Federal Register in compliance with its regulations (10 C.F.R. § 590.205). Due to the complexity of the issues raised by the Application, DOE/FE provided an even longer

comment period of 60 days than the 30-day period established in that regulation.[335] We therefore find that the comment period was lawful and adequate.

2. Motions for Leave to Intervene and/or Protest

As discussed above (*supra* § VII.A.2), DOE/FE received 31 filings either captioned as motions for leave to intervene and/or protest Pieridae US's Application, or that mention a request to intervene in the proceeding (and thus are construed as a motion for leave to intervene). In its Answer, Pieridae US opposes 27 of these motions for lack of compliance with DOE/FE's procedural regulations set forth in 10 C.F.R. §§ 590.103(b) and 590.107. We have identified each motion by the name of the person submitting the motion above.[336] Pieridae US opposes the remaining motions based on substantive disagreements with the intervenors' arguments, as addressed below.

Upon review, DOE/FE agrees with Pieridae US that 27 motions for leave to intervene and/or protest do not, in fact, comply with DOE/FE's requirements. First, section 590.103(b) requires "[a]ny petition, motion, answer, request, comment, [or] protest" to be "signed either by the person upon whose behalf the document is filed or by an authorized representative."[337] For documents signed by an authorized representative, the filing "shall contain a certified statement that the representative is a duly authorized representative unless the representative has a certified statement already on file in the FE docket of the proceeding."[338] Second, the regulation explicitly requires "[a]ll documents" to be "verified under oath or affirmation by the person filing, or by an officer or authorized representative of the firm having knowledge of the facts

[335] *See* Pieridae US Notice of App., 79 Fed. Reg. at 73,286.
[336] *See supra* at 86-87 nn. 177-180.
[337] 10 C.F.R. § 590.103(b).
[338] *Id*.

alleged."[339] Third, "[e]ach document … shall contain a certification that a copy has been served as required by [10 C.F.R.] § 590.107 and indicate the date of service."[340]

The 27 contested motions do not comply with one or more of these requirements. Indeed, many are brief submissions that—although requesting a grant of a motion to intervene in these proceedings—do not comply with any of DOE/FE's requirements for motions and protests set forth above. Many also fail to set forth any facts upon which the movant's claim of interest is based, as required by 10 C.F.R. § 590.103(b).[341] Accordingly, we deny these 27 motions to intervene in and/or protest this proceeding, as listed in the Appendix to this Order. Nonetheless, because these filings contain considerations that may be relevant to our analysis, we accept these 27 filings as comments opposing the Application. Accordingly, the comments have been accepted for filing but the filers will not be made parties to the proceeding.

In its Answer, Pieridae US also opposes the motions to intervene of Saint John Gas Marketing Company and IECA, respectively, for an alleged failure to serve the motion on Pieridae US or a representative of Pieridae US, despite the inclusion of a sworn certificate of service by each movant. Upon review, we find that both motions to intervene should be granted, notwithstanding Pieridae US's claims. Although Pieridae US is correct that each movant is required to serve upon the applicant's representative a copy of any document filed with DOE/FE (10 C.F.R. § 590.107(a), (b)), both movants properly served DOE/FE, and each filing was posted promptly on the electronic docket in this proceeding. Pieridae US also timely filed an Answer responding to IECA's arguments on the merits, and we have taken those arguments into consideration in this Order. Therefore, we cannot say that Pieridae US was prejudiced by any lack of service. For these reasons, and because Saint John Gas and IECA each have articulated a

[339] *Id*.
[340] *Id*.
[341] *See*, *e.g.*, Motions to Intervene of Madeline Cronin and Julie HawkOwl.

sufficient interest in the outcome of this proceeding to warrant intervention, we grant their respective motions to intervene. As noted above, the motions to intervene filed by MassPLAN and NEES, respectively, are also granted, for a total of four motions to intervene and/or protest.

3. Answer and Reply Motions

As described above, Pieridae US filed a Consolidated Answer to the various motions submitted in response to the Notice of Application. Two of the intervenors—Saint John Gas and NEES—filed motions for leave to reply to Pieridae US's Answer. NEES also filed two supplements to its motion for leave to reply to Pieridae US's Answer. Pieridae US did not oppose any of these filings.

Saint John Gas's motion for leave to reply was denied by operation of law when DOE/FE did not rule on that request within 30 days after they were filed. 10 C.F.R. § 590.302(c). As noted above, NEES's motion for leave to reply (and its two supplements to that motion) were tolled for purposes of further consideration by order dated September 17, 2015. We now grant NEES's motion for leave to file a reply and the two related supplements. These filings contain information material to DOE/FE's consideration of the Application, and therefore we find good cause to consider the arguments raised therein.

4. Pieridae US's Motion to Lodge

In its Motion to Lodge, filed as part of its Second Supplement to the Application and tolled by DOE/FE order, Pieridae US provides two documents as Exhibits A and C, and asks DOE/FE to "lodge [these] materials (as well as other such materials in the underlying Canadian proceedings as the DOE/FE determines to be relevant and necessary …)" in this docket for inclusion in DOE/FE's decision record.[342] Exhibit A is a copy of the conditional Environmental Assessment Approval of the proposed Goldboro LNG Project by the Minister of Environment of

[342] Pieridae US Second Supp. & Mot. to Lodge at 6.

Nova Scotia. Exhibit C appears to be an email to Pieridae US from a project manager in the Canadian Environmental Assessment Agency.[343]

In opposing this Motion, NEES asserts, among other things, that DOE/FE cannot accept the Minister's decision or any other materials in the Canadian proceedings unless DOE/FE undertakes an independent investigation as to the facts of those proceedings.[344] NEES also contends that, "in view of the misstatements and vagueness of Pieridae during this proceeding, it is reasonable to conclude that Pieridae has conducted itself similarly within the Canadian proceedings."[345]

NEES has not adduced sufficient evidence in this record for us to question the veracity of statements made either to DOE/FE or (insofar as relevant to our review) to Canadian officials in proceedings related to the environmental review of the proposed Goldboro LNG Project. Nonetheless, we must deny Pieridae US's Motion to Lodge because the Goldboro Project, to be located in Nova Scotia, Canada, is outside the scope of our environmental review under NEPA in this proceeding, which necessarily focuses on potential environmental impacts within the United States. The Minister of Environment of Nova Scotia's EA Approval of the Goldboro Project, and the issue of whether any additional federal environmental assessment by the Government of Canada could be required, is likewise beyond the scope of our review under both NEPA and NGA section 3(a). Accordingly, we find that the materials offered by Pieridae US in its Motion to Lodge are not relevant to the administrative record in this proceeding.

5. IECA's Request to Suspend Consideration of Pieridae US's Application

In its motion and protest filed on February 9, 2015, IECA asks DOE/FE to suspend consideration of Pieridae US's Application until the Application is ready (or nearly ready) for

[343] *See supra* § IV.D.
[344] NEES Second Supp. to Mot. to Reply at 3.
[345] *Id*.

final action, *i.e.* when DOE has completed its NEPA review and has sufficient information on which to base a public interest determination. At the time of this filing, IECA states that "Pieridae Energy has not completed the required NEPA process …."[346] IECA requests suspension in part so that it may submit pleadings based on the data purportedly available at the time the Application is ready for review.[347] IECA also states that DOE/FE's alleged failure to establish a comment deadline timed to coincide with the expected completion of NEPA review is inconsistent with DOE/FE's "Procedures for Liquefied Natural Gas Export Decisions" (Procedures), and thus the Procedures are "inefficient" and "should be modified."[348]

In its Answer, Pieridae US opposes the motion to suspend, claiming that IECA's criticisms of DOE/FE's procedures do not relate to the merits of the Application and should be disregarded for the purpose of evaluating the Application.[349]

Under DOE's regulations, IECA's motion to suspend was denied by operation of law when DOE/FE did not rule on it within 30 days after it was filed. 10 C.F.R. § 590.302(c). IECA's arguments are also mooted by the limited scope of the authorization issued in this Order, *i.e.*, by the fact that this authorization permits exports using only existing capacity on the M&N US Pipeline for which environmental review was previously completed by FERC, *and* requires Pieridae US to submit a new export application with DOE/FE should it propose to conduct export operations using capacity either not presently in existence on the M&N US Pipeline or on other existing (or yet-to-be built) natural gas pipelines. This requirement for the filing of an additional export application will ensure that no U.S.-based pipeline facilities essential to Pieridae US's export operations are put into service for those purposes without an opportunity

[346] IECA Mot. at 4.
[347] *Id*.
[348] *Id*.
[349] Pieridae US Answer at 12.

for the necessary environmental review, including opportunity for public participation. Consequently, it is inappropriate and unnecessary to suspend this proceeding until additional environmental review is completed.

6. NEES's Motion for Additional Procedures

As described above, NEES has requested that DOE/FE direct Pieridae US to comply with additional procedures concerning the Application under 10 C.F.R. § 590.206, including the filing of supplemental written comments, written interrogatories, and/or other discovery procedures, a conference, verbal presentation, and/or adjudication. Alternatively, under 10 C.F.R. § 590.310, NEES requests the opportunity to submit and to receive answers to written interrogatories and supplemental information from Pieridae US. In its motion, NEES asserts that the Application is "vague[]" and "non-committal," and does not substantiate certain claims, such that including interrogatories and other procedures will better enable DOE/FE to make a determination in this matter.[350] In its First Supplement, NEES urges DOE/FE to require Pieridae US to provide supplemental information concerning its redefined business plan (described in Pieridae US's First Supplement to the Application), stating that Pieridae US's statements about its business plan raise even more unanswered questions. Specifically, NEES charges that "it is wholly unclear how the Goldboro LNG Project … will be impacted by this redefined business plan."[351] Pieridae US opposes NEES's request for any additional procedures.

Upon review of the Application and Pieridae US's Supplements to the Application, we agree with Pieridae US and find that NEES's request for additional procedures should be denied. The record in this proceeding is both complete and adequate to support a finding that the proposed exports using the existing capacity of the M&N US Pipeline will not be inconsistent

[350] NEES Mot. at 7.
[351] NEES First Supp. to Motion for Leave to Reply at 2.

with the public interest, for the reasons set forth in this Order. In particular, contrary to NEES's arguments concerning the alleged vagueness of Pieridae US's "redefined" business plans, we find that Pieridae US updated the docket in this proceeding with relevant new information concerning its plans for other entities in Canada (including but not limited to Pieridae CA) to liquefy the U.S.-sourced natural gas at the Goldboro LNG Project and to re-export the natural gas in the form of LNG to non-FTA countries. We have taken that information into account in our reasoning and in the scope of this authorization. Accordingly, no additional procedures, including interrogatories, are necessary.

7. NEES's Request to Suspend Non-FTA Approvals

In its motion, NEES asks DOE/FE to "suspend any further LNG export approvals to non-FTA nations" until the U.S. Energy Information Administration (EIA) is able to provide more accurate information concerning the interactions between U.S. energy prices and the global economy.[352] Pieridae US opposes this request.

Under DOE's regulations, NEES's request to suspend non-FTA export approvals was denied by operation of law when DOE/FE did not rule on those requests within 30 days after they were filed. 10 C.F.R. § 590.302(c). Even if NEES's request was not denied by operation of law, we disagree with NEES's suggestion that the National Energy Modeling System (NEMS) model and—by extension, the 2012 EIA Study—produce inaccurate results, such that DOE/FE is unable to make an informed decision in this proceeding. As discussed above, because the NEMS model used by EIA did not account for the impact of energy price changes on global energy utilization patterns and did not include a full macroeconomic model, DOE/FE commissioned NERA to provide such an analysis as the second part of the 2012 LNG Export Study. NERA found that the United States would experience net economic benefits from increased LNG

[352] NEES Reply at 6.

exports in all cases studied, and NEES provides no evidence to refute this finding. Accordingly, contrary to NEES's argument, there is no need to suspend the processing of LNG export applications until such time as EIA prepares a study of macroeconomic impacts.

B. Applicability of Natural Gas Act Section 3(a) Public Interest Review

We find it necessary to review the Application in this proceeding under section 3(a) of the NGA, rather than section 3(c). Section 3(a), 15 U.S.C. §717b(a), requires a full public interest review of a natural gas export application and authorizes DOE/FE to attach such terms and conditions to the authorization as necessary to ensure that the authorization is consistent with the public interest. By contrast, section 3(c), 15 U.S.C. §717b(c), states that applications to export natural gas to FTA countries must be deemed in the public interest and requires DOE/FE to grant such applications without delay or modification.

In this proceeding, we confront Pieridae US's proposal to export natural gas by pipeline to Canada, a FTA country, for the primary purpose of re-exporting the U.S.-sourced natural gas (after liquefaction in Canada) in the form of LNG to non-FTA countries. We find that, notwithstanding the fact that Canada is a FTA country, Pieridae US's proposal must be reviewed under NGA section 3(a), instead of section 3(c). This is because the U.S.-sourced natural gas to be liquefied and re-exported is intended to be delivered for end use to non-FTA countries.[353] The destination of the U.S.-sourced natural gas or LNG for end use is critical to our determination, as is the trade status of that destination country or countries. If DOE were to determine that Pieridae US's proposed arrangement were *not* subject to section 3(a), we would fail to give effect to Congress' intent that all exports destined for non-FTA countries be reviewed for their consistency with the public interest. We would be enabling Pieridae US (and other

[353] *See supra* at 2 n.9 (defining "end use" for purposes of this Order as the combustion or other chemical reaction conversion process (*e.g.*, conversion to methanol).

potential applicants) to evade the public interest protections set forth in section 3(a) of the NGA for non-FTA exports simply by transiting the U.S.-sourced natural gas or LNG through a FTA country prior to its liquefaction and re-export to a non-FTA country.[354] Accordingly, we will review the Application under NGA section 3(a).

C. Non-Environmental Issues

In considering non-environmental issues in this proceeding, we have reviewed the Application and Supplements to the Application submitted by Pieridae US; the pleadings submitted by the intervenors and commenters; and the 2012 LNG Export Study (including both the EIA and 2012 NERA Studies). We also take administrative notice of EIA's most recent authoritative supply data and projections, set forth in AEO 2015. For the following reasons, the record in this proceeding does not demonstrate that a grant of the requested authorization, if limited to use of the existing capacity of the M&N US Pipeline, would be inconsistent with the public interest.

1. Pipeline Capacity Issues

We agree with those commenters and intervenors who have observed that this proceeding presents issues of first impression. This is among the first two proceedings in which DOE/FE has been asked to review an application to export U.S.-sourced natural gas by pipeline to Canada for liquefaction in Canada, for subsequent re-export of that natural gas in the form of LNG to non-FTA countries.[355] In addition, this proceeding presents an unusual factual circumstance. Most applications to DOE/FE for authority to export natural gas to non-FTA countries involve the ready availability of natural gas through an integrated grid of multiple interstate natural gas pipelines. This Application, by contrast, calls for the transportation of U.S.-sourced natural gas

[354] *See supra* at 3-4 (discussing same).
[355] *See also Bear Head LNG*, DOE/FE Order No. 3770, discussed *supra* at 5 n.15.

through a single interstate natural gas pipeline (the M&N US Pipeline). Yet, as discussed *infra*, it has not been established whether the capacity of the M&N Pipeline is adequate to transport the proposed export volumes to the designated cross-border facilities at the United States-Canada border. We have reviewed the Application with these observations in mind.

The principal issue common to many of the arguments raised by intervenors and commenters bears on the question of pipeline capacity—specifically, whether the capacity of the M&N US Pipeline is sufficient for the proposed export authorization. After reviewing the record, we find that Pieridae US has not established whether the existing capacity of the M&N US Pipeline is sufficient to transport the volumes contemplated for export in the Application. We take administrative notice of FERC's determinations its 2007 and 2009 Orders that the relevant cross-border facilities for the proposed exports have a capacity of 833,317 Dth/d (which we estimate is equivalent to 0.81 Bcf/d of natural gas).[356] Those determinations, however, do not address the capacity of the M&N Pipeline that would be used to transport natural gas from Dracut, Massachusetts, in a northerly direction to the cross-border facilities. The Application states that the existing capacity of the M&N US Pipeline is 440,000 Dth/d, whereas the amount proposed to be exported by Pieridae US is equivalent to an average daily throughput of 829,000 Dth/d.[357] According to Pieridae US, the existing capacity of the M&N US Pipeline is therefore equivalent to "about 0.4243 Bcf/d … compared to [its] proposed exports of up to 0.8000 Bcf/d [of natural gas]."[358]

This evidence does not establish the capacity of the M&N US Pipeline should the flow of natural gas on the system be reversed and the system otherwise adapted and/or expanded for purposes of moving natural gas in a northerly direction. We note that several intervenors and

[356] *See supra* at 4 nn.12-13.
[357] *See supra* at § IV.C.
[358] *Supra* at 17 (quoting Pieridae US App. at 23 n.32).

commenters have argued that the requested export authorization will incentivize the expansion of the M&N US Pipeline and, possibly, other pipelines. Insofar as such capacity expansions may result proximately from the issuance of export authorizations by this agency, DOE/FE is responsible for evaluating the impacts of the capacity expansion as part of its pubic interest review under section 3(a) of the NGA and its environmental review under NEPA. Pieridae US contends in its Application that, in prior non-FTA export application proceedings, DOE/FE has not afforded weight in its public interest review to the capacity of the interstate pipelines delivering natural gas for export. Pieridae US may well be correct. However, as discussed above, DOE/FE has not dealt previously with circumstances where, as here, the applicant identifies only a single pipeline capable of transporting natural gas to an LNG terminal for export and that pipeline may not presently have the capacity to meet the anticipated demand for export volumes.

Accordingly, we will grant Pieridae US's Application and authorize the exports up to the requested volume of 0.8 Bcf/d of natural gas (equivalent to 829,000 Dth/d), but will impose a limitation on the authorization requiring Pieridae US to submit a new export application should it wish to make use of any new capacity on M&N US Pipeline or new or upgraded capacity on other cross-border pipelines to support its authorized export operations. Pipeline capacity will be considered "new" or "upgraded" for purposes of this limitation if it is the result of physical changes that increase the northbound capacity of such a pipeline and any such changes require an amendment to the pipeline's certificate issued by FERC under NGA section 7, 15 U.S.C. §717f. By imposing this limitation on the requested authorization, we ensure that DOE and the public will have an opportunity to review and to comment, respectively, on the potential public interest

and environmental impacts of any facilities' expansion connected with Pieridae US's export operations.

2. Natural Gas Supplies and Domestic Demand

The record indicates that there are ample supplies of natural gas within the lower-48 states to meet the demands of consumers in the market territory of the M&N US Pipeline and also to meet Pieridae US's proposed export operations up to 0.8 Bcf/d of natural gas. Pieridae US has pointed to data from AEO 2014 showing that onshore production of natural gas in the lower-48 states will reach 13.33 Tcf in 2020 and 18.50 Tcf in 2035 and data in the ICF study showing that the North America natural gas resource base is sufficient to supply U.S. and Canadian natural gas markets for almost 150 years at current consumption levels. This is further confirmed by data from AEO 2015 which, as discussed *supra*, shows total recoverable reserves of 2,266 Tcf and an increasing domestic supply base to 2035.

3. Pipeline Rate Impacts

In circumstances where the local capacity of a distribution company or, in this instance, an interstate pipeline, is stressed over the potentially competing demands of consumers in domestic and export markets, a freely functioning market will incentivize the development of increased capacity to meet rising demand. The record in this proceeding, particularly Appendix E to the Application, shows that there are several pending proposals to increase pipeline capacity into the market territory currently traversed by M&N US Pipeline. The success of these proposals cannot be assumed and we make no such assumption. Nevertheless, we think it reasonable to observe that the success of such proposals will make it more likely that additional pipeline capacity will become available to meet the demand occasioned by this authorization plus the local and regional demand in the states served by M&N US Pipeline. Alternatively, if

no additional pipeline projects move forward, the likely effect will be increased competition for pipeline capacity. This could result in higher rates for interstate natural gas transportation services. Yet the rates charged for interstate pipeline capacity are subject to review by FERC under sections 4 and 5 of the NGA, 15 U.S.C. §§ 717c and 717d. FERC is charged under these sections of the NGA with ensuring that the rates for interstate pipeline services are just and reasonable. Given this backstop on the potential pipeline rate impact of increased throughput on the M&N US Pipeline, which is uncontroverted in the record, we do not find that it has been shown that rate increases occasioned by or related to the exports proposed by Pieridae US will be contrary to the public interest.

4. Commodity Price Impacts

As discussed above, the 2012 LNG Export Study projected the economic impacts of LNG exports in a range of scenarios, including scenarios that equaled and exceeded the current amount of LNG exports authorized in the final non-FTA export authorizations to date, including this Order (equivalent to a total of 10.82 Bcf/d of natural gas). The 2012 LNG Export Study concluded that LNG exports at these levels (*e.g.*, 6 Bcf/d of natural gas and higher) would result in higher U.S. natural gas prices, but that these price changes would remain in a relatively narrow range across the scenarios studied. NERA's analysis in its 2012 Study indicates that, after five years of increasing LNG exports, wellhead natural gas price increases could range from $0.22 to $1.11 (2010$/Mcf) depending on the market-determined level of exports. However, even with these estimated price increases, NERA found that the United States would experience net economic benefits from increased LNG exports in all cases studied.

IECA argues that EIA relied on outdated data for its analyses—specifically, data from the years characterized by the worst U.S. manufacturing slowdown in the recent past. IECA argues

that predictions from any model calibrated with this data would severely understate the impact of LNG exports on the supply and price of domestic natural gas. We do not agree with IECA's arguments concerning this purportedly old data, or its insistence that more recent data would illustrate that the proposed exports are contrary to the public interest.[359] As discussed herein, the more recent AEO 2015 projections indicate domestic supply and demand conditions that are more favorable, not less favorable, to exports. Specifically, the most recent outlook in the AEO 2015 Reference Case for 2035 reflects LNG exports equivalent to 9.0 Bcf/d of natural gas, net natural gas pipeline exports of 5.2 Bcf/d, and market price $0.39/MMBtu below the AEO 2011 Reference Case price, in constant 2012 dollars. It should be noted that, for 2035, the AEO 2011 Reference Case forecast 0.5 Bcf/d of net imports of natural gas plus LNG.[360] Accordingly, we reject IECA's arguments and find that, as to the impact of these LNG exports on domestic gas prices, IECA has not overcome the statutory presumption that the requested authorization is consistent with the public interest.

5. Significance of the 2012 LNG Export Study

For the reasons discussed above, DOE/FE commissioned the 2012 LNG Export Study and invited the submission of responsive comments. DOE/FE has analyzed this material and determined that the 2012 LNG Export Study provides substantial support for granting Pieridae US's Application. The conclusion of the 2012 LNG Export Study is that the United States will experience net economic benefits from issuance of authorizations to export domestically produced LNG.

[359] In addition to IECA, certain commenters in this proceeding raised a variety of concerns about the impact of Pieridae US's proposed exports on domestic prices of natural gas. *See supra* at § VII.C.3. These concerns are addressed above and in DOE/FE's analysis of comments received on the 2012 LNG Export Study. *See supra* § VIII.F ("Prices and Volatility").
[360] *See supra* § VIII.A.

We have evaluated the initial and reply comments submitted in response to the 2012 LNG Export Study. Various commenters in that proceeding, as well NEES, IECA, and certain commenters in this proceeding, have criticized the data used as inputs to the 2012 LNG Export Study and/or numerous aspects of the models, assumptions, and design of the Study. However, EIA's most recent projections, set forth in AEO 2015, continue to show market conditions that will accommodate increased exports of natural gas. When compared to the AEO 2013 Reference Case, the AEO 2015 Reference Case projects increases in domestic natural gas production—well in excess of what is required to meet projected increases in domestic consumption. Accordingly, we find that the 2012 LNG Export Study is fundamentally sound and supports the proposition that the proposed authorization will not be inconsistent with the public interest.

6. Benefits of International Trade

We have not limited our review to the contents of the 2012 LNG Export Study and the current data from AEO 2015 but have considered a wide range of other information. 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."[361]

We have also considered the international consequences of our decision, including those addressed by Pieridae US in its Application. 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

[361] National Export Initiative, 75 Fed. Reg. 12,433 (Mar. 16, 2010).

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 2012 LNG Export Study.

D. Environmental Issues

In reviewing the potential environmental impacts of Pieridae US's proposal to export LNG, DOE/FE has considered its obligations under NEPA and its separate obligation under NGA section 3(a) to ensure that the proposal is not inconsistent with the public interest. We have also reviewed the motions, protests, and comments submitted in response to the Notice of Application.

1. Issuance of Categorical Exclusion

DOE's regulations at 10 C.F.R. Part 1021, Subpart D, Appendix B, list categorical exclusions that apply to DOE actions. Item B5.7 provides a categorical exclusion where approvals or disapprovals of authorizations to import or export natural gas under NGA section 3 involve minor operational changes, but not new construction. We find that the present authorization falls within the scope of the B5.7 categorical exclusion for two reasons. First, Pieridae US will construct the natural gas liquefaction facility at issue in this case—the proposed Goldboro LNG Project—in Canada. This construction outside of the United States is beyond the scope of our environmental review under NEPA. Second, as explained above, this Order only

authorizes exports on existing facilities. On this basis, DOE/FE issued the Categorical Exclusion on January 28, 2016.[362]

The issuance of the Categorical Exclusion supports a determination that no further environmental review of Pieridae US's Application is required under NEPA. In light of the issuance of the Categorical Exclusion, we find that no environmental conditions need to be imposed on this authorization.

2. Scope of NEPA Review

MassPLAN and many commenters in this proceeding have urged DOE/FE to consider the indirect effects of induced natural gas production in the United States associated with Pieridae US's Application—including but not limited to impacts on climate change from GHG emissions associated with the production, transport, and combustion of the natural gas—as well as impacts associated with the construction and/or expansion of various pipeline infrastructure in the New England region (whether already in existence, pending before FERC, or anticipated) that would transport the natural gas Canada.

We find that a detailed environmental analysis of increased natural gas production and/or pipeline construction or expansion would be too speculative for consideration in this proceeding because these possible impacts cannot be described with sufficient specificity to make their consideration useful for reasoned decision-making. Such increased production and possible pipeline build-out is not "reasonably foreseeable" for purposes of NEPA analysis. We therefore find that NEPA does not require our environmental review to include induced upstream natural gas production, nor does it require us to consider impacts associated with pending or anticipated projects not related to this authorization. As explained herein, this authorization is expressly

[362] *See* U.S. Dep't of Energy, Categorical Exclusion Determination, *Pieridae Energy (USA) Ltd.*, FE Docket No. 14-179-LNG (Jan. 28, 2016).

conditioned on Pieridae US using the capacity of the M&N US Pipeline in service as of the date of this Order.[363]

Further, 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.[364] 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 once the facility is operational. To illustrate the point, of the more than 40 applications to build

[363] *See infra* §§ XIII (Terms & Conditions Para. J) & XIV (Ordering Para. A).
[364] *See* LNG Export Study – Related Documents, available at http://energy.gov/fe/services/natural-gas-regulation/lng-export-study (EIA 2012 Study) at 10-11.

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.[365]

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.[366]

3. Cumulative Environmental Impacts

Many commenters in this proceeding assert that our environmental review must consider the cumulative environmental impacts from all proposed and previously approved export authorizations—and/or all proposed pipeline projects—and suggest that some form of EIS is legally required for these purposes. We disagree. In issuing the Categorical Exclusion under NEPA in this proceeding, we have determined that no new construction will be required in the United States to support the proposed exports. As noted above, this authorization does not apply to any future construction or operational changes to expand the capacity of the M&N Pipeline or other facilities located within the United States caused either in whole or in part by Pieridae US's export operations. We further find that other aspects of our review, including the Addendum and

[365] *See Freeport LNG Expansion L.P., et al., 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, at 100 n.161 (Nov. 15, 2013) (FLEX II Conditional Order).
[366] *Sabine Pass*, DOE/FE Order No. 2961-A, at 11 (quoting 40 C.F.R. § 1508.7).

the LCA GHG Report, take into account all reasonably foreseeable cumulative environmental impacts relating to the exports of LNG proposed in this proceeding. Therefore, we are satisfied that all cumulative environmental impacts relevant to this proceeding have been considered.

4. 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.[367] Nevertheless, a decision by DOE/FE to authorize exports to non-FTA nations could accelerate that development by some increment. For this reason, DOE/FE prepared and received public comment on the Addendum and made the Addendum and the comments part of the record in this proceeding. 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 (or re-exports) of U.S.-sourced natural gas in the form of LNG 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 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

[367] Addendum at 2.

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.[368] In 2013, EPA updated those regulations to include storage tanks,[369] 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.[370] More recently, in January 2015, EPA announced a strategy for "address[ing] methane and smog-forming VOC emissions from the oil and gas industry in order to ensure continued, safe, and responsible growth in U.S. oil and natural gas production."[371] Specifically, as part of the Administration's efforts to address climate change, EPA has initiated a rulemaking to set standards for methane and VOC emissions from new and modified oil and gas production sources, and natural gas processing and transmission sources.[372] EPA issued a proposed rule in September 2015, with a final rule expected to follow in 2016.[373]

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 discussed herein, but would have little

[368] U.S. Envtl. 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).
[369] U.S. Envtl. Prot. Agency, Oil and Natural Gas Sector: Reconsideration of Certain Provisions of New Source Performance Standards; Final Amendments, 78 Fed. Reg. 58,416 (Sept. 23, 2013).
[370] U.S. Envtl. 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* § X.C.
[371] U.S. Envtl. Prot. Agency, Fact Sheet: EPA's Strategy for Reducing Methane and Ozone-Forming Pollution From the Oil and Natural Gas Industry (Jan. 14, 2015), *available at* http://www.epa.gov/airquality/oilandgas/pdfs/20150114fs.pdf.
[372] The White House, Office of the Press Secretary, Fact Sheet: Administration Takes Steps Forward on Climate Action Plan by Announcing Actions to Cut Methane Emissions (Jan. 14, 2015), *available at* https://www.whitehouse.gov/the-press-office/2015/01/14/fact-sheet-administration-takes-steps-forward-climate-action-plan-anno-1 (stating that, in developing the proposed and final standards, EPA "will focus on in-use technologies, current industry practices, [and] emerging innovations … to ensure that emissions reductions can be achieved as oil and gas production and operations continue to grow.").
[373] U.S. Envtl. Prot. Agency, Oil and Natural Gas Sector: Emission Standards for New and Modified Sources; Proposed Rule, 80 Fed. Reg. 56,593 (Sept. 18, 2015). EPA subsequently extended the public comment period on this proposed rule and two related proposed rules until December 4, 2015. *See* 80 Fed. Reg. 70,719 (Nov. 13, 2015).

more than a modest, incremental impact on the environmental issues raised by commenters to the 2012 LNG Export Study. For these reasons, we conclude that the environmental concerns associated with natural gas production do not establish that re-exports of U.S.-sourced natural gas in the form of LNG to non-FTA nations are inconsistent with the public interest.

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

MassPLAN and numerous commenters in this proceeding (including Mr. Rutilious B. Perkins, III), as well as other commenters on the LCA GHG Report and the Addendum, have expressed concern that exports of domestic natural gas to non-FTA nations may impact the balance of global GHG emissions through their impact domestically on the price and availability of natural gas for electric generation and other uses. They also have objected that exports of natural gas could have a negative effect on the GHG intensity and total amount of energy consumed in foreign nations.

a. 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)."[374] 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."[375] 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."[376] 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%) over the period from 2015 to 2035.[377] 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 above.

We further note that EIA's 2012 Study assumed the continuation of regulations in effect at the time the AEO 2011 was prepared.[378] Therefore, EIA's analysis did not include the impacts

[374] 2012 EIA Study at 18.
[375] *Id*.
[376] *Id*.
[377] *Id*.
[378] 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.").

that EPA's Mercury and Air Toxics Standard[379] and its Transport Rule[380] may have on the extent to which the U.S. coal fleet would compensate for reduced use of natural gas. Nor did EIA's 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 expected to reduce the extent to which the increased use of coal would compensate for reduced use of natural gas. These rules, finalized in the fall of 2015, impose limits on GHG emissions from both new and existing coal-fired power plants.[381] In particular, these rules 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.

b. 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 Figures 3 and 4 below, which are also presented above in Section X.A (Figures 1 and 2):

[379] U.S. Envtl. 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).
[380] U.S. Envtl. 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).
[381] U.S. Envtl. Protection Agency, Standards of Performance for Greenhouse Gas Emissions from New, Modified, and Reconstructed Stationary Sources: Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64,510 (Oct. 23, 2015); U.S. Envtl. Protection Agency, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units; Final Rule, 80 Fed. Reg. 64,662 (Oct. 23, 2015) (effective Dec. 22, 2015).

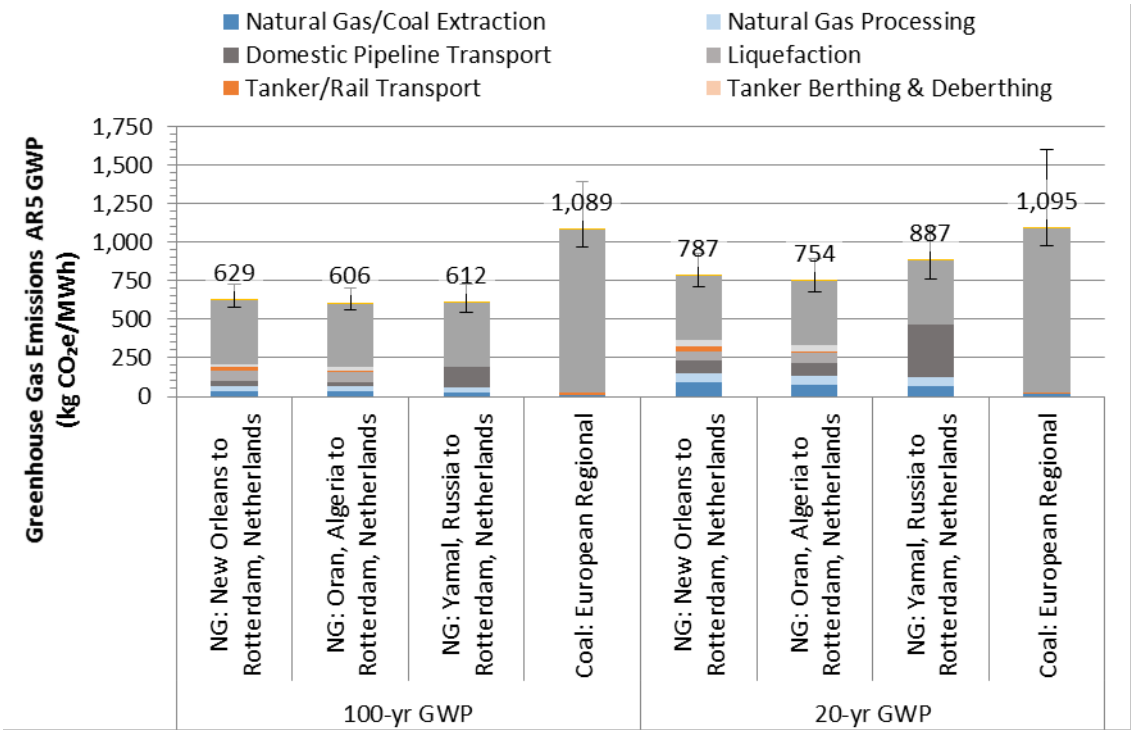

Figure 3: Life Cycle GHG Emissions for Natural Gas and Coal Power in Europe[382]

[382] LCA GHG Report at 9 (Figure 6-1).

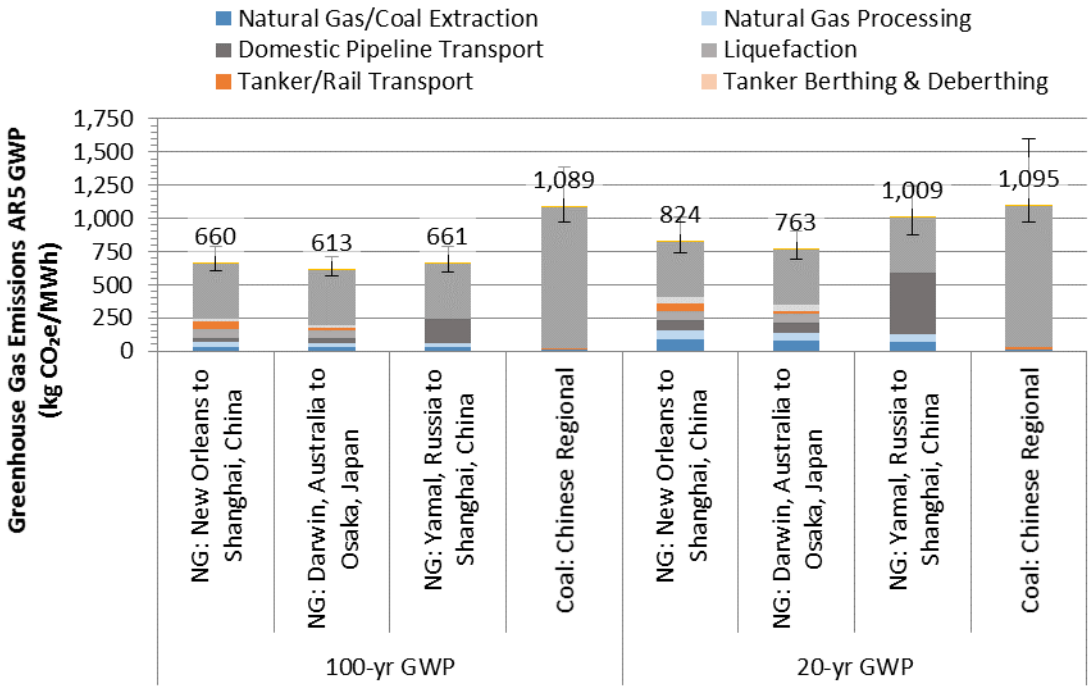

Figure 4: Life Cycle GHG Emissions for Natural Gas and Coal Power in Asia[383]

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.[384]

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 Western Europe, indigenous natural gas, synthetic natural gas derived from coal, and other resources, as well as

[383] LCA GHG Report at 10 (Figure 6-2).
[384] *Id*. at 9, 18.

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 not only would 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.[385]

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 or other non-FTA LNG export proceedings. 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.[386] For India, installed electric generation capacity in 2014 is 59% coal and 9% natural gas.[387] 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.[388] In Europe, use of fossil fuels is slightly less than in the Asian nations

[385] 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.

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

[387] U.S. Energy Information Administration, India Analysis Brief (last updated June 26, 2014), *available at* http://www.eia.gov/beta/international/analysis.cfm?iso=IND

[388] U.S. Energy Information Administration, Japan Analysis Brief (last updated Jan. 30, 2015), *available at* http://www.eia.gov/countries/cab.cfm?fips=JA. In this updated Brief, EIA observed that, "[o]nce Japan removed its nuclear generation capacity from operation starting in 2011, other fuels such as LNG, oil, and coal displaced it. This shift has markedly altered the generation portfolio," with reports that "LNG, oil, and coal shares rose to 43%, 14%,

noted above but still significant, comprising 68% and 49% of electric generation in the United Kingdom and Spain for 2012, respectively.[389]

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. Because 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 we explain herein, coal remains a prevalent choice for electric power generation in LNG-importing countries and competes with natural gas as a source of baseload power.

It is important, however, to recognize DOE/FE's limited aims in making these comparisons. We emphasize that the comparisons to coal and foreign-sourced gas in the LCA GHG Report do not themselves answer how U.S. LNG exports may affect the global GHG balance because U.S. LNG may compete with other resources as well. Nonetheless, given the prevalence of coal and natural gas as sources of electric generation in LNG-importing countries, the comparison provides valuable information.

Additionally, as noted above, DOE/FE has not attempted to calculate a more precise prediction regarding global GHG impacts because the compounded uncertainties in estimating

---

and 30%, respectively, in 2013." *Id.*

[389] 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.

how the availability of U.S. LNG exports would affect the market for every potential energy source in every importing country—together with the interventions of foreign governments in those markets—would render such an analysis too speculative to inform our public interest determination. For example, even in the unlikely scenario that *all* U.S. LNG were exported to Japan, those exports would affect the global price of LNG, which in turn would affect energy systems in numerous countries besides Japan. 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. Even with respect to new capacity, it may not be valid to assume that natural gas 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.

In sum, the conclusions of the LCA GHG Report, combined with the observation that many LNG-importing nations rely heavily on fossil fuels for electric generation, suggest 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.

E. Other Considerations

Our decision is not premised on an uncritical acceptance of the general conclusion of the 2012 LNG Export Study of net economic benefits from LNG exports. Both the 2012 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 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 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 Pieridae US's proposed re-exports of U.S.-sourced natural gas in the form of LNG 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 Guidelines[390] that, under most circumstances, the market is the most efficient means of allocating natural gas supplies. However, contrary to arguments made by IECA in its Protest (*supra* § VII.D.4), we recognize that 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.[391] Given these possibilities, DOE/FE recognizes the need to monitor market developments closely as the impact of successive authorizations of LNG exports unfolds.

[390] 49 Fed. Reg. at 6684.

[391] Some commenters on the 2012 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).

F. Conclusion

We have reviewed the evidence in the record and relevant precedent in earlier non-FTA export decisions and have not found an adequate basis to conclude that Pieridae US's proposed export of U.S-sourced natural gas to Canada using the existing facilities of the M&N US Pipeline for liquefaction and re-export in the form of LNG from Canada for end use in non-FTA countries will be inconsistent with the public interest. For that reason, we are granting the non-FTA portion of Pieridae US's Application 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 decision-making 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 10.82 Bcf/d of natural gas, or 3.949 trillion cubic feet per year, for the 14 final authorizations issued to date— Sabine Pass Liquefaction, LLC (2.2 Bcf/d),[392] Carib Energy (USA) LLC (0.04 Bcf/d),[393] Cameron LNG, LLC (1.7 Bcf/d),[394] FLEX I (1.4 Bcf/d),[395] FLEX II (0.4 Bcf/d),[396] Dominion Cove Point LNG,

[392] *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).
[393] *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).
[394] *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).
[395] *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) (FLEX I Final Order).
[396] *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) (FLEX II Final Order).

LP (0.77 Bcf/d),[397] Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC (2.1 Bcf/d),[398] Sabine Pass Liquefaction, LLC Expansion Project (1.38 Bcf/d),[399] American Marketing LLC (0.008 Bcf/d),[400] Emera CNG, LLC (0.008 Bcf/d),[401] Floridian Natural Gas Storage Company, LLC,[402] Air Flow North American Corp. (0.002 Bcf/d), this Order, and the authorization being issued concurrently to Bear Head LNG (DOE/FE No. 3770) (0.81 Bcf/d).[403] We note that the volumes authorized for export in the *Carib* and *Floridian* orders are both 14.6 Bcf/yr of natural gas (0.04 Bcf/d), yet are not additive to one another because the source of LNG approved under both orders is from the Floridian Facility.[404] Likewise, the volumes authorized for export in this Order and the Bear Head LNG order are not additive; together, they are limited to a maximum of 0.81 Bcf/d (the volume approved for Bear Head LNG) to reflect the current capacity of the M&N US Pipeline. In sum, the total export volume is within the range of

[397] *Dominion Cove Point LNG, LP*, DOE/FE Order No. 3331-A, FE Docket No. 11-128-LNG, Final Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas from the Cove Point LNG Terminal in Calvert County, Maryland, to Non-Free Trade Agreement Nations (May 7, 2015).
[398] *Cheniere Marketing, LLC and Corpus Christi Liquefaction, LLC*, DOE/FE Order No. 3638, FE Docket No. 12-97-LNG, Final Order and Opinion Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Proposed Corpus Christi Liquefaction Project to Be Located in Corpus Christi, Texas, to Non-Free Trade Agreement Nations (May 12, 2015).
[399] *Sabine Pass Liquefaction, LLC*, DOE/FE Order No. 3669, FE Docket Nos. 13-30-LNG, 13-42-LNG, & 13-121-LNG, Final Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Sabine Pass LNG Terminal Located in Cameron Parish, Louisiana, to Free Trade Agreement Nations (June 26, 2015).
[400] *American LNG Marketing LLC*, DOE/FE Order No. 3690, FE Docket No. 14-209-LNG, Final Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas in ISO Containers Loaded at the Proposed Hialeah Facility near Medley, Florida, and Exported by Vessel to Non-Free Trade Agreement Nations (Aug. 7, 2015).
[401] *Emera CNG, LLC*, DOE/FE Order No. 3727, FE Docket No. 13-157-CNG, Final Opinion and Order Granting Long-Term Multi-Contract Authorization to Export Compressed Natural Gas by Vessel From a Proposed CNG Compression and Loading Facility at the Port of Palm Beach, Florida, to Non-Free Trade Agreement Nations (Oct. 19, 2015).
[402] *Floridian Natural Gas Storage Co., LLC*, DOE/FE Order No. 3744, FE Docket No. 15-38-LNG, Final Opinion and Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas in ISO Containers Loaded at the Proposed Floridian Facility in Martin County, Florida, and Exported by Vessel to Non-Free Trade Agreement Nations (Nov. 25, 2015).
[403] *See Bear Head LNG*, DOE/FE Order No. 3770, *supra* at 5 n.15.
[404] *See Floridian Natural Gas Storage Co., LLC*, DOE/FE Order No. 3744, at 22 (stating that the quantity of LNG authorized for export by Floridian "will be reduced by the portion of the total approved export volume of 14.6 Bcf/yr that is under firm contract directly or indirectly to Carib Energy (USA), LLC"); *see also id*. at 21 (Floridian "may not treat the volumes authorized for export in the [*Carib* and *Floridian*] proceedings as additive to one another").

scenarios analyzed in the 2012 EIA and NERA studies. 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.

DOE/FE will continue taking a measured approach in reviewing the other pending applications to export natural gas. 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 2012 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 phenomenon 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.

XII. 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 and Condition are explained below. Pieridae US must abide by each Term and Condition or face rescission of its authorization or other appropriate sanction.

A. Term of the Authorization

Pieridae US requests a 20-year term for the authorization commencing from the date export operations begin. This term is consistent with our practice in the final and conditional non-FTA export authorizations issued to date.[405] 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. Accordingly, the 20-year term will begin on the date when Pieridae US commences commercial re-export of U.S-sourced natural gas in the form of LNG from the proposed Goldboro LNG Project, but not before.

B. Commencement of Operations Within Seven Years

Pieridae US requested this authorization to commence on the earlier of the date of first re-export or seven years from the date of the issuance of this Order. Consistent with the final and conditional non-FTA authorizations issued to date, DOE/FE will grant this request, adding as a condition of the authorization that Pieridae US must commence commercial re-export operations 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

[405] *See, e.g.*, *Freeport LNG Expansion, L.P., et al.*, DOE/FE Order No. 3357-B, at 100.

their efforts to obtain those authorizations by authorization holders that are not engaged in actual export or re-export operations.

C. Commissioning Volumes

Pieridae US will be permitted to apply for short-term authorizations to re-export Commissioning Volumes prior to the commencement of the first commercial re-exports of U.S.-sourced natural gas in the form of LNG from the Goldboro LNG Project. "Commissioning Volumes" are defined as the volume of LNG produced and exported (or re-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 re-exports pursuant to Pieridae US's long-term contracts.[406] The Commissioning Volumes will not be counted against the maximum level of volume authorized in Pieridae US's FTA order (DOE/FE Order No. 3639) or in this Order.

D. Make-Up Period

Pieridae US 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 for export or re-export in Pieridae US's FTA order (DOE/FE Order No. 3639) or in this Order. Insofar as Pieridae US may seek to export or re-export additional volumes not previously authorized, it will be required to obtain appropriate authorization from DOE/FE.

[406] For additional discussion of Commissioning Volumes and the Make-Up Period referenced below, see *Freeport LNG Expansion, L.P., et al.*, DOE/FE Order Nos. 3282-B & 3357-A, Order Amending DOE/FE Order Nos. 3282 and 3357, FE Docket Nos. 10-161-LNG & 11-161-LNG, at 4-9 (June 6, 2014).

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.[407] 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. Accordingly, Pieridae shall be required to comply with DOE/FE's procedures governing a change in control.[408]

F. Agency Rights

Pieridae US requests authorization to re-export U.S-sourced natural gas in the form of LNG on its own behalf and as agent for other entities that hold title to the LNG at the time of re-export, pursuant to long-term sales and purchase agreements with Pieridae US. DOE/FE previously addressed the issue of Agency Rights in Order No. 2913,[409] 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

[407] 10 C.F.R. § 590.405.
[408] 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. 65,541 (Nov. 5, 2014) [hereinafter Procedures for Changes in Control].
[409] *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) [hereinafter *Freeport LNG*].

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.[410] 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*.[411] 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 title-holder (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.[412]

To ensure that the public interest is served, the authorization granted herein shall be conditioned to require that where Pieridae US proposes to re-export U.S-sourced natural gas in the form of LNG as agent for other entities that hold title to the LNG (Registrants), it must register with DOE/FE those entities on whose behalf it will re-export the LNG in accordance with the procedures and requirements described herein.

G. Contract Provisions for the Sale or Transfer of U.S-Sourced Natural Gas in the Form of LNG to be Re-Exported

DOE/FE's regulations require applicants to supply transaction-specific factual information "to the extent practicable."[413] 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

[410] *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.
[411] *Gulf Coast LNG Export, LLC*, DOE/FE Order No. 3163, FE Docket No. 12-05-LNG, Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Proposed Brownsville Terminal to Free Trade Agreement Nations (Oct. 16, 2012).
[412] *See id*. at 7-8.
[413] 10 C.F.R. § 590.202(b).

public disclosure, and DOE/FE determines it will be afforded confidential treatment in accordance with 10 C.F.R. § 1004.11.[414]

DOE/FE will require that Pieridae US file or cause to be filed with DOE/FE any relevant long-term commercial agreements, including sale and purchase agreements, pursuant to which Pieridae US re-exports U.S-sourced natural gas in the form of LNG as agent for a Registrant.

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 proposed Goldboro LNG Project, a long-term sales contract involving U.S-sourced natural gas stored or liquefied at the Goldboro LNG Project, or an agreement to provide long-term re-export services from the Goldboro LNG Project.

In addition, DOE/FE finds that section 590.202(c) of DOE/FE's regulations[415] requires that Pieridae US file, or cause to be filed, all long-term contracts associated with the long-term supply of U.S.-sourced natural gas to the proposed Goldboro LNG Project, whether signed by Pieridae US or the Registrant, within 30 days of their execution.

DOE/FE recognizes that some information in Pieridae US's or a Registrant's long-term commercial agreements associated with the re-export of U.S-sourced natural gas in the form of LNG, and/or long-term contracts associated with the long-term supply of U.S.-sourced natural gas to the proposed Goldboro LNG Project, may be commercially sensitive. DOE/FE therefore will provide Pieridae US the option to file or cause to be filed either unredacted contracts, or in

[414] *Id*. § 590.202(e).
[415] *Id*. § 590.202(c).

the alternative (A) Pieridae US 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 U.S-sourced natural gas in the form of LNG re-exported pursuant to this Order shall include an acknowledgement of these requirements.

H. Export Quantity

Pieridae US seeks authorization to re-export U.S.-sourced natural gas in the form of LNG in a total volume equivalent to 292 Bcf/yr of natural gas, which is within the anticipated maximum liquefaction capacity of the Goldboro LNG Facility.[416] This Order authorizes the export of this U.S.-sourced natural gas in the form of LNG in the full amount requested, up to the equivalent of 292 Bcf/yr of natural gas.

I. Combined FTA and Non-FTA Export Authorization Volumes

Pieridae US is currently authorized in DOE/FE Order No. 3639 to export U.S.-sourced natural gas by pipeline from the United States to Canada for end use in Canada and/or, after liquefaction in Canada, by vessel from the proposed Goldboro LNG Project to FTA countries for end use in FTA countries. The volume authorized in the FTA order is the same volume

[416] As noted above (*supra* § IV.B), Pieridae US estimates that Goldboro will be capable of producing LNG in a volume equivalent to approximately 487 Bcf/yr of natural gas.

authorized herein, equivalent to approximately 292 Bcf/yr of natural gas. Because the U.S.-sourced natural gas proposed for export and/or proposed for re-export in the form of LNG under both authorizations will originate from the same facility (the Goldboro LNG Project), Pieridae US may not treat the volumes authorized for export or re-export in the two proceedings as additive to one another.

J. Export Authorization Volumes on the M&N Pipeline

This export authorization is limited to volumes of natural gas that Pieridae US exports to Canada using the capacity of the M&N US Pipeline's cross-border facilities in service as of the date of this Order. Should Pieridae US wish to use new or upgraded pipeline capacity to transport volumes for export to non-FTA countries, it will be required to apply to DOE/FE for new export authorization.[417]

K. Environmental Review

As explained above, the Application qualifies for a categorical exclusion, which DOE/FE issued on January 28, 2016. No additional environmental review or environmental conditions are necessary.

XIII. FINDINGS

On the basis of the findings and conclusions set forth above, we find that it has not been shown that a grant of the requested authorization will be inconsistent with the public interest, and we further find that Pieridae US's Application should be granted subject to the Terms and Conditions set forth herein. The following Ordering Paragraphs reflect current DOE/FE practice.

[417] As set forth above, pipeline capacity will be considered "new" or "upgraded" for purposes of this limitation if it is the result of physical changes that increase the northbound capacity of an existing or new pipeline with cross-border facilities and any such changes require a new certificate of public convenience and necessity or an amendment to a pipeline certificate previously issued by FERC under NGA section 7, 15 U.S.C. §717f. *See supra* at 5, 197-99.

XIV. ORDER

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

A. Pieridae Energy (USA) Ltd. is authorized to export U.S.-sourced natural gas using the capacity of the M&N US Pipeline in service as of the date of this Order to Canada for liquefaction and re-export in the form of LNG in a volume up to the equivalent of 292 Bcf/yr of natural gas. Should Pieridae US seek to use pipeline facilities to implement this authorization other than the existing capacity of the M&N US Pipeline in service as of the date of this Order, it shall apply for new export authorization. Pieridae US is authorized to re-export the LNG subject to this authorization by vessel from the proposed Goldboro LNG Project, to be located in the Municipality of the District of Guysborough, Nova Scotia, Canada. This authorization is for a term of 20 years to commence from the date of first commercial re-export, but not before. Pieridae US is authorized to re-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. Pieridae US may export (or re-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 previously authorized in Pieridae US's FTA order (DOE/FE Order No. 3639) or in this Order.

C. Pieridae US 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 for export or re-export in Pieridae US's FTA order (DOE/FE Order No. 3639) or in this Order. Insofar as Pieridae US may seek to export or re-export additional volumes not previously authorized, it will be required

to obtain appropriate authorization from DOE/FE.

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

E. The quantity of U.S.-sourced natural gas in the form of LNG authorized for re-export in this Order (equivalent to 292 Bcf/yr of natural gas) is not additive to the export volume in Pieridae US's FTA authorization in this docket, set forth in DOE/FE Order No. 3639, or the export volume in Bear Head LNG's non-FTA authorization in FE Docket No. 15-33-LNG, set forth in DOE/FE Order No. 3770.

F. This U.S.-sourced natural gas in the form of LNG may be re-exported to any country with which the United States does not have a FTA requiring the national treatment for trade in natural gas (non-FTA countries) and/or to FTA countries for end use in non-FTA countries, which currently have or in the future develop the capacity to import LNG, and with which trade is not prohibited by U.S. law or policy.

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

H. (i) Pieridae US shall file, or cause others to file, with the Office of Regulation and International Engagement a non-redacted copy of all executed long-term contracts associated with the long-term re-export of U.S.-sourced natural gas in the form of LNG as agent for other entities from the Goldboro LNG Project. The non-redacted copies may be filed under seal and must be filed within 30 days of their execution. Additionally, if Pieridae US 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, Pieridae US 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, Pieridae US shall state why the redacted or non-disclosed information should be exempted from public disclosure.

(ii) Pieridae US shall file, or cause others to file, with the Office of Regulation and International Engagement a non-redacted copy of all executed long-term contracts associated with the long-term supply of natural gas to the Goldboro LNG Project. The non-redacted copies may be filed under seal and must be filed within 30 days of their execution. Additionally, if Pieridae US 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, Pieridae US shall also 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, Pieridae US shall state why the redacted or non-disclosed information should be exempted from public disclosure.

I. Pieridae US, or others for whom Pieridae US acts as agent, shall include the following provision in any agreement or other contract for the sale or transfer of U.S.-sourced natural gas in the form of LNG re-exported pursuant to this Order:

> Customer or purchaser acknowledges and agrees that it will resell or transfer U.S.-sourced natural gas in the form of LNG purchased hereunder for delivery only to countries identified in Ordering Paragraph F of DOE/FE Order No. 3768, issued February 5, 2016, in FE Docket No. 14-179-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 Pieridae Energy (USA) Ltd. that identifies the country (or countries) into which the re-exported LNG or natural gas was actually delivered and/or received for end use, and to include in any resale contract for such LNG the necessary conditions to insure that Pieridae Energy (USA) Ltd. is made aware of all such countries.

J. Pieridae US is permitted to use its authorization in order to re-export U.S.-sourced natural gas in the form of 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 Pieridae US with all information necessary to permit Pieridae US 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 H of this Order.

K. Each registration submitted pursuant to this Order shall have current information on file with DOE/FE. Any changes in company name, contact information, length 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).

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

M. Within two weeks after Pieridae US's first re-export of U.S.-sourced natural gas in the form of LNG occurs from the Goldboro LNG Project, Pieridae US shall provide written

notification of the date that the first re-export of LNG authorized in Ordering Paragraph A above occurred.

N. Pieridae US shall file with the Office of Regulation and International Engagement, on a semi-annual basis, written reports describing the status of the proposed Goldboro LNG Project. The reports shall be filed on or by April 1 and October 1 of each year, and shall include information on the status of the Goldboro LNG Project, the date the Goldboro LNG Project is expected to commence first re-exports of LNG, and the status of the long-term contracts associated with the long-term re-export of LNG and any long-term supply contracts.

O. With respect to any change in control of the authorization holder, Pieridae US must comply with DOE/FE's Procedures for Change in Control Affecting Applications and Authorizations to Import or Export Natural Gas.[418] 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 Pieridae US, 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.[419]

P. Monthly Reports: With respect to the LNG re-exports authorized by this Order, Pieridae US shall file with the Office of Regulation and International Engagement, within 30 days following the last day of each calendar month, a report indicating whether re-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 re-exports

[418] *See* Procedures for Changes in Control at 65,541-42.
[419] *See id*. at 65,542.

have not occurred, a report of "no activity" for that month must be filed. If re-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 Canadian export terminal; (3) the name of the LNG tanker; (4) the date of departure from the Canadian export terminal; (5) the country (or countries) into which the LNG and/or natural gas is actually delivered and/or received for end use; (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)

Q. All monthly report filings shall be made to U.S. Department of Energy (FE-34), Office of Fossil Energy, Office of Regulation and International Engagement, P.O. Box 44375, Washington, D.C. 20026-4375, Attention: Natural Gas Reports. Alternatively, reports may be e-mailed to ngreports@hq.doe.gov or may be faxed to Natural Gas Reports at (202) 586-6050.

R. The requests for extension of the time to comment and intervene in this proceeding have been denied by operation of law. 10 C.F.R. § 590.302(c).

S. The motions to intervene and/or protest in this proceeding submitted by Saint John Gas Marketing Company, NEES, MassPLAN, and IECA, respectively, are granted. All other motions to intervene and/or protest are not in compliance with DOE/FE's regulations (10 C.F.R. §§ 103, 107) and thus are denied.

T. The motion for leave to reply filed by Saint John Gas Marketing Company has been denied by operation of law. 10 C.F.R. § 590.302(c). NEES's motion for leave to reply (and related supplements) are granted.

U. Pieridae US's Motion to Lodge is denied.

V. IECA's request to suspend consideration of the Application and NEES's request to suspend non-FTA approvals has been denied by operation of law. 10 C.F.R. § 590.302(c).

W. NEES's motion for additional procedures is denied.

Issued in Washington, D.C., on February 5, 2016.

Christopher A. Smith
Assistant Secretary
Office of Fossil Energy

APPENDIX
PROCEDURALLY NON-COMPLIANT MOTIONS

	Number on Docket:	Date Filed:	Filed by:	Stated Type of Filing:
[1]	4	02/09/15	Rich Cowan for Dracut Pipeline Awareness Group	Motion to Intervene
[2]	5	02/09/15	Jeff Zimmerman for Damascus Citizens for Sustainability, Inc.	Motion to Intervene and/or Comment
[3]	6	02/09/15	Wes Gillingham for Catskill Mountainkeeper	Motion to Intervene and Protest
[4]	7	02/09/15	Pramilla Malick	Motion to Intervene and/or Comment
[5]	8	02/09/15	Nisha Swinton for Food & Water Watch	Motion to Intervene
[6]	9	02/09/15	Barbara Clifford	Motion to Intervene
[7]	10	02/09/15	Deborah (Debby) Lewis	Motion to Intervene
[8]	11	02/09/15	Mark Pezzati	Motion to Intervene
[9]	12	02/09/15	Julie Hawkowl	Motion to Intervene
[10]	13	02/09/15	Karen Weber for Foundation for a Green Future, Inc.	Motion to Intervene and Protest
[11]	14	02/09/15	Madeline Cronin	Motion to Intervene
[12]	15	02/09/15	Ben Martin for 350CT	Motion to Intervene and Protest
[13]	16	02/09/15	Julia Wernke	Motion to Intervene
[14]	17	02/09/15	Eugene Marner for Compressor-Free Franklin	Motion to Intervene and Protest
[15]	18	02/09/15	Sarah Partan	Motion to Intervene
[16]	19	02/09/15	Andra Rose	Motion to Intervene
[17]	21	02/09/15	Rebecca Roter	Motion to Intervene
[18]	22	02/09/15	Karen Ribeiro	Motion to Intervene
[19]	23	02/09/15	Kat McGhee	Motion to Intervene
[20]	24	02/09/15	Vera Scroggins	Motion to Intervene
[21]	25	02/09/15	Jane Winn for the Berkshire Environmental Action Team, Inc.	Motion to Intervene and Protest
[22]	26	02/09/15	Joan Tubridy for Citizens Energy and Economics Council of Delaware Country, NY	Motion to Intervene and Protest
[23]	31	02/09/15	Ann/Toby Woll	Motion to Intervene
[24]	32	02/09/15	Andrea Doremus Cuetara	Motion to Intervene
[25]	73	02/09/15	Judith K. Canepa	Motion to Intervene
[26]	165	02/09/15	Marilyn Lerner and Anne Diciccio on behalf of New Hampshire Pipeline Awareness Network	Motion to Intervene and Protest
[27]	166	02/09/15	Rebecca Roter on behalf of Breathe Easy Susquehanna County	Motion to Intervene