Preferred Alternative

DOE does not have a preferred alternative for the disposal of depleted uranium, but does identify factors that DOE plans to consider in developing a preferred alternative or alternatives for inclusion in the Final SEIS. These factors are discussed in the **SUMMARY** and chapter four of the Draft SEIS. The preferred alternative could be a combination of two or more alternatives. DOE invites public comments on these factors and any additional factors that should be considered in the selection of a preferred alternative and why.

Next Steps

Following the end of the public comment period, DOE will consider public comments on the Draft SEIS in preparing the Final SEIS. After issuing the Final SEIS, DOE will consider the environmental impacts presented in the Final SEIS, along with other appropriate information in proposing its decision(s) related to the disposal of depleted uranium for an Amended Record of Decision.

Web-based Public Hearing Information

Registration details are included below and are also available on the DOE EM SEIS project website (See **ADDRESSES** section). If you are joining the web-based public hearing via internet, copy and paste the link below to login to the WebEx Meeting Room, then follow prompts after entering the access code. If you are joining the web-based public hearing via phone, dial the US Toll number below and follow prompts to enter access code. For Global Call in numbers, visit the DU Oxide SEIS website. Documents and the presentation for the public hearing will be made available at *http://www.energy.gov/em/disposition-uranium-oxide-conversion-depleted-uranium-hexafluoride,* as well as shared during live web-based public hearings. Comments will be accepted during the web-based public hearing, by mail, by email, and through submittal of comment forms on the DU Oxide SEIS website. Persons who wish to speak may sign up to speak before each meeting by submitting a request to *DUF6_NEPA@em.doe.gov.*

- Join web-based public hearing via WebEx Meeting Room:
  - *https://doe.webex.com/join/duf6_nepa_*(Copy and Paste into web browser).
- Join web-based public hearing by phone:
  - US Toll: 1–415–527–5035 (For Global Call-In Numbers visit DU Oxide SEIS website).
  - Access code: 988 230 782 #.

Public Reading Rooms and Libraries

Copies of the Draft SEIS are available at *http://www.energy.gov/em/disposition-uranium-oxide-conversion-depleted-uranium-hexafluoride.* Copies may also be found for public review at the locations listed below:

District of Columbia

U.S. Department of Energy
Freedom of Information Act Electronic Reading Room:
https://www.energy.gov/management/office-management/operational-management/freedom-information-act/reading-room

Nevada

Nevada Site Office, U.S. Department of Energy
Public Reading Room
755 East Flamingo Road, Room 103
Las Vegas, NV 89119, (702) 794–5106.

Amargosa Valley Library
829 E Farm Road
HCR 69 Box 401–T
Amargosa, NV 89020, (775) 372–5340.

Clark County Library
1401 E Flamingo Road
Las Vegas, NV 89119, (702) 507–3400.

Indian Springs Library
715 Gretta Lane
P.O. Box 629
Indian Springs, NV 89018, (702) 879–3845.

Las Vegas Library
833 N Las Vegas Boulevard
Las Vegas, NV 89101, (702) 507–3500.

Pahrump Community Library,
701 S. East Street
Pahrump, NV 89048, (775) 727–5930.

Tonopah Public Library,
167 S Central Street
Tonopah, NV 89049, (775) 482–3374.

Utah

Tooele City Public Library
128 W Vine Street
Tooele, UT 84074, (435) 882–2182.

Texas

Andrews County Library
109 NW 1st Street
Andrews, TX 79714, (432)-523–9819.

Kentucky

U.S. DOE Environmental Information Center
Emerging Technology Center (Room 221)
5100 Alben Barkley Drive
Paducah, KY 42001, (270) 554–3004.

McCracken County Public Library
555 Washington Street
Paducah, KY 42003, (270) 442–2510.

Ohio

U.S. DOE Environmental Information Center
Ohio State Endeavor Center
1862 Shyville Road (Room 207)
Piketon, OH 45661, (740) 289–8898.

Portsmouth Public Library
1220 Gallia Street
Portsmouth, OH 45662, (740) 354–5688.

Scioto County Law Library
602 Seventh Street (Room 306)
Portsmouth, OH 45662, (740) 355–8259.

Individual commentators' names and addresses (including email addresses) received as part of oral statements at the public hearings or comment documents on this Draft SEIS normally are part of the public record. DOE plans to reproduce comment documents in their entirety in the Final SEIS, as appropriate, and to post all comment documents received in their entirety on the DU oxide SEIS website *at the close of the public comment period.* Any person wishing to have his/her name, address, or other identifying information withheld from the public record of comment documents must state this request prominently at the beginning of any comment document. DOE will honor the request to the extent allowable by law. All submissions from organizations or businesses will be included in the public record and open to public inspection in their entirety.

Issued at Washington, DC on December 20, 2018.

Elizabeth A. Connell,

Acting Associate Principal Deputy Assistant Secretary for Regulatory and Policy Affairs.

[FR Doc. 2018–28249 Filed 12–27–18; 8:45 am]

BILLING CODE 6450–01–P

DEPARTMENT OF ENERGY

Study on Macroeconomic Outcomes of LNG Exports: Response to Comments Received on Study

AGENCY: Office of Fossil Energy, Department of Energy.

ACTION: Notice of response to comments.

	FE Docket No.
Jordan Cove Energy Project, L.P	12–32–LNG
Gulf LNG Liquefaction Company, LLC	12–101–LNG

	FE Docket No.
CE FLNG, LLC	12–123–LNG
MPEH LLC	13–26–LNG
Venture Global Calcasieu Pass, LLC	13–69–LNG
Eos LNG LLC	13–116–LNG
Barca LNG LLC	13–118–LNG
Commonwealth LNG, LLC	13–153–LNG
Venture Global Calcasieu Pass, LLC	14–88–LNG
SCT&E LNG, LLC	14–98–LNG
Venture Global Calcasieu Pass, LLC	15–25–LNG
G2 LNG LLC	15–45–LNG
Texas LNG Brownsville LLC	15–62–LNG
Strom Inc	15–78–LNG
Port Arthur LNG, LLC	15–96–LNG
Rio Grande LNG, LLC	15–190–LNG
Eagle LNG Partners Jacksonville, LLC	16–15–LNG
SeaOne Gulfport, LLC	16–22–CGL
Venture Global Plaquemines LNG, LLC	16–28–LNG
Driftwood LNG, LLC	16–144–LNG
Fourchon LNG, LLC	17–105–LNG
Galveston Bay LNG, LLC	17–167–LNG
Freeport LNG Expansion L.P., and FLNG	18–26–LNG
Corpus Christi Liquefaction Stage III, LLC	18–78–LNG
Energía Costa Azul, S. de R.L. de C.V	18–144–LNG
Energía Costa Azul, S. de R.L. de C.V	18–145–LNG

SUMMARY: On June 12, 2018, the Office of Fossil Energy (FE) of the Department of Energy (DOE) gave notice of the availability of a study, *Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports* (2018 LNG Export Study or 2018 Study), in the above-referenced proceedings and invited the submission of public comments on the Study. DOE commissioned the 2018 LNG Export Study to inform its decision on pending and future applications seeking authorization to export domestically produced liquefied natural gas (LNG) from the lower-48 states to countries with which the United States does not have a free trade agreement (FTA) requiring national treatment for trade in natural gas, and with which trade is not prohibited by U.S. law or policy (non-FTA countries). The 2018 LNG Export Study evaluates a wider range of scenarios than DOE's prior LNG export studies, including examining the probability of various export scenarios. In this document, DOE/FE responds to the 19 public comments received on the 2018 Study and summarizes its conclusions on the Study. The 2018 LNG Export Study and the public comments are posted on the DOE/FE website at: *https://fossil.energy.gov/app/docketindex/docket/index/10.*

DATES: *Applicable on:* December 28, 2018.

FOR FURTHER INFORMATION CONTACT: Amy Sweeney, U.S. Department of Energy (FE–34), Office of Regulation, Analysis, and Engagement, Office of Fossil Energy, Forrestal Building, Room 3E–042, 1000 Independence Avenue SW, Washington, DC 20585; (202) 586–2627; *amy.sweeney@hq.doe.gov;* or Cassandra Bernstein, U.S. Department of Energy (GC–76), Office of the Assistant General Counsel for Electricity and Fossil Energy, Forrestal Building, Room 6D–033, 1000 Independence Ave. SW, Washington, DC 20585; (202) 586–9793; *cassandra.bernstein@hq.doe.gov.*

SUPPLEMENTARY INFORMATION:

Acronyms and Abbreviations. A number of acronyms and abbreviations are used in this document and set forth below for reference.

AEO Annual Energy Outlook
APA Administrative Procedure Act
API American Petroleum Institute
Bcf/d Billion Cubic Feet per Day
Bcf/yr Billion Cubic Feet per Year
CLNG Center for Liquefied Natural Gas
CNG Compressed Natural Gas
DOE Department of Energy
DQA Data Quality Act
EA Environmental Assessment
EIA U.S. Energy Information Administration
EIS Environmental Impact Statement
FE Office of Fossil Energy, U.S. Department of Energy
FERC Federal Energy Regulatory Commission
FTA Free Trade Agreement
GDP Gross Domestic Product
GNGM Global Natural Gas Model
HOGR High Oil and Gas Resource and Technology
IEA International Energy Agency
IEO International Energy Outlook
JCEP Jordan Cove Energy Project L.P.
LNG Liquefied Natural Gas
LOGR Low Oil and Gas Resource and Technology
MMBtu Million British Thermal Units
mtpa Million Metric Tons per Annum
NEPA National Environmental Policy Act of 1969
NERA NERA Economic Consulting
NGA Natural Gas Act of 1938
NGL Natural Gas Liquid
NOA Notice of Availability
ppm Parts Per Million
ROW Rest of World
Tcf Trillion Cubic Feet
WEO World Energy Outlook

I. Background

A. DOE Export Authorizations Under Section 3 of the Natural Gas Act

DOE is responsible for authorizing exports of domestically produced natural gas to foreign countries pursuant to section 3 of the Natural Gas Act (NGA), 15 U.S.C. 717b.[1] In relevant part, section 3(c) of the NGA applies to applications for exports of natural gas, including LNG, to countries with which the United States has entered into a free trade agreement (FTA) requiring national treatment for trade in natural gas, and with which trade is not prohibited by U.S. law or policy (FTA countries).[2] Section 3(c) was amended by section 201 of the Energy Policy Act of 1992 (Pub. L. 102–486) to require that FTA applications ''shall be deemed to be consistent with the public interest'' and granted ''without modification or delay.'' [3] Therefore, DOE/FE approves applications for FTA authorizations without modification or delay.[4] None of the comments or discussion herein apply to FTA authorizations issued under NGA section 3(c).

For applications to export natural gas to non-FTA countries, section 3(a) of the NGA sets forth the following standard of review:

> [N]o person shall export any natural gas from the United States to a foreign country or import any natural gas from a foreign country without first having secured an order of the [Secretary of Energy [5]] 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.[6]

DOE has consistently interpreted this provision as creating a rebuttable presumption that a proposed export of natural gas to non-FTA countries is in the public interest.[7] Accordingly, DOE conducts an informal adjudication on non-FTA applications and will grant each application unless DOE finds that the proposed exportation will not be consistent with the public interest.[8] Before reaching a final decision, DOE must also comply with the National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. 4321 *et seq.*

B. Public Interest Review for Non-FTA Export Authorizations

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, DOE/FE has identified a range of factors that it evaluates when reviewing an application to export LNG to non-FTA countries. These factors include economic impacts, international impacts, security of natural gas supply, and environmental impacts, among others. To conduct this review, DOE/FE looks to record evidence developed in the application proceeding.[9]

DOE/FE's prior decisions have also looked to certain principles established in its 1984 Policy Guidelines.[10] The goals of the Policy Guidelines are to minimize federal control and involvement in energy markets and to promote a balanced and mixed energy resource system. The Guidelines provide:

> The market, not government, should determine the price and other contract terms of imported [or exported] natural gas . . . . The federal government's primary responsibility in authorizing imports [or exports] will be to evaluate the need for the gas and whether the import [or export] arrangement will provide the gas on a competitively priced basis for the duration of the contract while minimizing regulatory impediments to a freely operating market.[11]

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.[12]

In Order No. 1473, DOE/FE stated that it was guided by DOE Delegation Order No. 0204–111. That delegation order, which authorized the Administrator of the Economic Regulatory Administration to exercise the agency's review authority under NGA section 3, directed the Administrator to regulate exports ''based on a consideration of the domestic need for the gas to be exported and such other matters as the Administrator finds in the circumstances of a particular case to be appropriate.'' [13]

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. Under this public interest standard, DOE has issued 30 final authorizations to export domestically produced LNG or compressed natural gas (CNG) to non-FTA countries to date, bringing the

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[1] 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.

[2] 15 U.S.C. 717b(c). 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.

[3] 15 U.S.C. 717b(c).

[4] Unless otherwise stated, all references to exports of LNG herein refer to domestically produced natural gas liquefied in the United States. Additionally, DOE/FE uses the terms ''authorization'' and ''order'' interchangeably.

[5] 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.

[6] 15 U.S.C. 717b(a) (emphasis added).

[7] *See Sierra Club* v. *U.S. Dep't of Energy,* 867 F.3d 189, 203 (DC Cir. 2017) (''We have construed [NGA section 3(a)] as containing a 'general presumption favoring [export] authorization.' '') (quoting *W. Va. Pub. Serv. Comm'n* v. *U.S. Dep't of Energy,* 681 F.2d 847, 856 (DC Cir. 1982)).

[8] *See id.* (''there must be 'an affirmative showing of inconsistency with the public interest' to deny the application'' under NGA section 3(a)) (quoting *Panhandle Producers & Royalty Owners Ass'n* v. *Econ. Regulatory Admin.,* 822 F.2d 1105, 1111 (DC Cir. 1987)). We note that, as of August 24, 2018, qualifying small-scale exports of natural gas to non-FTA countries are treated differently—specifically, they are deemed to be consistent with the public interest under NGA section 3(a) (10 CFR 590.102(p); 590.208(a)). *See* U.S. Dep't of Energy, Small-Scale Natural Gas Exports; Final Rule, 83 FR 35106 (July 25, 2018).

[9] *See, e.g., Eagle LNG Partners Jacksonville II LLC,* DOE/FE Order No. 4078, FE Docket No. 17–79–LNG, Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas in ISO Containers Loaded at the Eagle Maxville Facility in Jacksonville, Florida, and Exported by Vessel to Free Trade Agreement and Non-Free Trade Agreement Nations (Sept. 15, 2017).

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

[11] *Id.* at 6685.

[12] *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)).

[13] DOE Delegation Order No. 0204–111 at 1; *see also* 1984 Policy Guidelines, 49 FR 6690. In February 1989, the Assistant Secretary for Fossil Energy assumed the delegated responsibilities of the Administrator of the Economic Regulatory Administration.

cumulative total of approved non-FTA exports to 23.05 billion cubic feet per day (Bcf/d) of natural gas, or 8.41 trillion cubic feet (Tcf) per year.[14] Each of these non-FTA orders authorize an export term of 20 years, as set forth in the orders.

C. Judicial Decisions Upholding DOE's Non-FTA Authorizations

Beginning in 2015, Sierra Club petitioned the U.S. Court of Appeals for the District of Columbia Circuit (D.C. Circuit) for review of five long-term LNG export authorizations issued by DOE/FE under the standard of review described above. Sierra Club challenged DOE/FE's approval of LNG exports to non-FTA countries from projects proposed or operated by the following authorization holders: Freeport LNG Expansion, L.P., *et al.;* Dominion Energy Cove Point LNG, LP (formerly Dominion Cove Point LNG, LP); Sabine Pass Liquefaction, LLC; and Cheniere Marketing, LLC, *et al.* The D.C. Circuit subsequently denied four of the five petitions for review: one in a published decision issued on August 15, 2017 (*Sierra Club I*),[15] and three in a consolidated, unpublished opinion issued on November 1, 2017 (*Sierra Club II*).[16] Sierra Club subsequently withdrew its fifth and remaining petition for review.[17]

In *Sierra Club I,* the D.C. Circuit concluded that DOE/FE had complied with both NGA section 3(a) and NEPA in issuing the challenged non-FTA authorization. Freeport LNG Expansion, L.P. and its related entities (collectively, Freeport) had applied to DOE/FE for authorization to export LNG to non-FTA countries from the Freeport Terminal located on Quintana Island, Texas. DOE/FE granted the application in 2014 in a volume equivalent to 0.4 Bcf/d of natural gas, finding that Freeport's proposed exports were in the public interest under NGA section 3(a). DOE/FE also considered and disclosed the potential environmental impacts of its decision under NEPA. Sierra Club petitioned for review of the Freeport authorization, arguing that DOE fell short of its obligations under both the NGA and NEPA. The D.C. Circuit rejected Sierra Club's arguments in a unanimous decision, holding that, ''Sierra Club has given us no reason to question the Department's judgment that the [Freeport] application is not inconsistent with the public interest.'' [18]

In the consolidated opinion in *Sierra Club II* issued on November 1, 2017, the D.C. Circuit ruled that ''[t]he court's decision in [*Sierra Club I*] largely governs the resolution of the [three] instant cases.'' [19] Upon its review of the remaining ''narrow issues'' in those cases, the Court again rejected Sierra Club's arguments under the NGA and NEPA, and upheld DOE/FE's actions in issuing the non-FTA authorizations in those proceedings.[20]

II. DOE's Prior LNG Export Studies

The 2018 LNG Export Study [21] builds upon four prior studies commissioned by DOE to examine the economic impacts of U.S. LNG exports. With one early exception, DOE/FE has issued the 30 existing non-FTA authorizations based on its consideration of one or more of these economic studies under NGA section 3(a). These studies are summarized below.

A. 2012 EIA and NERA Studies (Collectively, the 2012 LNG Export Study)

In 2011, DOE/FE engaged the U.S. Energy Information Administration (EIA) and NERA Economic Consulting (NERA) to conduct a two-part study of the economic impacts of U.S. LNG exports, which together was called the ''2012 LNG Export Study.'' The first part, performed by EIA and originally published in January 2012, assessed how specified scenarios of increased natural gas exports could affect domestic energy markets. Specifically, EIA examined how prescribed levels of natural gas exports (at 6 Bcf/d and 12 Bcf/d) above baseline cases could affect domestic energy markets.

The second part, performed by NERA under contract to DOE, evaluated the macroeconomic impact of LNG exports on the U.S. economy. NERA used a general equilibrium macroeconomic model of the U.S. economy with an emphasis on the energy sector and natural gas in particular. The 2012 NERA Study projected that, across all scenarios studied—assuming either 6 Bcf/d or 12 Bcf/d of LNG export volumes—the United States would experience net economic benefits from allowing LNG exports.

In December 2012, DOE/FE published a notice of availability of the 2012 LNG Export Study in the **Federal Register** for public comment.[22] DOE/FE subsequently responded to the public comments in connection with the LNG export proceedings identified in that notice.[23]

B. 2014 and 2015 LNG Export Studies

By May 2014, in light of the volume of LNG exports to non-FTA countries then-authorized by DOE/FE and the number of non-FTA export applications still pending, DOE/FE determined that an updated study was warranted to consider the economic impacts of exporting LNG from the lower-48 states to non-FTA countries.[24] On May 29, 2014, DOE announced plans to undertake new economic studies to gain a better understanding of how potentially higher levels of U.S. LNG exports—at levels between 12 and 20 Bcf/d of natural gas—would affect the public interest.[25]

DOE/FE commissioned two new macroeconomic studies. The first, *Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets,* was performed by EIA and published in October 2014 (2014 EIA LNG Export Study or 2014 Study).[26] The 2014 Study

[14] *See Mexico Pacific Limited LLC,* DOE/FE Order No. 4312, FE Docket No. 18–70–LNG, Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export U.S.-Sourced Natural Gas by Pipeline to Mexico for Liquefaction and Re-Export in the Form of Liquefied Natural Gas to Non-Free Trade Agreement Countries, at 37 (Dec. 14, 2018).

[15] *Sierra Club* vs. *U.S. Dep't of Energy,* 867 F.3d 189 (Aug. 15, 2017) (denying petition of review of the LNG export authorization issued to Freeport LNG Expansion, L.P., *et al.*).

[16] *Sierra Club* v. *U.S. Dep't of Energy,* Nos. 16–1186, 16–1252, 16–1253, 703 Fed. Appx. 1 (D.C. Cir. Nov. 1, 2017) (denying petitions of review of the LNG export authorization issued to Dominion Cove Point LNG, LP; Sabine Pass Liquefaction, LLC; and Cheniere Marketing, LLC, *et al.,* respectively).

[17] *See Sierra Club* v. *U.S. Dep't of Energy,* No. 16–1426, Per Curiam Order (D.C. Cir. Jan. 30, 2018) (granting Sierra Club's unopposed motion for voluntarily dismissal).

[18] *Sierra Club I,* 867 F.3d at 203.

[19] *Sierra Club,* 703 Fed. Appx. 1 at *2.

[20] *Id.*

[21] NERA Economic Consulting, *Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports* (June 7, 2018), *available at: https://www.energy.gov/sites/prod/files/2018/06/f52/Macroeconomic%20LNG%20Export%20Study%202018.pdf* [hereinafter 2018 LNG Export Study].

[22] *See* 2012 LNG Export Study, 77 FR 73627 (Dec. 11, 2012), *available at: http://energy.gov/sites/prod/files/2013/04/f0/fr_notice_two_part_study.pdf* (Notice of Availability of the LNG Export Study).

[23] *See, e.g., Freeport LNG Expansion L.P., et al.,* DOE/FE Order No. 3282, FE Docket No. 10–161–LNG, Order Conditionally Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas to Non-Free Trade Agreement Nations, at 56–109 (May 17, 2013).

[24] Because there is no natural gas pipeline interconnection between Alaska and the lower 48 states, DOE/FE generally views those LNG export markets as distinct. DOE/FE therefore focuses on LNG exports from the lower-48 states for purposes of determining macroeconomic impacts.

[25] *See* U.S. Dep't of Energy, Office of Fossil Energy, Request for an Update of EIA's January 2012 Study of Liquefied Natural Gas Export Scenarios, *available at: http://energy.gov/fe/downloads/request-update-eia-s-january-2012-study-liquefied-natural-gas-export-scenarios* (May 29, 2014) (memorandum from FE to EIA).

[26] U.S. Energy Information Administration, *Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets* (Oct. 2014), *available at: https://www.eia.gov/analysis/requests/fe/pdf/lng.pdf.*

assessed how specified scenarios of increased natural gas exports could affect domestic energy markets. At DOE's request, this 2014 Study served as an update of EIA's January 2012 study of LNG export scenarios and used baseline cases from EIA's *Annual Energy Outlook* 2014 (AEO 2014).[27]

The second study, *The Macroeconomic Impact of Increasing U.S. LNG Exports,* was performed jointly by the Center for Energy Studies at Rice University's Baker Institute and Oxford Economics under contract to DOE/FE (together, Rice-Oxford) and published in October 2015 (2015 LNG Export Study or 2015 Study).[28] The 2015 Study is a scenario-based assessment of the macroeconomic impact of levels of U.S. LNG exports, sourced from the lower-48 states, under different assumptions including U.S. resource endowment, U.S. natural gas demand, international LNG market dynamics, and other factors. The 2015 Study considers export volumes ranging from 12 to 20 Bcf/d of natural gas, as well as a high resource recovery case examining export volumes up to 28 Bcf/d of natural gas. The analysis covers the 2015 to 2040 time period.

In December 2015, DOE/FE published a Notice of Availability of the 2014 and 2015 LNG Export Studies in the **Federal Register**, and invited public comment on those Studies.[29] DOE/FE subsequently responded to the public comments in connection with the LNG export proceedings identified in that notice.[30]

III. Overview of 2018 LNG Export Study

At the time DOE commissioned the 2018 LNG Export Study earlier this year, DOE/FE had 25 pending applications requesting authorization to export domestically produced LNG to non-FTA countries.[31] In light of both the cumulative volume of exports to non-FTA countries authorized at that time (equivalent to 21.35 Bcf/d of natural gas) and the additional volume of LNG requested for export in those pending applications, DOE/FE determined that a new macroeconomic study was warranted.[32] Accordingly, DOE/FE, through its support contractor KeyLogic Systems, Inc., commissioned NERA to conduct the 2018 LNG Export Study.

Like the four prior economic studies, the 2018 LNG Export Study examines the impacts of varying levels of LNG exports on domestic energy markets. As explained below, the 2018 LNG Export Study assesses different levels of ''unconstrained'' LNG exports (defined as market-determined levels of exports), and analyzes the outcomes of different LNG export levels on the U.S. natural gas markets and the U.S. economy as a whole, over the 2020 to 2050 time period. As part of this analysis, DOE/FE directed NERA to examine the likelihood of conditions leading to various export scenarios, making it the first DOE macroeconomic study to squarely address this issue.

To summarize, the 2018 LNG Export Study differs from DOE/FE's prior economic studies in the following ways:

(i) Includes a larger number of scenarios (54 scenarios) to capture a wider range of uncertainty in four natural gas market conditions than examined in the previous studies;

(ii) Includes LNG exports in all 54 scenarios that are market-determined levels, including the three alternative baseline scenarios that are based on the projections in EIA's *Annual Energy Outlook* 2017 (AEO 2017);[33]

(iii) Examines unconstrained LNG export volumes beyond the levels examined in the previous studies;

(iv) Examines the likelihood of those market-determined LNG export volumes; and

(v) Provides macroeconomic projections associated with several of the scenarios lying within the more likely range.

IV. 2018 LNG Export Study, Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports

A. Overview of NERA's Findings

NERA's key findings in the 2018 Study include the following:

- The more likely range of LNG exports in the year 2040 was judged to range from 8.7 to 30.7 Bcf/d of natural gas. This assessment was based on a probabilistic analysis of 54 different scenarios constructed for the Study.[34]
- U.S. natural gas prices range from $5 to approximately $6.50 per million British thermal unit (MMBtu) in 2040 (in constant 2016 dollars) under Reference case supply assumptions. These central cases have a combined probability of 47%.[35]
- Levels of gross domestic product (GDP) are most sensitive to assumptions about U.S. supply of natural gas, with high supply driving higher levels of GDP. For each of the supply scenarios, higher levels of LNG exports in response to international demand consistently lead to higher levels of GDP. GDP achieved with the highest level of LNG exports in each group exceeds GDP with the lowest level of LNG exports by $13 to $72 billion in 2040 (in constant 2016 dollars).[36]
- About 80% of the increase in LNG exports is satisfied by increased U.S. production of natural gas, with positive effects on labor income, output, and profits in the natural gas production sector.[37]
- Chemical industry subsectors of the economy that rely heavily on natural gas for energy and as a feedstock continue to exhibit robust growth even at higher LNG export levels. This growth is only insignificantly slower than cases with lower LNG export levels.
- Even the most extreme scenarios of high LNG exports outside the more likely probability range (exhibiting a combined probability of less than 3%) show higher overall economic performance in terms of GDP, household income, and consumer welfare than lower export levels associated with the same domestic supply scenarios.

B. Methodology and Scenarios

The 2018 Study develops 54 scenarios by identifying various assumptions for domestic and international supply and demand conditions to capture a wide range of uncertainty in the natural gas markets. The scenarios include three

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

[28] Center for Energy Studies at Rice University Baker Institute and Oxford Economics, *The Macroeconomic Impact of Increasing U.S. LNG Exports* (Oct. 29, 2015), *available at: http://energy.gov/sites/prod/files/2015/12/f27/20151113_macro_impact_of_lng_exports_0.pdf.*

[29] U.S. Dep't of Energy, Macroeconomic Impacts of LNG Exports Studies; Notice of Availability and Request for Comments, 80 FR 81300, 81302 (Dec. 29, 2015).

[30] *See, e.g., Sabine Pass Liquefaction, LLC,* DOE/FE Order No. 3792, FE Docket No. 15–63–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 Non-Free Trade Agreement Nations, at 66–121 (Mar. 11, 2016).

[31] *See* U.S. Dep't of Energy, Study on Macroeconomic Outcomes of LNG Exports; Notice of Availability of the 2018 LNG Export Study and Request for Comments, 83 FR 27314 (June 12, 2018) (identifying 25 docket proceedings).

[32] Additionally, to date, DOE/FE has authorized a cumulative total of LNG exports to FTA countries under section 3(c) of the NGA in a volume of 59.33 Bcf/d from LNG projects. These FTA volumes are not additive to the authorized non-FTA volumes.

[33] U.S. Energy Info. Admin., *Annual Energy Outlook* 2017 (with projections to 2050) (Jan. 5, 2017), *available at: https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf.*

[34] *See* 2018 LNG Export Study at 14.

[35] *Id.* at 17.

[36] *Id.* at 18.

[37] *Id.* at 21.

baseline cases based on EIA's AEO 2017 projections (the most recent EIA projections available at the time), with varying assumptions about U.S. natural gas supply.[38] Alternative scenarios add other assumptions about both future U.S. and international demand for natural gas. International assumptions are based on EIA's *International Energy Outlook* 2017 (IEO 2017) and the International Energy Agency's (IEA) *World Energy Outlook* 2016 (WEO 2016).

As noted above, the 2018 Study also examines the likelihood of conditions leading to various export scenarios. Specifically, the 2018 Study includes peer-reviewed probabilities of uncertainties surrounding developments in the international and domestic natural gas markets that were, in turn, combined to develop the 54 export scenarios and their associated macroeconomic impacts.

1. Scenarios

a. U.S. Natural Gas Supply

The amount of natural gas that can be supplied at a given price depends on a number of factors, including how extraction technology develops, the magnitude of the extractable resource, political positions for or against limits on unconventional natural gas resource development (*i.e.,* hydraulic fracturing), as well as the cost to develop natural gas resources.[39] The 2018 Study specifies three different cases for U.S. natural gas supply derived from EIA's AEO 2017:

i. AEO 2017's Reference case provides a central estimate of U.S. natural gas production;

ii. High Oil and Gas Resource and Technology (HOGR) case provides more optimistic resource development estimates than the Reference case; and

iii. Low Oil and Gas Resource and Technology (LOGR) case provides less optimistic resource development estimates than the Reference case.

The differences in the natural gas production levels across these three cases arise from varying assumptions around unproven offshore resources, onshore shale gas resources, tight gas resources, and conventional and tight oil associated gas resources, as well as the costs of producing these resources.[40]

b. U.S. Natural Gas Demand

The 2018 Study notes that U.S. natural gas demand is primarily influenced by economic growth, population growth, per capita income, and environmental policies that influence fuel choices among sources of energy and total demand for energy.[41] The 2018 Study specifies three different cases for U.S. natural gas demand:

i. AEO 2017's Reference case, which provides a central estimate of U.S. natural gas demand;

ii. A Robust Economic Growth case, which provides a high estimate for U.S. natural gas demand driven by higher levels of gross domestic product growth; and

iii. A Renewables Mandate case, which provides a low estimate for U.S. natural gas demand driven by the imposition of a stringent renewables mandate.

c. Rest of World Natural Gas Supply

The 2018 Study considers two cases for international natural gas supply:

i. IEO 2017's Reference case; and

ii. A Low Supply case, which was created by reducing the IEO 2017 Reference case natural gas production consistent with supply reductions in the LOGR case for U.S. supply.[42]

d. Rest of World Natural Gas Demand

NERA notes that there are relatively few global natural gas forecasts that provide a range of scenarios that would allow NERA to isolate drivers of global natural gas demand outside the United States.[43] NERA identifies two such forecasts as EIA's IEO 2017 and IEA's WEO 2016. The 2018 Study considers three cases for international natural gas demand:

i. IEO 2017's Reference case;

ii. WEO 2016's Current Policies scenario, which provided a high estimate for international natural gas demand; and

iii. WEO 2016's 450 parts per million (ppm) case, which provides a low estimate for international natural gas demand based on policies with the objective of limiting the average global temperature increase in 2100 to 2 degrees Celsius above pre-industrial levels.

2. Probability Assignments

A key feature of the 2018 Study is to provide not only quantification of the effects to the U.S. natural gas market and its overall economy under each of the scenarios outlined, but also an assessment of the probability of each of these scenarios, and thus the probability of the natural gas and macroeconomic outcomes associated with each.

NERA first developed estimates of the probabilities for the level of U.S. supply and demand, as well as supply and demand in the rest of the world.[44] DOE/FE and its support contractor KeyLogic, Inc. contacted a set of independent experts recommended by DOE (hereinafter the peer reviewers) to obtain their probability assignments for these same four metrics. After receiving feedback from the peer reviewers, NERA reevaluated the original probability assignments to arrive at the final probabilities.

a. U.S. Supply Case Probabilities and Ranges

The peer reviewers did not converge on common recommendations for U.S. supply case probabilities and ranges. One peer reviewer suggested focusing the probabilities more towards the Reference case by reducing the prominence of both the high and low cases.[45] Another peer reviewer recommended reducing the probability for the Reference case and increasing the probabilities for both the high and low cases. Several other peer reviewers agreed with the original assignment of probabilities. According to NERA, there did not appear to be a consensus on how to change the proposed probabilities. The recommendations from the peer reviewers seemed either to offset each other or to agree with the original probabilities. For this reason, NERA decided to retain the original probability assignments. NERA made no change to its original range of U.S. supply values or the probabilities assigned to them.

b. U.S. Demand Scenario Probabilities and Ranges

In evaluating NERA's U.S. demand scenario probabilities and ranges, the peer reviewers did not have a consistent theme in their recommendations. One peer reviewer recommended greater emphasis on the Reference case, while another recommended deemphasizing the Reference case to increase the importance of the high and low cases.[46] Two other peer reviewers recommended that NERA retain the probability assignments with no changes. Because the recommendations lacked a common theme but nevertheless seemed to offset each other, NERA retained the original probability assignments and made no changes to the original range of U.S. Demand.

[38] *See id.* at 12; *see also supra* at note 33.

[39] 2018 LNG Export Study at 25.

[40] *Id.* at 25–26, 28; *see also* AEO 2017 at 12, 16.

[41] 2018 LNG Export Study at 26.

[42] *Id.* at 29–30.

[43] *Id.* at 30.

[44] *Id.* at 37.

[45] *Id.* at 43.

[46] *Id.*

c. Rest of World Supply Scenario Probabilities and Ranges

In evaluating the Rest of World supply scenarios, NERA noted several common themes from the peer reviewers. Several of the peer reviewers felt the proposed probabilities were reasonable. Another peer reviewer recommended assigning greater probability to the Reference case. No peer reviewer recommended that the low case receive more emphasis. As a result, the probability of the Reference case was increased by 5% while reducing the probability of the low case by the same amount. NERA made no changes to the original range of Rest of World Supply.

d. Rest of World Demand Scenario Probabilities and Ranges

In evaluating the Rest of World demand scenarios, NERA noted common agreement on several themes. None of the peer reviewers recommended increasing the probability of the low world demand case. Several of the peer reviewers agreed that the Reference case should receive greater importance, with the high case receiving less importance. The peer reviewers disagreed on the degree to which the relative importance should be modified. In addition, the peer reviewers felt that the high end of the range for Rest of World demand should be increased to a level double the original differential between the reference and high cases. Based on the peer review recommendations, the high end of the range was increased as recommended by one peer reviewer. Overall, the high case probability was decreased to 50%, the Reference case probability was increased to 45%, and the low case stayed at a probability of 5%.

Table 1 below presents the final probability assignments after peer review and the central estimate of the ranges adopted for the analysis.[47]

TABLE 1—FINAL PROBABILITY ASSIGNMENTS AND CENTRAL SUPPLY/DEMAND ESTIMATES (TRILLIONS OF CUBIC FEET) FOR EACH CASE IN 2040

		U.S. supply	U.S. demand	ROW supply	ROW demand
	Case	AEO 2017, HOGR	Robust Economic Growth	.....	WEO
High	Estimate	49	39	.....	172
	Probability	30%	17%	.....	50%
	Case	AEO 2017, Reference	AEO 2017, Reference	IEO 2017, Reference	IEO 2017, Reference
Reference	Estimate	39	33	139	145
	Probability	55%	66%	80%	45%
	Case	AEO 2017, LOGR	Renewables Mandate	Low Supply	WEO 2016, 450 ppm
Low	Estimate	28	27	90	113
	Probability	15%	17%	20%	5%

C. NERA's Global Natural Gas Model (GNGM)

The 2018 Study used the GNGM, which NERA describes as a worldwide model of the natural gas market based on LNG trade, interregional pipelines, and regional supply and demand.[48] This model allows NERA to examine the likely direct and indirect impacts on regional natural gas markets of various industry developments and policy choices. Using the GNGM, NERA can take into account developments in individual regions and gauge region-specific market outcomes.

The GNGM's structure has full flexibility in terms of the time periods and regions it covers. For the 2018 Study, the model divides the world into 18 regions and solves for equilibrium natural gas flows, supply, and demand for the years 2020 to 2040 in five-year time steps.[49] The model can be adapted to analyze any individual region in the world, as well as to consider a more granular time scale. The regional structure allows the model to factor in key components driving the natural gas market, including pipeline and marine linkages among regions, competition among supplier regions, and competition between LNG and natural gas pipelines.

D. NERA's N_{ew}ERA Macroeconomic Model

NERA developed the N_{ew}ERA model to forecast the impact of policy, regulatory, and economic factors on the energy sector and the economy as a whole. To evaluate policies that have significant impacts on the entire U.S. economy, NERA uses the N_{ew}ERA model to capture the effects as they ripple through all sectors of the economy and the associated feedback effects. The version of the N_{ew}ERA model used for the 2018 Study includes a macroeconomic model that represents all sectors of the economy.

The macroeconomic model incorporates all production sectors, including liquefaction plants required for LNG exports; energy extraction; manufacturing and service sectors; and final demand for goods and services by households, the government, and for investment.[50] The consequences of changes in LNG exports are transmitted throughout the U.S. economy as sectors respond until the economy reaches equilibrium. Producers and households are able to change their demand for goods and services in response to changes in prices.

The N_{ew}ERA model addresses the key factors affecting future U.S. natural gas demand, supply, and price. One of the major uncertainties is the availability of shale gas in the United States. To account for this uncertainty and the effect it could have on domestic markets, the N_{ew}ERA model includes resource supply curves for U.S. natural gas. The model also accounts for pipeline trade in natural gas with Mexico and Canada, and the potential build-up of liquefaction plants for exporting LNG. The N_{ew}ERA model also has a supply (demand) curve for U.S. imports (exports) that represents how

[47] 2018 LNG Export Study at 43–44 (Table 3).

[48] *Id.* at 33.

[49] *Id.*

[50] *Id.* at 34.

the global LNG market price would react to changes in U.S. imports or exports.[51]

U.S. wellhead natural gas prices in the N_{ew}ERA model are matched to the resulting prices from the GNGM. The baselines for the N_{ew}ERA model are based on EIA's AEO 2017 Reference, High Oil and Gas Supply, and Low Oil and Gas Supply cases.

E. Results of the 2018 Study

The 54 scenarios in the 2018 Study provide a wide range of results. NERA chose to focus on a subset of more likely outcomes, given DOE's assumptions about the probabilities associated with U.S. natural gas production, demand and supply, and demand for natural gas in the rest of the world. NERA defined the more likely outcomes as those that result in U.S. LNG exports that are within a one standard deviation of the mean level of exports.[52] In the Study, NERA stated that an interval of plus or minus one standard deviation was chosen as more informative because it indicates a reasonable range of uncertainty without unduly emphasizing very unlikely outcomes.[53]

The 2018 Study finds that, by the year 2040, there is a 16% chance that U.S. LNG exports will be below 9.0 Bcf/d and a 16% chance that they will be above 30.7 Bcf/d of natural gas.[54] Put differently, there is approximately a 68% probability that U.S. LNG exports will be between 9.0 and 30.7 Bcf/d in 2040. Table 2 below lists 27 scenarios that are the ''more likely'' scenarios in 2040 (*i.e.,* within one standard deviation of the mean for all 54 scenarios).[55] The scenario nomenclature in Table 2 refers to the case used for U.S. natural gas supply, U.S. natural gas demand, Rest of World natural gas supply, and Rest of World natural gas demand, respectively.

TABLE 2—LNG EXPORTS AND SCENARIO PROBABILITY FOR THE MORE LIKELY SCENARIOS IN 2040

Scenario	LNG exports Bcf/day	Scenario probability (%)
Low_High_Low_High	22.7	0.3
Low_Low_Low_High	26.1	0.3
Low_Low_Low_Ref	12.4	0.2
Low_Ref_Low_High	23.4	1.0
Low_Ref_Low_Ref	9.9	0.9
Ref_High_Low_Low	15.5	0.1
Ref_High_Low_Ref	28.9	0.8
Ref_High_Ref_High	23.4	3.7
Ref_High_Ref_Ref	12.4	3.4
Ref_Low_Low_Low	18.3	0.1
Ref_Low_Low_Ref	30.5	0.8
Ref_Low_Ref_High	25.7	3.7
Ref_Low_Ref_Ref	18.6	3.4
Ref_Ref_Low_Low	17.0	0.4
Ref_Ref_Low_Ref	29.6	3.3
Ref_Ref_Ref_High	24.0	14.5
Ref_Ref_Ref_Ref	12.9	13.1
High_High_Low_Low	22.2	0.1
High_High_Ref_High	30.1	2.0
High_High_Ref_Low	8.7	0.2
High_High_Ref_Ref	22.6	1.8
High_Low_Low_Low	23.6	0.1
High_Low_Ref_Low	12.4	0.2
High_Low_Ref_Ref	23.6	1.8
High_Ref_Low_Low	22.8	0.2
High_Ref_Ref_High	30.7	7.9
High_Ref_Ref_Low	9.0	0.8
High_Ref_Ref_Ref	23.3	7.1

The 2018 Study summarized changes in Henry Hub prices in 2040 (in constant 2016 dollars) by the different U.S. natural gas supply scenarios, as follows:

- For all of the reference U.S. supply scenarios in the more likely range, Henry Hub natural gas prices could be from $5 to $6.50 per million British thermal units (MMBtu) in 2040. These mid-range scenarios have a combined probability of 47%.[56]
- For all of the HOGR supply scenarios in the more likely range, Henry Hub prices range from $3.50 to $4 per MMBtu in 2040.[57] These scenarios with natural gas prices at the low end of the range have a combined probability of 22%.[58]
- For all of the LOGR supply scenarios in the more likely range, Henry Hub prices range from $10 to $13 per MMBtu in 2040. These scenarios with natural gas prices at the high end of the range have a combined probability of 3%.

The 2018 Study finds two important relationships between U.S. LNG exports and U.S. natural gas prices:

- ''Increasing U.S. LNG exports under any given set of assumptions about U.S. natural gas resources and their production leads to only small increases in U.S. natural gas prices;'' [59] and
- ''Available natural gas resources have the largest impact on natural gas prices. Therefore, U.S. natural gas prices are far more dependent on available resources and technologies to extract

[51] *Id.*

[52] 2018 LNG Export Study at 47.

[53] *Id.*

[54] *Id.* at 49–50.

[55] 2018 LNG Export Study at 50–51 (Table 4).

[56] *Id.* at 54; *see also id.* at 53 (Figure 12).

[57] *Id.* at 53 (Table 12).

[58] *Id.* at 54.

[59] *Id.* at 55 (discussing Figure 12).

available resources than on U.S. policies surrounding LNG exports.'' [60]

Applying the same one-standard deviation interval of a probability greater than 16% and less than 84% reveals that the more likely range of Henry Hub price is from $3.90 to $6.70 per MMBtu of natural gas.[61]

The 2018 Study identifies 12 representative scenarios for macroeconomic analysis. The 12 scenarios include three different baselines and nine alternative shock scenarios (three per baseline).[62] The scenarios are grouped according to the outlook for U.S. natural gas supply, as described previously: Reference, HOGR, and LOGR cases. All of the nine alternative N_{ew}ERA scenarios project LNG export levels that are higher than their corresponding reference scenario. This selection of scenarios allows the analysis to capture the macroeconomic effects of higher LNG exports associated with higher levels of demand for U.S. LNG exports from the rest of the world.

However, not all of the scenarios evaluated produce LNG export levels that fall within a one-standard deviation interval around the mean of modeled LNG export volumes (the ''more likely'' range). Therefore, the 2018 Study discusses the macroeconomic effects for the seven macroeconomic scenarios that do fall within the range of more likely scenarios, as shown in bold in Table 3: [63]

TABLE 3—MACROECONOMIC SCENARIOS

U.S. supply	U.S. demand	ROW supply	ROW demand	LNG exports (Bcf/day)	Cumulative probability (%)
Ref	**Ref**	**Ref**	**Ref**	**12.9**	**33**
Ref	**Ref**	**Low**	**Ref**	**29.6**	**76**
Ref	Ref	Low	High	45.7	96
Ref	**Ref**	**Ref**	**High**	**24.0**	**68**
High	**Ref**	**Ref**	**Ref**	**23.3**	**47**
High	Ref	Low	Ref	40.4	91
High	Ref	Low	High	52.8	99
High	**Ref**	**Ref**	**High**	**30.7**	**87**
Low	Ref	Ref	Ref	0.1	5
Low	**Ref**	**Low**	**Ref**	**9.9**	**16**
Low	**Ref**	**Low**	**High**	**23.4**	**48**
Low	Ref	Ref	High	8.2	11

Finally, the 2018 Study summarizes a number of the broad macroeconomic effects on the U.S. economy of increased LNG exports, as discussed below.

1. U.S. Consumer Well-Being Increases With Rising LNG Exports

For the more likely scenarios, consumer welfare ranges from $30.25 trillion to $30.26 trillion (a variation of $10 billion).[64] As U.S. LNG exports increase, U.S. households receive additional income from two sources. First, the LNG exports provide additional export revenues, and second, households that hold shares in companies that own liquefaction plants receive additional income from take-or-pay tolling charges for LNG exports. These additional sources of income for U.S. consumers outweigh the income loss associated with higher energy prices.

2. Total Economic Activity Expands With Rising LNG Exports

Gross domestic product (GDP), or the level of total economic activity in the economy, is another economic metric that is often used to evaluate the effect of a change to the economy. The GDP effects associated with higher LNG exports increase as the economy benefits from investment in the liquefaction process, export revenues, resource income, and additional wealth transfers (in the form of tolling charges). The impact of LNG exports results in shifts in income between different sources, but overall GDP improves as LNG exports increase for all scenarios with the same U.S. natural gas supply conditions.

Levels of GDP are most sensitive to assumptions about U.S. supply, with high natural gas supply driving higher levels of GDP. For each of the supply scenarios, higher levels of LNG exports in response to international demand consistently lead to higher levels of GDP. GDP achieved with the highest level of LNG exports in each group exceeds GDP with the lowest level of LNG exports by $13 to $72 billion in 2040 (in constant 2016 dollars).[65]

3. Sectoral Growth Rates Change Negligibly for Key Economic Sectors and Energy-Intensive Sectors

Sectoral growth rates remain robust for all of the sectors that rely on natural gas as fuel and raw material input. The variation in the growth rates attributable to differences in LNG exports ranges from one to seven basis points (0.01% to 0.07%). Even for the scenario with the largest change in sectoral growth rates, the change is still relatively small.[66] According to NERA, it is reasonable to conclude that an increased level of LNG exports will have a negligible effect on how quickly these sectors grow.[67]

4. Household Income Shifts Between Different Sources But Is Positive Overall

When comparing changes in resource income between the baseline and the scenarios, resource income associated with natural gas significantly increases. This is because both the value of the natural gas resource, as well as returns to specialized capital and labor, increase when additional LNG exports are allowed.[68] Value-added income (wage and capital income) also increases because of the increased opportunity for exports and the resulting boost to labor income, profits, and GDP.

At the same time, the resource income associated with coal and crude oil changes minimally. Therefore, the total change in resource income is positive for the scenarios, and the changes in

[60] *Id.*

[61] 2018 LNG Export Study at 55; *see also id.* at 56 (Figure 13).

[62] *Id.* at 62.

[63] *Id.* at 63 (Table 9).

[64] *See id.* at 67; *see also id.* at 66 (Figure 16), 67 (Table 10).

[65] 2018 LNG Export Study at 18.

[66] *Id.* at 70.

[67] *Id.*

[68] *Id.* at 73.

resource income increase with the level of LNG exports. Income associated with net transfers includes government transfers and all tolling charges on LNG exports. Government transfers remain the same between the baseline and scenarios, so the net transfer reflects the additional wealth transfer. Changes in tax revenue are ''grossed up'' in value added.[69]

5. Aggregate Consumption and Investment Is Higher

Aggregate consumption measures the total spending on goods and services in the economy. Within each U.S. natural gas supply scenario, aggregate consumption is higher when LNG exports are higher.

As with the welfare and GDP results, wealth transfer associated with LNG exports increases household income which, in turn, leads to higher spending on goods and services. Under the Reference U.S. natural gas supply scenario, aggregate consumption is $25,049 billion and LNG exports are 12.9 Bcf/d. When LNG exports increase as a result of natural gas demand pull, aggregate consumption is $25,054 billion (for 29.6 Bcf/d), an increase of about $5 billion.[70] A similar pattern is observed in the outcomes for aggregate consumption in each of the groups of scenarios based on alternative U.S. natural gas supply assumptions.[71]

6. U.S. LNG Exports Are Backed by Increased Natural Gas Production

The results from NERA's analysis indicate there is no support for the concern that LNG exports would come at the expense of domestic natural gas consumption. To the contrary, a large share of the increase in LNG exports is supported by an increase in domestic natural gas production, leading to a modest increase in natural gas prices and additional income from export revenues.[72] About 80% of the increase in LNG exports is satisfied by increased domestic production of natural gas, with positive effects on labor income, output, and profits in the natural gas production sector.

In the Reference U.S. supply scenarios, as total natural gas exports increase from 5.8 Tcf (in the Ref_Ref_Ref scenario) to 12.9 Tcf (in the Ref_Ref_Low_Ref scenario), natural gas production increases for the corresponding scenarios from 37.7 Tcf to 43.9 Tcf, respectively, in 2040.[73]

V. Notice of Availability of the 2018 LNG Export Study

On June 12, 2018, DOE published notice of availability (NOA) of the 2018 LNG Export Study and a request for comments.[74] The purpose of the NOA was ''to enter the 2018 LNG Export Study into the administrative record of the 25 pending non-FTA export proceedings [identified in the NOA] and to invite comments on the Study for use in the pending and future non-FTA application proceedings.'' [75] DOE provided the following instructions:

> Comments must be limited to the methodology, results, and conclusions of the 2018 LNG Export Study on the factors evaluated. These factors include the potential impact of LNG exports on domestic energy consumption, production, and prices; the macroeconomic factors identified in the Study, including gross domestic product, consumption, U.S. economic sector analysis, and U.S. LNG export feasibility analysis; and any other factors included in the Study. In addition, comments may be directed toward the feasibility of various scenarios used in the Study.[76]

Publication of the NOA began a 45-day public comment period that ended on July 27, 2018.

DOE received 19 comments on the 2018 LNG Export Study from a variety of sources, including participants in the natural gas industry, environmental organizations, and individuals. Of those, nine comments supported the Study,[77] eight comments opposed the 2018 Study and/or exports of LNG,[78] one comment took no position,[79] and one comment was non-responsive.[80] The NOA and comments received on the NOA are available on DOE's website at *https://fossil.energy.gov/app/docketindex/docket/index/10.*

VI. Comments on the 2018 LNG Export Study and DOE/FE Response

DOE has evaluated the comments received during the public comment period. Below, DOE/FE summarizes: (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 has responded to the relevant and significant issues raised by the commenters.[81]

A. Data Inputs and Estimates of Natural Gas Demand

1. Comments

Every commenter supporting the 2018 LNG Export Study expresses support for NERA's study design. For example, Cheniere states that the 2018 Study's ''refined approach'' is well-suited to the present context, in which DOE/FE has approved non-FTA exports in a volume (at the time of Cheniere's filing) up to 21.35 Bcf/d, with more non-FTA applications pending.[82] The commenters point out that the study design—with 54 different scenarios reflecting a range of market uncertainties and market-determined levels of export volumes—differs from past studies that were based on prescribed LNG export volumes. JCEP states that the 2018 Study takes the ''next logical step'' in studying unbounded exports driven by market demand.[83] For this reason, commenters including LNG Allies and API characterize the 2018 Study as the most comprehensive of DOE's export studies to date.

LNG Allies observes that the 2018 Study uses data from AEO 2017 for its analysis, but notes that the projections in EIA's *Annual Energy Outlook* 2018 (AEO 2018) [84] indicate ''significantly lower natural gas prices in the United States in the future, as well as considerably higher U.S. natural gas production under all scenarios (versus

[69] *Id.* at 73.

[70] We noted that, in the narrative section of the 2018 Study on this point, there is a typo in the Reference case number. *See* 2018 LNG Export Study at 75 (''Under the Reference U.S. natural gas supply scenario, Ref_Ref_Ref_Ref, aggregate consumption is $24,049 billion and LNG exports are 12.9 Bcf/d.''). The $24,049 billion number is actually $25,049, as shown in the corresponding Table 14. *See id.* at 76.

[71] 2018 LNG Export Study at 75.

[72] *Id.* at 77.

[73] *Id.* at 78 and Figure 21.

[74] *See* U.S. Dep't of Energy, Study on Macroeconomic Outcomes of LNG Exports; Notice of Availability of the 2018 LNG Export Study and Request for Comments, 83 FR 27314 (June 12, 2018).

[75] *Id.* at 27315.

[76] *Id.* at 27316 (noting that ''[w]hile this invitation to comment covers a broad range of issues, DOE may disregard comments that are not germane to the present inquiry.'').

[77] Supporting comments were filed by the Marcellus Shale Coalition; the Center for Liquefied Natural Gas (CLNG); the Pennsylvania Chamber of Business and Industry; the American Petroleum Institute (API); Cheniere Energy, Inc. (Cheniere); Jordan Cove Energy Project L.P. (JCEP); LNG Allies; NextDecade Corp.; and Anonymous. The Anonymous comment is comprised of five comments filed by the same anonymous author.

[78] Opposing comments were filed by Patricia Weber; Oil Change International; Food & Water Watch; Industrial Energy Consumers of America (IECA); Oregon Wild; Sierra Club; Deb Evans and Ron Schaaf (the Evans Schaaf Family); and Jody McCaffree (individually and as executive director of Citizens for Renewables/Citizens Against LNG). Oil Change International and Food & Water Watch filed identical comments.

[79] Comment of John Young.

[80] Comment of Vincent Burke.

[81] *See, e.g., Public Citizen* v. *F.A.A.,* 988 F.2d 186, 197 (D.C. Cir. 1993).

[82] Comment of Cheniere at 3.

[83] Comment of JCEP at 3.

[84] U.S. Energy Info. Admin., *Annual Energy Outlook* 2018 (with projections to 2050) (Feb. 6, 2018), *available at: https://www.eia.gov/outlooks/aeo/pdf/AEO2018.pdf.*

AEO 2017).'' [85] LNG Allies asserts that, had it been possible for the 2018 Study to draw upon EIA's most recent data in AEO 2018, the evidence supporting market-determined levels of U.S. LNG exports would have been ''*even more persuasive.*'' [86]

JCEP also endorses the 2018 Study's design as ''appropriate and important given the state of the U.S. LNG export market to date.'' [87] Specifically, JCEP notes that some LNG export projects have received authorizations from the Federal Energy Regulatory Commission (FERC) and DOE, but have not yet moved forward on construction or may never move forward. In JCEP's view, these ''stalled'' projects should not prevent other projects from obtaining export authorizations through artificial limits on approved export volumes. Therefore, JCEP asserts, the 2018 Study correctly evaluated LNG exports limited only by market demand, not by regulatory constraints imposed by DOE.[88]

On the other hand, several commenters—including Sierra Club, Oregon Wild, and the Industrial Energy Consumers of America (IECA)—challenge the scope of the 2018 Study and the data used as inputs. Specifically, these commenters assert that the 2018 Study relies on inaccurate assumptions that fail to reflect conditions that adversely affect (and will continue to affect) the viability of U.S. LNG exports.

First, Oregon Wild states that the U.S. market for fossil fuels is deeply flawed. According to Oregon Wild, the current prices for natural gas do not reflect either the full costs of production or significant externalities (*e.g.,* global climate change and ocean acidification), and thus are artificially low. Low prices for LNG, in turn, result in artificially high demand and supply that ''far exceeds'' optimal levels.[89] Consequently, Oregon Wild states that increasing exports of U.S. LNG ''will increase the supply of a commodity that is already oversupplied at a global scale.'' [90]

Commenters including Oil Change International, Food & Water Watch, and Sierra Club assert that the 2018 Study is based on flawed projections of global demand for natural gas. Sierra Club argues that the 2018 Study ''drastically overstates'' global demand, which ''significantly skews'' the 2018 Study's overall analysis and conclusions.[91] Oil Change International, Food & Water Watch, and other commenters also allege the following deficiencies in NERA's study design:

- Fails to account for the negative impacts of increased natural gas production and related infrastructure;
- Fails to consider shifts in anti-fossil fuel energy policies at the state level that will impact U.S. supplies;
- Fails to acknowledge the transition to renewable energy and storage (*i.e.,* flexible generation technologies) that compete with natural gas globally, as well as efforts in the United States to build out renewable energy sources and increase energy efficiency;
- Improperly relies on ''projected diminishing Rest of World'' natural gas supplies;
- Fails to properly account for economic costs related to environmental issues, particularly the costs associated with climate change; and
- Fails to account for international efforts to address climate change and/or assumes that such efforts will fail, which allegedly will impact global demand for natural gas.[92]

Addressing the climate change argument, Oil Change International and Food & Water Watch first challenge the statement in the 2018 Study that '' 'NERA [has] followed the development of international agreements on climate change for many years, and we do not expect that future progress will be very much greater than in the past.' '' [93] On this basis, NERA attributed a ''low probability''—specifically, a 5% probability—to the ''low international demand case'' for the rest of the world (ROW), in which international demand for natural gas is reduced due to policies to address climate change.[94]

The Evans Schaaf Family submitted a comment challenging NERA's assumption, asserting that ''[t]he most glaring of [NERA's] predictions is that there is a mere 5% probability that the [Rest of World] would meet the 450 ppm [parts per million] of CO2e [carbon dioxide equivalent] as set forth in the Paris Climate Agreement.'' [95] The 450 ppm case assumes a set of policies with the objective of limiting the average global temperature increase in 2100 to 2 degrees Celsius above pre-industrial levels.[96] NERA noted that, ''[t]o achieve this concentration, it is necessary to phase out all fossil fuel use including natural gas over the course of the next century.'' [97] Oil Change International and Food & Water Watch contend, however, that NERA ''provide[d] no scientific reasoning for attributing a 5% probability to international gas demand levels that align with the . . . 450 ppm Scenario.'' [98]

Oil Change International and Food & Water Watch also state that the 2018 Study should have given much greater emphasis to low natural gas demand scenarios that align with the Paris Agreement.[99] In their view, rather than NERA adopting a ''subjective and cynical'' view towards international climate negotiations, a ''methodologically sound approach would be to project the level of U.S. LNG exports that align with global success in meeting the Paris goals.'' [100] They point out that the Paris Agreement has been ratified by more than 170 nations, with the United States being the only country to back away from the Agreement.

According to the commenters, this approach would show a much lower global demand for U.S. LNG exports by the middle of this century, indicating a very different trajectory to any of those described in the 2018 Study. They claim that, by attributing a low probability to the likelihood that demand for U.S. natural gas will be reduced in light of climate policies, the 2018 Study is ''predicated on a failure to prevent catastrophic climate impacts.'' [101]

Similarly, Sierra Club asserts that the 2018 Study overstates global natural gas demand, and thus market support for U.S. LNG exports, ''by assuming that the most likely [demand] scenario is for the rest of the world to take *no* further action to limit greenhouse gas emissions.'' [102] Specifically, Sierra Club disputes NERA's judgment that the high demand case—assigned a 65% probability—should assume that 2016 is the last year in which the global community undertakes any effort to limit greenhouse gas emissions, *i.e.,* that no further action is taken between 2018 and 2040.[103] In Sierra Club's view, ''this

[85] Comment of LNG Allies at 2.

[86] *Id.* (emphasis in original).

[87] Comment of JCEP at 3.

[88] *Id.*

[89] Comment of Oregon Wild at 1.

[90] *Id.*

[91] Comment of Sierra Club at 1.

[92] Comments of Oil Change International and Food & Water Watch at 1.

[93] *Id.* at 2 (citing 2018 LNG Export Study at 42).

[94] 2018 LNG Export Study at 41–42.

[95] Comment of the Evans Schaaf Family at 1.

[96] 2018 LNG Export Study at 30; *see also id.* at 41 (explaining that the ''lowest natural gas demand is obtained from a scenario in which the IEA assumes that every country adopts policies sufficient to keep global greenhouse gas concentrations under 450 ppm CO2e.'').

[97] *Id.* at 41.

[98] Comments of Oil Change International and Food & Water Watch at 2.

[99] *Id.*

[100] *Id.*

[101] *Id.*

[102] Comments of Sierra Club at 1 (emphasis in original).

[103] *Id.* (citing 2018 LNG Export Study at 41–43) (NERA explaining that ''we assign . . . the highest

Continued

scenario might represent a useful hypothetical 'ceiling' on global natural gas demand,'' but the 2018 Study does not demonstrate that it is plausible, much less the ''*most likely*'' scenario.[104]

Turning to renewable energy, Oil Change International and Food & Water Watch cite recent analysis from Bloomberg New Energy Finance, the *New Energy Outlook* 2018.[105] They argue that this Bloomberg analysis projects a very different picture of future energy demand than assumed in the 2018 Study. For example, they argue that, by 2050, renewable energy will make up over two-thirds of global power generation, while fossil energy will have declined to 29% from 63% today.[106] Citing these and other projections, the commenters argue that there will be substantial constraints on growth in the demand for U.S. LNG. The commenters argue that, without these adjustments, the 2018 Study exaggerates both the potential for U.S. LNG exports and the related macroeconomic benefits.

Patricia Weber and other commenters express concern about NERA's statement that the 2018 Study '' 'does not investigate' '' the variations in domestic versus foreign ownership of assets as part of its N_{ew}Era model.[107] Ms. Weber questions why NERA did not consider the implications for the U.S. economy of a foreign-owned pipeline exporting U.S. LNG through a foreign-owned facility. She cites JCEP's pending LNG export project, in which the proposed Jordan Cove Energy Project and associated Pacific Connector Gas Pipeline would be owned by a Canadian corporation.[108]

Similarly, Ms. Weber and the Evans Schaaf Family question whether the 2018 Study excludes Canadian (or Mexican) natural gas supply as a factor. In their view, since NERA states that ''countries in the North American region share a single natural gas market,'' [109] any macroeconomic benefits associated with LNG exports should be applied across North America, and not assumed to accrue only to the United States, as the 2018 Study suggests.

Finally, some commenters, including Ms. Weber and Jody McCaffree, dispute the 2018 Study's conclusions regarding international levels of U.S. LNG exports. They suggest that the current volumes of LNG exports across the world (not only U.S. LNG) are already excessive and will result in a global oversupply. Citing a 2017 report by the International Gas Union, Ms. McCaffree warns that ''it would take *15 years* . . . until the current excess of LNG volumes would likely be absorbed into the international LNG export markets.'' [110] Ms. Weber also questions whether the 2018 Study considers any potential macroeconomic impacts if the infrastructure created from increased LNG exports exceeds the bounds of what the market demands—for example, if the LNG industry ''overbuilds'' two to three times more export capacity than ultimately needed.[111]

2. DOE/FE Response

The 2018 Study considered 54 different scenarios of LNG exports from the United States over the coming decades. Different assumptions regarding future supply and demand conditions provided a wide range of possible outcomes for further macroeconomic analysis. Through a peer-reviewed process, the 2018 Study assigned probabilities for each of the supply and demand cases, which, when combined, provided likelihoods for the scenarios. This approach allowed NERA to consider very unlikely scenarios for U.S. LNG exports—with export levels much lower and much higher than the Reference case—thus providing a more comprehensive range of outcomes than considered in DOE's previous LNG export studies. The 2018 Study found a ''positive correlation between GDP and LNG exports for the more likely scenarios in 2040,'' such that ''[i]n all scenarios with common assumptions about U.S. natural gas supply and demand, there is greater gain in GDP as the LNG export volume increases.'' [112]

We take note of EIA's projections in AEO 2018, published on February 6, 2018, for natural gas supply, demand, and prices.[113] One commenter noted the lower domestic natural gas prices and higher domestic natural gas production projected in AEO 2018 than in the projections from AEO 2017 used in the 2018 Study. Projected Reference case domestic dry natural gas production for the year 2040 increased by 2.41 Tcf between AEO 2017 and AEO 2018 (from 37.74 Tcf to 40.15 Tcf, respectively). The Henry Hub price in 2040 declined from $5.18 per million British thermal units (MMBtu) in the AEO 2017 projections to $4.50/MMBtu in the AEO 2018 projections (both prices in constant 2017 dollars). Reference case LNG exports in the year 2040 increased from the 2017 to 2018 projections by 0.92 Tcf (from 4.44 Tcf to 5.36 Tcf). As described here, the AEO 2018 Reference case, even more so than AEO 2017, projects robust domestic supply conditions that are more than adequate to meet domestic needs and supply exports.

Several commenters suggested the 2018 LNG Export Study overstates the future level of U.S. LNG exports, as well as the probability of those levels of exports occurring. DOE/FE commissioned the 2018 Study to inform its public interest analysis of pending long-term applications to export LNG to non-FTA countries beyond the 21.35 Bcf/d of exports already approved at that time. To develop scenarios with much larger volumes of exports than under Reference case conditions, the 2018 Study performers examined unconstrained cases and assigned probabilities to help illustrate the likelihood of LNG export levels much lower and much higher than the Reference case. The macroeconomic analysis of the export scenarios provides valuable input to inform DOE/FE's public interest analysis. The 2018 Study does not (and was not intended to) provide an analysis of any ''optimal'' level of LNG exports based on different policy objectives. Further, the 2018 Study Reference case rate of exports in 2040 (''Ref_Ref_Ref_Ref'') is in the range of LNG exports projected in AEO 2018 for the same time period—12.9 Bcf/d in the 2018 Study, compared to 14.7 Bcf/d in AEO 2018.

If increased global demand for U.S. LNG exports does not materialize, as some commenters suggest, there would be no corresponding incremental domestic supply or price impact since additional LNG exports would not occur, irrespective of regulatory approvals. As some commenters point out, multiple proposed projects have received full approval for their export facilities from FERC and DOE, yet they have neither made a final investment decision nor begun construction. Given the significant capital costs of liquefaction and export facilities, project developers in the United States typically must demonstrate long-term

probability to the WEO Current Policies case that assumes no additional actions to limit emissions [after 2016].'').

[104] *Id.*

[105] Comments of Oil Change International and Food & Water Watch at 3 n.4 (citation omitted).

[106] *Id.* at 3.

[107] Comment of Patricia Weber at 1 (quoting 2018 LNG Export Study at 34 n.34) (NERA stating that, ''[i]n the N_{ew}ERA model, it is possible to represent these variations in domestic versus foreign ownership of assets and capture export revenues to better understand the issues. However, this study does not investigate these issues.'').

[108] *Id.*

[109] 2018 LNG Export Study at 56 n.48.

[110] Comment of Jody McCaffree at 2 (emphasis in original) (citing International Gas Union, *2017 World LNG Report,* at 4–5) (attached as Exh. 1 to McCaffree Comment).

[111] *Id.*

[112] 2018 LNG Export Study at 67.

[113] *See* AEO 2018, *supra* note 84.

demand for their projects through the execution of long-term contracts to raise the needed capital to finance their projects. DOE/FE also notes that current large-scale liquefaction capacity in operation or under construction in the United States today equals approximately 11 Bcf/d of exports, which is more than 3 Bcf/d below the AEO 2018 Reference case rate of LNG exports projected in 2040.

B. Economic Benefits Associated With LNG Exports

1. Economic Benefits Realized to Date

a. Comments

Cheniere states that it agrees with the results of the 2018 LNG Export Study, and emphasizes that, ''for Cheniere, the positive economic impacts of LNG exports are not just a matter of economic theory.'' [114] In the years since DOE/FE published its first LNG export study, Cheniere—through its subsidiary, Sabine Pass Liquefaction, LLC—has constructed and launched operations at the Sabine Pass Liquefaction Project, located at the Sabine Pass LNG Terminal in Cameron Parish, Louisiana. Cheniere states that it has constructed four liquefaction trains at the Sabine Pass LNG Terminal, and is in the process of commencing exports from a fifth train.[115] DOE/FE (as well as the Anonymous commenter) notes that Cheniere began exporting U.S. LNG from the Sabine Pass LNG Terminal on February 24, 2016, and, to date, has exported 501 LNG cargoes from Sabine Pass (both long-term and short-term exports) with deliveries to 29 countries and regions worldwide.[116] Cheniere states that, through other subsidiaries, it is also in the process of constructing three liquefaction trains at the Corpus Christi LNG Terminal in San Patricio County, Texas.

According to Cheniere, these two LNG export projects have created approximately 9,000 direct construction jobs at peak construction over a period of several years, as well as more than 1,000 permanent, full-time jobs.[117] Cheniere asserts that the construction and operation of both the Sabine Pass and Corpus Christi Liquefaction Projects have generated, and will continue to generate, tens of thousands of indirect jobs across the United States. Cheniere states that, to date, it has sourced natural gas for the Sabine Pass Liquefaction Project from dozens of producers located in Texas, Louisiana, Arkansas, Pennsylvania, Ohio, West Virginia, Oklahoma, Illinois, and Kentucky. Cheniere maintains that jobs have been created due to the demand its LNG export operations have created for natural gas infrastructure—including in the steel industry and in other segments of the natural gas supply chain.[118]

In this regard, Cheniere states that liquefaction projects require a wide variety of manufactured parts and components, many of which can be sourced from domestic manufacturers. Cheniere states that, to date, its LNG facilities have procured components from 1,590 U.S. manufacturers in 46 states.[119] In sum, Cheniere maintains that, ''through its procurement of domestic natural gas and across its manufacturing supply chain,'' it ''has seen first-hand the broad economic benefits of LNG exports to the American economy.'' [120]

The American Petroleum Institute (API) agrees that the results of the 2018 LNG Export Study ''are consistent with U.S. LNG experience to date.'' [121] Specifically, API states that U.S. LNG cargoes commenced in early 2016, yet the impact on domestic prices of natural gas has been negligible. Likewise, the Pennsylvania Chamber of Business and Industry states that concerns about significant increases in natural gas prices occurring after DOE/FE began authorizing LNG exports have not been borne out.[122]

b. DOE/FE Response

The 2018 Study did not attempt to quantify the macroeconomic impacts or other direct and indirect effects of LNG exports since February 2016. Nonetheless, to provide one estimate of the current value of U.S. LNG exports, DOE/FE points to the quantity and price of U.S. LNG exported to date, as reported by DOE/FE export authorization holders. Since initial exports began from the lower-48 states in February 2016, a cumulative volume of over 1.7 trillion cubic feet of natural gas has been exported through October 2018, and the corresponding volume-weighted prices for the same period yield a value of over $7.9 billion.[123] Additionally, as noted previously, since U.S. LNG exports from the lower-48 states began, the projected Henry Hub price in 2040 has decreased from AEO 2017 to AEO 2018, which is a function of the size of domestic natural gas supply to meet both domestic and export demand.

2. Macroeconomic Benefits Under DOE's Studies to Date

a. Comments

Several commenters point out that the 2018 LNG Export Study builds on both DOE's prior macroeconomic studies and several studies conducted by other authors in reaffirming the economic benefits of LNG exports.[124] Cheniere notes that, even before the 2018 Study, DOE/FE had already developed a large body of analysis demonstrating the substantial macroeconomic benefits of LNG exports to the United States. Cheniere, JCEP, and API state that DOE's four prior studies were varied in their methodology, but they all confirm the same fundamental conclusion: LNG exports are a clear net benefit to the U.S. economy and are therefore in the public interest.[125] The commenters maintain that the conclusions of the 2018 LNG Export Study—especially when considered along with DOE's prior LNG studies—should put to rest any lingering concerns that increased U.S. LNG exports are not in the public interest. According to API, ''[i]t should now be abundantly clear that U.S. LNG offers sizable benefits to U.S. consumers, workers, and the economy overall.'' [126]

b. DOE/FE Response

DOE's prior LNG export studies (the 2012, 2014, and 2015 LNG Export Studies) consistently have projected positive economic benefits from increased levels of U.S. LNG exports, as measured by GDP.

[114] Comment of Cheniere at 1.

[115] *Id.*

[116] *See* FE LNG Monthly, Dec. 2018, and LNG Annual 2016, 2017, *available at: https://www.energy.gov/fe/listings/lng-reports; see also* Comment of NextDecade Corp. at 9; Comment of API at 2. Additionally, we note that Dominion Energy Cove Point LNG, LP (DECP) commenced LNG exports on March 2, 2018. To date, DECP has exported 36 LNG cargoes from its terminal in Lusby, Maryland (both long-term and short-term exports), with deliveries to 13 countries and regions worldwide.

[117] *See* Comment of Cheniere at 2.

[118] *See id.*

[119] *See id.*

[120] *Id.*

[121] Comment of API at 2.

[122] Comment of Pennsylvania Chamber of Business and Industry at 1–2; *see infra* at § VI.G.

[123] LNG exports of 186,841 million cubic feet (MMcf) in 2016 * $4.71/thousand cubic feet (Mcf) + LNG exports of 707,542 MMcf in 2017 * $4.69/Mcf + LNG exports of 852,368 MMcf from Jan.–Oct. 2018 at $4.90/Mcf, as reported in EIA's Natural Gas Monthly (Nov. 2018), *available at: https://www.eia.gov/naturalgas/monthly/pdf/table_05.pdf* (Table 5, U.S. natural gas exports, 2016–2018) and FE LNG Monthly, Dec. 2018, *available at: https://www.energy.gov/fe/listings/lng-reports.*

[124] Cheniere, LNG Allies, and API identify other studies examining LNG exports by authors including the Brookings Institution, Deloitte, IHS, IHS Energy, ICF International, and API.

[125] Comment of Cheniere at 2–3 & nn.6–10 (citations omitted); Comment of JCEP at 3; Comment of API at 2.

[126] Comment of API at 3.

C. Distributional Impacts

1. Gross Domestic Product (GDP)

a. Comments

Some commenters, including IECA, Sierra Club, and the Evans Schaaf Family, allege that any macroeconomic benefits from the 2018 LNG Export Study are likely overstated. These commenters allege that, in concluding that LNG exports would create a net benefit to the economy, the 2018 Study relied too heavily on the fact that exports will increase GDP while failing to give adequate weight to projected domestic natural gas price increases, as well as to negative socio-economic, sectoral, and regional impacts. IECA also disagrees with the fact that the 2018 Study emphasizes the national net economic benefits of LNG exports. IECA charges that this focus is not consistent with the U.S. Supreme Court's definition of ''public interest,'' which it claims is intended to focus on ''impacts to people, not GDP.'' [127]

Other commenters—including the Marcellus Shale Coalition, API, CLNG, NextDecade Corp., and the Anonymous commenter—assert that LNG exports will provide macroeconomic benefits to the United States. These commenters point out that, across a wide range of scenarios, the 2018 Study found that LNG exports will provide a net benefit to the U.S. economy and will allow for continued economic growth. JCEP and Cheniere emphasize the 2018 Study's conclusion that '' 'there is greater gain in GDP as the LNG export volume increases.' ''[128] Specifically, as commenters point out, the 2018 Study demonstrates that GDP grows as LNG exports increase because the U.S. economy benefits from investment in liquefaction facilities, export revenues, income from the upstream and midstream natural gas industry, and tolling charges generated by the LNG export facilities. JCEP emphasizes that these increases in GDP result, in part, from the fact that exports of LNG will not result in decreased domestic consumption of natural gas. Rather, LNG exports will be in addition to, not in place of, domestic uses of natural gas.[129]

NextDecade acknowledges the 2018 Study's conclusion that ''there is virtually no chance'' that non-FTA LNG exports will reach the 55.04 Bcf/d level in aggregate volumes for which DOE had approved and/or received applications by 2040 (as of the date of the Study).[130] Nonetheless, NextDecade points out that, regardless of the volume of LNG ultimately exported, the 2018 Study found that LNG exports are in the public interest. For this reason, NextDecade asserts that the market, not DOE, should decide which of the pending LNG export projects will meet global market demand. NextDecade further notes the 2018 Study's finding that '' 'any restrictions on LNG exports would forgo the additional GDP to be gained by allowing exports to respond to market conditions.' '' [131] In sum, these commenters support NERA's conclusion that allowing the market to determine the level of U.S. LNG exports will ''lead to an increase in overall economic activity leading to higher GDP.'' [132]

b. DOE/FE Response

The 2018 Study measured the broad macroeconomic effects on the U.S. economy through several metrics, including ''the wellbeing of the average U.S. consumer, total household income from all sources, economy-wide investment, output effects on key manufacturing sectors, and gross domestic product (GDP).'' [133] With respect to consumer well-being, the 2018 Study found that all scenarios within the more likely range of results are welfare-improving for the average U.S. household. This result is driven by households' receipt of additional income from export revenues and take-or-pay tolling charges for LNG exports, and this additional income outweighs the income lost from higher energy prices.[134]

In terms of total household income, the 2018 Study considered two broad categories of income sources: Resource income and value-added income. The resource income reflects the value of the natural gas resource as well as returns to specialized capital and labor. The value-added income is a measure of labor income and capital income. In the 2018 Study, both resource income and value-added income increase as LNG exports increase for given domestic natural gas supply assumptions across the more likely scenarios examined.[135]

In terms of economy-wide investment, the 2018 Study shows higher levels of aggregate investment for higher levels of LNG exports. Within the natural gas sector, additional investments take place to expand natural gas production and to build liquefaction capacity. Overall aggregate investment also grows with capacity increases in industries that supply machinery and equipment that make up the overall natural gas value chain.[136]

Finally, in terms of GDP, as noted previously, the 2018 Study found a ''positive correlation between GDP and LNG exports for the more likely scenarios in 2040.'' [137]

2. Sectoral Impacts

a. Comments

Some commenters, including IECA, Jody McCaffree, and the Evans Schaaf Family, debate whether LNG exports will impact the domestic energy-intensive, trade-exposed (EITE) sectors disproportionately, at too high a cost to the U.S. economy to justify exporting LNG.[138] Specifically, IECA asserts that increasing U.S. LNG exports reduces the cost of natural gas to global competitors and simultaneously increases the domestic cost of natural gas and electricity—creating a ''double negative impact'' on EITE industries.[139] According to these commenters, these price impacts will lead to lost jobs and lower wages in the EITE sectors, while also making it more difficult for the U.S. to compete globally, invest capital, and create high-paying middle class jobs.

According to IECA, the oil and natural gas industry employed 512,000 jobs in 2017, whereas the manufacturing sector currently employs 12,713,000 jobs.[140] Of the approximately 12.7 million manufacturing jobs, approximately 5,125,600 jobs in the EITE industries would be most affected by LNG exports.[141] IECA cautions that if DOE ''approves too many export terminals and natural gas prices rise,'' DOE will be putting ''at risk trillions of dollars of manufacturing assets and over 12.7 million jobs.'' [142] In light of the various alleged flaws in the 2018 Study identified by IECA and discussed herein, IECA maintains that the 2018 Study overinflates economic growth and job projections attributed to LNG exports.

Other commenters, including CLNG and API, dispute these arguments. They disagree with the notion that an LNG

[127] Comment of IECA at 3.

[128] *See, e.g.,* Comment of Cheniere at 5 (quoting 2018 LNG Export Study at 67–68).

[129] Comment of JCEP at 4 (citing 2018 LNG Export Study at 77).

[130] Comment of NextDecade Corp. at 11 (quoting 2018 LNG Export Study at 49).

[131] *Id.* (quoting 2018 LNG Export Study at 68).

[132] 2018 LNG Export Study at 68.

[133] *Id.* at 65.

[134] *Id.* at 66–67.

[135] *Id.* at 73–74.

[136] *Id.* at 76.

[137] *Id.* at 67.

[138] IECA states that its members in EITE sectors represent industries including: Chemicals, plastics, steel, iron ore, aluminum, paper, food processing, fertilizer, insulation, glass, industrial gases, building products, automotive, independent oil refining, and cement. *See* Comment of IECA at 2.

[139] *Id.*

[140] *Id.*

[141] *Id.*

[142] *Id.*

export industry cannot co-exist with a growing domestic manufacturing base. They emphasize the size and productivity of the U.S. natural gas resource base, contending that there is an abundance of natural gas to support both LNG export demand and continued growth in the EITE industries.

CLNG argues that the ''dramatic increase'' in natural gas supply has enabled an industrial renaissance in the U.S. manufacturing sector, with demand for natural gas from the manufacturing sector reaching an all-time high this past winter.[143] According to CLNG, growth in LNG exports sends market signals to incentivize domestic production of natural gas. This increased production benefits U.S. consumers, as well as industries involved in the natural gas supply chain (such as construction and manufacturing)—spurring more economic growth.[144] NextDecade similarly asserts that, under the 2018 Study's most likely scenarios, industries that rely on natural gas for fuel and as a raw material input will maintain strong growth, even if LNG exports increase.[145]

Additionally, API argues that the economic benefits of increased natural gas use extend to the industrial sector—including through the increased production of associated natural gas liquids (NGLs), which must be extracted before natural gas is liquefied for export. CLNG and API maintain that growth in NGLs creates a competitive advantage for U.S. chemical manufacturers and leads to greater investment, industry growth, and new jobs.[146] API contends that NGLs ''have bolstered the U.S. petrochemical sector and fostered a renaissance in U.S. manufacturing,'' underscoring the value of U.S. LNG at home and abroad.[147]

Next, CLNG argues that companies from around the world are investing in new projects to build or expand their ''shale-advantaged capacity'' in the United States. CLNG states that, between 2010 and 2015, 48 new industrial projects in the petrochemical, fertilizer, steel, and natural gas-to-liquids sectors were completed, representing an investment of $28 billion.[148] According to CLNG, experts forecast additional industrial investment of $135 billion to build 59 new projects and 11 expansions between 2017 and 2022.[149]

In sum, CLNG cautions that suppressing LNG exports will limit production of natural gas which, in turn, will limit both: (i) Overall economic benefits to the domestic economy, and (ii) the opportunity for the United States to continue growing its manufacturing sectors that benefit from increased supplies of natural gas.[150]

b. DOE/FE Response

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, DOE observes 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 natural gas used in manufacturing and natural gas diverted for export. These observations are consistent with DOE/FE's analysis of similar arguments made in response to its prior macroeconomic studies.[151] The competition between the demand for natural gas for domestic consumption and the demand for natural gas for export is captured in the modelling for the 2018 Study. In scenarios with increased levels of U.S. LNG exports with common domestic natural gas supply assumptions, the 2018 Study found that greater economic benefits, in terms of GDP, accrued to the U.S. economy due to those exports.

Contrary to IECA's concerns about the negative impacts to EITE industries potentially caused by increased LNG exports, the 2018 Study found: ''All negatively affected sectors, and in particular the natural gas intensive sectors, continue to grow robustly at higher levels of LNG exports, albeit at slightly lower rates of increase than they would at lower levels.'' [152] The 2018 Study further found that, ''[s]ectoral growths rates remain robust for all of the sectors that rely on natural gas as fuel and raw material input,'' with ''[t]he variation in the growth rates attributable to differences in LNG exports ranges from one to seven basis points (0.01% to 0.07%).'' [153] Based on these findings (which no commenters attempt to rebut), we are not persuaded by IECA's claim that DOE's approval of LNG exports will put trillions of dollars of U.S. manufacturing assets and millions of jobs at risk, among other alleged negative impacts.

With respect to the argument that some industries derive greater economic value from natural gas than others, DOE/FE continues to be guided by the long-standing principle established in the 1984 Policy Guidelines that resource allocation decisions of this nature are better left to the market, rather than to DOE, to resolve.[154]

3. Consumer Welfare

a. Comments

Sierra Club, IECA, the Evans Schaaf Family, and other commenters maintain that the positive macroeconomic benefits of LNG exports will not accrue to most U.S. citizens. They contend that the 2018 Study acknowledges both the positive and negative effects associated with LNG exports, but glosses over the fact that these positive and negative effects are not equally or evenly distributed.[155] According to these commenters, exports of LNG will harm all Americans by increasing natural gas prices, and thus most Americans will not share in any benefits associated with LNG exports.

Sierra Club and IECA argue that the main beneficiaries of LNG exports will be a very small fraction of the U.S population—namely, American households that own stock in natural gas production and export companies. Sierra Club claims that the 2018 Study ''simply asserts'' that households in general own the LNG production processes and industries, without providing any analysis of which households own this stock or how the benefits and harms of exports will be distributed among the American public.[156] These commenters argue that, without such analysis, DOE cannot conclude that LNG exports are in the public interest. IECA adds that a future revenue stream from LNG exports cannot predict the level of dividends paid out to shareholders or whether a share price will rise—and alleges that NERA did not disclose the economics behind this claim.[157]

Additionally, IECA argues that the 2018 Study points to a second economic benefit of LNG exports that will offset household economic losses due to

[143] Comment of CLNG at 4 & n.17 (citing Energy Ventures Analysis, Inc., *2017–2018 Winter Outlook for Natural Gas,* 2017).

[144] *See id.* at 4.

[145] Comment of NextDecade Corp. at 5.

[146] Comment of CLNG at 4.

[147] Comment of API at 2–3.

[148] Comment of CLNG at 4.

[149] *Id.* (citing Energy Ventures Analysis, Inc., *2017–2018 Winter Outlook for Natural Gas,* 2017).

[150] *Id.* at 4.

[151] *See, e.g., Golden Pass Products LLC,* DOE/FE Order No. 3978, FE Docket No. 12–156–LNG, Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Golden Pass LNG Terminal Located in Jefferson County, Texas, to Non-Free Trade Agreement Nations, at 77–80 (Apr. 25, 2017).

[152] 2018 LNG Export Study at 70.

[153] *Id.*

[154] *See infra* § I.B.

[155] Comment of Sierra Club at 2 (quoting 2018 LNG Export Study at 64).

[156] *Id.*

[157] Comment of IECA at 3.

higher energy costs: an increase in the value of the U.S. dollar. IECA disputes this benefit, contending (among other arguments) that it is speculative to assume that LNG exports would increase the value of the dollar, when there are far greater influences on the dollar's value.[158]

On the other hand, NextDecade contends that all of the ''more likely'' scenarios considered by NERA will improve consumer welfare for the average U.S. household, with consumer welfare strengthening even when global demand for LNG exports increases.[159] According to NextDecade, the 2018 Study shows that consumer welfare is highest when the United States has an abundant, low-cost, domestic natural gas supply.[160] Citing the 2018 Study, NextDecade and JCEP argue that this wealth transfer will benefit U.S. households through increased labor income and lower prices overall for imported goods—such that the benefits of LNG exports will outweigh any potential increase to the marginal cost of supplying natural gas.[161]

b. DOE/FE Response

Consistent with DOE/FE's prior studies, 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. DOE has observed in previous export authorizations that, although there could 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, DOE had not been presented with sufficiently compelling evidence that those circumstances were present.

The 2018 Study describes how different households could be affected by increased levels of LNG exports. In terms of direct benefits, the 2018 Study states that, ''[i]f U.S. households, or their retirement funds, hold stock in natural gas producers, they will benefit from the increase in the value of their investment.'' [162] The 2018 Study noted indirect benefits of increased LNG exports accruing to households through the additional wealth transferred into the United States, ''which increases the value of the dollar and reduces prices of other imported goods.'' [163] Overall, ''[l]ike other trade measures, LNG exports will cause shifts in industrial output, employment, and in sources of income.'' [164] However, the effects on different households from increased LNG exports will depend on their income sources.

As described previously, with respect to consumer well-being, the 2018 Study found that all scenarios within the more likely range of results are welfare-improving for the average U.S. household. This result is driven by households' receipt of additional income from export revenues and take-or-pay tolling charges for LNG exports, and this additional income outweighs the income lost from higher energy prices.[165]

Finally, we note that in the consolidated *Sierra Club II* case, the D.C. Circuit rejected—in all three cases—Sierra Club's argument that DOE ''erred by failing to consider distributional impacts'' when evaluating the public interest under NGA section 3(a).[166] The Court upheld DOE/FE's conclusion that ''given that exports will benefit the economy as a whole and *absent stronger record evidence on the distributional consequences,* [DOE/FE] could not say that . . . exports were inconsistent with the public interest on these grounds.'' [167] On this basis, the Court held that DOE/FE had ''adequately addressed'' Sierra Club's concerns regarding distributional impacts.[168]

None of the commenters advancing this argument have provided a quantitative analysis of the distributional consequences of authorizing LNG exports at the household level. Absent stronger record evidence on these alleged distributional consequences, we cannot say that increased LNG exports are inconsistent with the public interest on these grounds.

D. Regional Impacts

1. Comments

Some commenters, including Jody McCaffree and the Evans Schaaf Family, address the negative regional impacts potentially associated with LNG exports. They argue that local communities near shale gas production areas, pipelines, and/or LNG export terminals could be adversely affected by increases in natural gas production and LNG exports. They cite loss of property through eminent domain, property devaluation, degradation of infrastructure, environmental and public health issues (including local air pollution and poisoned drinking water), and harm to local economies, among other issues.

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. For example, the Marcellus Shale Coalition (comprised of nearly 200 producing, midstream, transmission, and supply chain members committed to the development of natural gas resources in the Marcellus, Utica, and related geological formations) cites the economic benefits of LNG exports to Pennsylvania's economy. The Coalition further asserts that increasing LNG exports is crucial to stabilizing domestic natural gas markets—particularly in the Appalachian Basin—and positioning these markets for continued growth.[169]

2. DOE/FE Response

A general consideration of regional impacts is outside of the scope of the 2018 LNG Export Study. DOE/FE believes regional impacts are appropriately considered on a case-by-case basis during the review of each non-FTA application, consistent with DOE/FE's longstanding practice.

E. Estimates of Domestic Natural Gas Supply

1. Comments

Jody McCaffree points to DOE/FE's total approved volume of exports to both FTA and non-FTA countries in alleging that DOE ''has already approved LNG exports in excess of projected U.S. production'' of natural gas.[170]

Other commenters, including API, CLNG, and the Marcellus Shale Coalition, assert that the United States has abundant domestic natural gas reserves. Pointing to the 2018 Study, CLNG asserts that ''[t]he scenarios where the U.S. reaps the most economic gains at the lowest price from exporting LNG are those where our supply of natural gas is highest.'' [171] CLNG further asserts that the United States is more than capable of continuing to meet high production and supply expectations, citing the growth of U.S. natural gas

[158] *Id.*

[159] Comment of NextDecade Corp. at 5.

[160] *Id.*

[161] Comment of JCEP at 5 (citing 2018 LNG Export Study at 64–65).

[162] 2018 LNG Export Study at 64.

[163] *Id.*

[164] *Id.* at 64–65.

[165] *Id.* at 66–67.

[166] *See Sierra Club* v. *U.S. Dep't of Energy,* Nos. 16–1186, 16–1252, 16–1253, 703 Fed. Appx. 1, at *3 (DC Cir. Nov. 1, 2017) (*Sierra Club II*), discussed *infra* at § I.C.

[167] *Id.* (emphasis added, internal quotations omitted, and alteration in original).

[168] *Id.*

[169] Comment of Marcellus Shale Coalition at 1–2.

[170] Comment of Jody McCaffree at 4.

[171] Comment of CLNG at 3.

production, the growth in total natural gas resource estimates, and improvements in the ability to detect and extract natural gas.

Commenters, such as API and the Pennsylvania Chamber of Business and Industry, likewise point to the conclusions of the 2018 Study in arguing that the vast resources of U.S. natural gas can provide affordable supplies to meet domestic demand, while simultaneously providing for an increase in LNG exports. The Pennsylvania Chamber of Business and Industry maintains that authorizing LNG exports results in a stable, affordable supply of natural gas to residential, commercial, and industrial customers. In the Chamber's view, the market development of natural gas, both domestically and abroad, promotes natural gas production and the build-out of natural gas transmission and LNG infrastructure in the United States.[172]

2. DOE/FE Response

First, DOE/FE notes that the volumes authorized for export to FTA and non-FTA countries are not additive to one another. Ms. McCaffree's argument does not appear to recognize this fact, which is reflected in DOE's orders. Rather, each authorization grants authority to export the entire volume of a facility to FTA or non-FTA countries, respectively, to provide the authorization holder with maximal flexibility in determining its export destinations. According to EIA data, U.S. domestic dry natural gas production for the year 2017 averaged a rate of 74.77 Bcf/d, well in excess of current long-term FTA and non-FTA authorizations (in non-additive volumes of 59.33 Bcf/d and 23.05 Bcf/d, respectively).[173]

DOE/FE takes note of the natural gas production projections in EIA's AEO 2018, which show significant increases over the forecast period. In the Reference case, dry natural gas production is projected to increase by 49% from 2016 to 2040 (26.94 Tcf to 40.15 Tcf).[174] In the High Oil and Gas Resource and Technology case, the growth from 2016 to 2040 in dry natural gas production is even larger at 85% (26.94 Tcf to 49.98 Tcf).[175]

F. Cost of Environmental Externalities

1. Comments

Several commenters, including Sierra Club, Oregon Wild, Jody McCaffree, and the Evans Schaaf Family, maintain that LNG exports will increase demand for natural gas, thereby increasing negative environmental and economic consequences associated with natural gas production. Sierra Club adds that every stage of the LNG lifecycle has important environmental impacts. These commenters assert that the 2018 Study failed to consider the cost of environmental externalities associated with LNG exports. The externalities identified by these commenters include, but are not limited to, the following:

- 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; and costs associated with increased water scarcity to support hydraulic fracturing;
- Environmental costs associated with the life cycle of U.S. LNG (hydraulic fracturing of shale gas, liquefaction, and export) in the form of increased emissions of GHGs and other global warming pollution, climate change and climate instability (including droughts and other extreme weather events), and ocean acidification;
- Local and regional costs associated with LNG exports, including impacts on local communities and industries;
- The costs associated with eminent domain, which may be necessary to build new pipelines to transport natural gas; and
- The potential regulatory costs and impacts of environmental regulations governing hydraulic fracturing and natural gas drilling.

According to Sierra Club, ''DOE has demonstrated that it plainly has the tools needed to consider these issues,'' [176] yet the 2018 Study failed to consider them. The Evans Schaaf Family also urges DOE to clarify what emissions are being calculated and whether a cost of those emissions has been included in the results of the 2018 Study.[177]

2. DOE/FE Response

Analysis of environmental impacts from the export of U.S. LNG was not part of the scope of the 2018 Study. Consistent with DOE/FE practice, all environmental issues will be analyzed in the final order issued in each of the pending and future non-FTA proceedings.

G. Natural Gas Price Impacts

1. Comments

Several commenters, such as IECA and Sierra Club, address potential natural gas price impacts associated with LNG exports. They contend that increases in LNG exports will increase demand for natural gas, driving up prices in the United States and adversely affecting electric and natural gas utility consumers, EITE industries, and residential consumers. In particular, IECA asserts that the 2018 Study's ''most likely'' scenario—LNG exports up to 30.7 Bcf/d by 2040—could increase prices 117% above today's Henry Hub prices by 2040, and 44% above EIA's AEO 2018 price in 2040 (which assumes 14.5 Bcf/d of LNG exports).[178] IECA alleges that such price hikes would threaten the domestic supply of natural gas at reasonable prices, such that exports of this magnitude would not be in the public interest.[179]

IECA further warns that ''excessive LNG exports'' may result in domestic prices for natural gas becoming tied to global demand-driven pricing.[180] According to IECA, when global demand increases, so will U.S. natural gas prices—to the detriment of U.S. consumers.

On the other hand, commenters such as API, NextDecade, and the Pennsylvania Chamber of Business and Industry dispute the likelihood of price increases due to LNG exports. For example, NextDecade points to the finding of the 2018 Study that U.S. natural gas prices are more dependent on both the availability of natural gas and extraction technology than on U.S. LNG export policy—which, it states, demonstrates the importance of policies that continue to support natural gas infrastructure, including LNG export authorizations. For this reason, NextDecade asserts, the 2018 Study shows that higher LNG exports cause only ''very small'' increases in U.S. natural gas prices, if any.[181]

These commenters contend that, in fact, there have been no significant price increases since exports of U.S. LNG began in 2016, contrary to warnings

[172] Comment of Pennsylvania Chamber of Business and Industry at 1–2.

[173] U.S. Energy Information Administration, ''Short-Term Energy Outlook,'' *available at: https://www.eia.gov/outlooks/steo/data/browser/#/?v=15&f=A&s=0&maptype=0&ctype=linechart* (Table 5a, U.S. Natural Gas Supply, Consumption, and Inventories, ''Total Dry Gas Production'').

[174] *See* AEO 2018, *supra* note 84, *https://www.eia.gov/outlooks/aeo/data/browser/#/?id=13-AEO2018&cases=ref2018&sourcekey=0;0* (link to table: Natural Gas Supply, Disposition, and Prices, ''Dry Gas Production'').

[175] *Id.*

[176] Comment of Sierra Club at 2.

[177] Comment of Evans Schaaf Family at 6.

[178] Comment of IECA at 2–3.

[179] *Id.* at 2 (citing *Fed. Power Comm'n* v. *Hope Gas Co.,* 320 U.S. 591, 610 (1944)).

[180] *Id.* at 1.

[181] Comment of NextDecade Corp. at 5–6 (citing 2018 LNG Export Study at 55).

made by commenters on DOE's prior LNG export studies. They point to the 2018 Study in arguing that domestic natural gas prices are unlikely to increase to a level that would impair manufacturing cost competitiveness or hurt consumers. According to API, the 2018 Study clearly shows that even at high levels of LNG exports, the impact on domestic prices is minimal because these exports are generating incremental new natural gas production that otherwise would not have a domestic market.[182] CLNG further argues that allowing U.S. Henry Hub indexed exports will help sustain lower pricing over the long-term and provide an alternative to oil-linked natural gas contracts.[183]

NextDecade states that, even in New England (which experiences frequent natural gas price spikes), the 2018 Study shows that the average base differential between New England and Henry Hub prices is unlikely to be affected by increases in LNG exports in the long run. As NextDecade explains, NERA found that these price spikes in New England are the result of the region's limited natural gas pipeline infrastructure and localized weather events. Therefore, NextDecade asserts, the prices spikes will continue regardless of the level of LNG exports.[184]

2. DOE/FE Response

The 2018 Study described two relationships between U.S LNG exports and U.S. natural gas prices based on the modeling results:

- ''Increasing U.S. LNG exports under any given set of assumptions about U.S. natural gas resources and their production leads to only small increases in U.S. natural gas prices;'' and
- ''Available natural gas resources have the largest impact on natural gas prices. Therefore, U.S. natural gas prices are far more dependent on available resources and technologies to extract available resources than on U.S. policies surrounding LNG exports.'' [185]

In the 2018 Study results, natural gas prices range from $5 to $6.50 per MMBtu in 2040 for all the Reference supply scenarios in the more likely range with a combined probability of 47%. In the high resource supply scenarios, natural gas prices range from $3.50 to $4 per MMBtu in 2040 with a combined probability of 22%.[186]

As an initial matter, IECA incorrectly identified the ''most likely'' scenario of LNG exports from the 2018 Study. ''Table 4'' in the Study provides the scenario probabilities for the more likely scenarios.[187] The most likely scenario has a probability of 14.5% and is the ''Ref_Ref_Ref_High'' case with exports of 24.0 Bcf/d in 2040.[188] This scenario is somewhat more likely than the Reference case (''Ref_Ref_Ref_Ref''), which has a probability of 13.1% and exports of 12.9 Bcf/d.[189] The 30.7 Bcf/d scenario (''High_Ref_Ref_High'') identified by IECA is the third most likely at 7.9%.[190]

Table 4 below shows modeled Henry Hub natural gas prices in 2040 for these three scenarios:'' [191]

TABLE 4—EXPORTS AND HENRY HUB PRICES FOR THREE MOST LIKELY SCENARIOS

Scenario	LNG exports in 2040 (Bcf/d)	Henry Hub in 2040 2016$/MMBtu
Ref_Ref_Ref_High	24.0	6.0
Ref_Ref_Ref_Ref	12.9	5.6
High_Ref_Ref_High	30.7	3.9

These Henry Hub prices in the 2018 Study are somewhat higher than those projected in EIA's AEO 2018. AEO 2018 projects LNG exports at a rate of 14.5 Bcf/d in the Reference case in 2040 with a corresponding Henry Hub price of $4.50 (in constant 2017 dollars). In the High Oil and Gas Resource and Technology (HOGR) case, LNG exports are larger at 21.9 Bcf/d with a Henry Hub price of $3.02.[192]

The price projections in the 2018 Study and in EIA's AEO 2018 are consistent with average annual Henry Hub spot prices over the past two decades. Between 2000 and 2009, annual average Henry Hub spot prices ranged from $3.38 to $8.86 per MMBtu; between 2010 and 2017, prices ranged from $2.52 to $4.37 per MMBtu.[193]

In response to comments noting that increased global demand for natural gas will increase domestic natural gas prices, several scenarios in the 2018 Study analyze this relationship and its domestic macroeconomic impact. Within a domestic natural gas supply scenario, increased ROW demand for natural gas increases domestic natural gas prices, all else being equal.[194] This increased ROW demand also causes prices throughout the world to increase.[195] The 2018 Study discusses this through an ''international demand pull'' scenario, quantifying the differences between the High_Ref_Ref_Low and High_Ref_Ref_High cases (where the only assumption changed is the ROW demand for natural gas). When moving from low to high ROW demand, the 2018 Study shows an increase in the Henry Hub price of $0.50 and an increase of $2.70 in the wellhead price outside of North America.[196] While domestic and ROW natural gas prices both increase, the increased ROW demand drives a larger increase in ROW prices than domestically. In this way, the 2018 Study shows that U.S. natural gas prices will not rise to the same levels as global natural gas prices as a result of increased LNG exports. This result is consistent with the 2015 Study's analysis of the linkages between U.S. and global natural gas prices, as DOE/FE previously discussed.[197]

As noted previously, the 2018 Study consistently shows macroeconomic benefits to the U.S. economy in every scenario at the projected Henry Hub

[182] Comment of API at 1.

[183] Comment of CLNG at 5.

[184] Comment of NextDecade Corp. at 6 (citing 2018 LNG Export Study at 54 n.47).

[185] 2018 LNG Export Study at 55.

[186] *Id.* at 54.

[187] *Id.* at 50–51.

[188] *Id.*

[189] *Id.*

[190] *Id.*

[191] 2018 LNG Export Study at Appendix E (pages unnumbered).

[192] AEO 2018, *supra* note 84, *https://www.eia.gov/outlooks/aeo/data/browser/#/?id=13-AEO2018&region=0-0&cases=highrt&start=2016&end=2050&f=A&sourcekey=0* (link to table: Natural Gas Supply, Disposition, and Prices, ''High resource and technology case,'' ''Natural gas spot price at Henry Hub'').

[193] *See* EIA, Henry Hub Natural Gas Spot Price (Annual), *available at: https://www.eia.gov/dnav/ng/hist/rngwhhda.htm* (Dec. 12, 2018).

[194] 2018 LNG Export Study at 57–58.

[195] *Id.* at 59.

[196] *Id.* at 57–60.

[197] *See, e.g., Golden Pass Products LLC,* DOE/FE Order No. 3978, at 91–92.

natural gas prices, as well as positive annual growth across the energy-intensive sectors.[198]

H. Benefits to U.S. Trade Balance

1. Comments

API and JCEP point to the conclusion of the 2018 LNG Export Study that increased exports of natural gas will improve the U.S. balance of trade. API further argues that LNG exports have helped to position the United States as an ''energy superpower,'' changing the ''energy equation'' to the benefit of the United States.[199]

NextDecade maintains that, with estimated export revenues of up to $129 billion per year by 2040, LNG exports present a significant opportunity to close the U.S. trade gap. NextDecade further states that, within the range of the Henry Hub price scenarios, the 2018 Study demonstrates that the United States is and will be a net exporter of natural gas—and, indeed, may ''emerge as the world's largest supplier of LNG in the coming years.'' [200] According to NextDecade, the 2018 Study also demonstrates that, even though natural gas supply and demand shocks both inside and outside of the United States have different impacts on natural gas prices, they result in similar levels of net LNG exports. Accordingly, NextDecade states that increased LNG exports will benefit the trade balance regardless of the volume exported.[201]

The Pennsylvania Chamber of Business and Industry agrees that the 2018 Study affirms the significant benefits that global trade can bring to the United States—specifically, through both LNG exports and in attracting new investment in manufacturing assets reliant on affordable natural gas.[202]

2. DOE/FE Response

Consistent with the observations on the benefits of trade made by the commenters, the 2018 Study notes that ''[i]ncreased exports of natural gas will improve the U.S. balance of trade and result in a wealth transfer into the U.S.'' [203]

I. Procedural Arguments

1. Compliance With Data Quality Act

a. Comments

IECA argues that the 2018 LNG Export Study violates the Data Quality Act (DQA) because: (i) NERA used a ''proprietary and non-reproducible economic model,'' and (ii) the Study's peer reviewers allegedly have a financial interest in LNG exports, such that they could not be independent in their views.[204] For these reasons, IECA contends that the 2018 Study ''cannot be used in decision-making by DOE.'' [205]

i. Background on Data Quality Act

In December 2000, Congress passed and the President signed the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106–554). Section 515 of that bill is commonly referred to as the ''Data Quality Act'' or the ''Information Quality Act.'' [206] Section 515 directed the Office of Management and Budget (OMB) to issue government-wide guidelines that ''provide policy and procedural guidance to Federal agencies for ensuring and maximizing the quality, objectivity, utility, and integrity of information (including statistical information) disseminated by Federal agencies . . . .'' [207]

Between 2001 and 2002, OMB published a series of guidelines and supplementary information implementing the Data Quality Act.[208] In final guidelines issued in February 2002, OMB instructed federal agencies to issue their own implementing guidelines by October 1, 2002. In its Guidelines, OMB observed that the Data Quality Act ''denotes four substantive terms regarding information disseminated by Federal agencies: quality, utility, objectivity, and integrity.'' [209] In October 2002, in response to OMB's Guidelines, DOE issued a document entitled *Final Report Implementing Office of Management and Budget Information Dissemination Quality Guidelines.*[210] DOE explained that it modeled its Guidelines on the OMB Guidelines with modifications specific to DOE.[211]

ii. IECA's Arguments

IECA argues that the 2018 Study violates three standards set forth in the DOE Guidelines: reproducibility, objectivity, and integrity.[212] The DOE Guidelines define these terms as follows:

- *Reproducibility:* ''means capability of being substantially reproduced, subject to an acceptable degree of imprecision, and with respect to analytical results, 'capable of being substantially reproduced' means that independent analysis of the original or supporting data using identical methods would generate similar analytic results . . . .'' [213]
- *Objectivity:* ''means the information is presented in an accurate, clear, complete, and unbiased manner and the substance of the information is accurate, reliable, and unbiased.'' [214]
- *Integrity:* ''means the information has been secured and protected from unauthorized access or revision, to ensure that the information is not compromised through corruption or falsification.[215]

IECA also asserts that the 2018 Study is ''influential'' under the DOE Guidelines, which is defined as:

> [W]hen used in the context of scientific, financial, or statistical information, information (1) that is subject to embargo until the date of its dissemination . . . because of potential market effects; (2) that is the basis for a DOE action that may result in an annual effect on the economy of $100 million or more; and (3) that is designated by a DOE Element as 'influential.' [216]

Information qualifying as ''influential'' is generally subject to a ''high degree of transparency of data and methods . . . to facilitate the reproducibility of [the] information by qualified third parties,'' unless it falls within a stated exemption.[217]

First, addressing reproducibility, IECA states that the 2018 Study uses a ''NERA proprietary economic model,'' such that ''third party economists have concluded that the results of the study

[198] 2018 LNG Export Study at 67, 70.

[199] Comment of API at 2.

[200] Comment of NextDecade Corp. at 4.

[201] *Id.* at 8.

[202] Comment of Pennsylvania Chamber of Business and Industry at 1–2.

[203] 2018 LNG Export Study at 64.

[204] Comment of IECA at 4.

[205] *Id.*

[206] Most federal agencies (including DOE) refer to section 515 as the ''Information Quality Act,'' but because IECA uses the ''Data Quality Act'' terminology, we will do so here.

[207] Section 515, Treasury & General Gov't Appropriations Act for Fiscal Year 2001 (Pub.L. 106–554; 114 Stat. 2763A–154)). The Data Quality Act amended the Paperwork Reduction Act of 1995 (44 U.S.C. Ch. 35).

[208] Office of Mgmt. & Budget, Guidelines for Ensuring and Maximizing the Quality, Objectivity, Utility, and Integrity of Information Disseminated by Federal Agencies; Republication, 67 FR 8452, 8452–8454 (Feb. 22, 2002) (summarizing OMB's procedural history in implementing section 515) [hereinafter OMB Guidelines].

[209] *Id.* (''quality'' is ''the encompassing term, of which 'utility,' 'objectivity,' and 'integrity' are the constituents); *see also id.* at 8459 (definition of ''quality'').

[210] U.S. Dep't of Energy, *Final Report Implementing Office of Management and Budget Info. Dissemination Quality Guidelines,* 67 FR 62446 (Oct. 7, 2002), *available at: https://www.energy.gov/sites/prod/files/nepapub/nepa_documents/RedDont/G-DOE-67FR6244 6OMBquality.pdf* [hereinafter DOE Guidelines].

[211] *Id.* at 62446–47.

[212] *See* Comment of IECA at 4–5.

[213] DOE Guidelines, 67 FR 62451 (Definition #9, ''Reproducibility'').

[214] *Id.* (Definition #7, ''Objectivity'').

[215] *Id.* (Definition #6, ''Integrity'').

[216] *Id.* (Definition #3, ''Influential'').

[217] *Id.* at 62452.

are not reproducible.'' [218] IECA also claims that the 2018 Study qualifies as ''influential'' under the DQA because ''it may result in an annual effect on the economy of $100 million or more.'' [219] IECA thus appears to suggest that the 2018 Study is subject to a ''high degree of transparency'' for purposes of reproducibility by ''qualified third parties.'' [220]

Second, IECA alleges that the 2018 Study is not ''objective'' and lacks ''integrity'' within the meaning of the DQA due to alleged personal bias on the part of NERA's external peer review panel. IECA claims that ''it is likely that every one of the individuals [involved in the peer review]—with the exception of peer reviewer John Staub of EIA—''have or will receive financial benefits from the oil and natural gas industries.'' [221] IECA contends that ''[i]ndependent objectivity and integrity is [sic] needed to validate the economic model and whether its assumptions are sound regardless of [the peer reviewers'] understanding of the oil and gas business, and not slanted to support the views of those who desire to export substantial volumes of LNG.'' [222] On this basis, IECA asks DOE whether the peer reviewers ''disclosed their financial association with the oil and gas industry.'' [223] The Evans Schaaf Family similarly questions the basis for the 2018 Study, given that (in their view) the data inputs for the Study ''are coming entirely from industry leaders who would likely have something to gain in developing LNG as a global commodity.'' [224]

b. DOE/FE Response

i. Reproducibility

DOE has carefully considered IECA's arguments and determined that the 2018 LNG Export Study satisfies the DQA's standard for ''reproducibility,'' as discussed below.

DOE/FE has determined that the 2018 Study fulfills the DQA's objectives in both providing transparency about the Study and ensuring the quality of information disseminated to the public. As discussed above, NERA relies on publicly available data for input into its models, including EIA's AEO 2017, EIA's IEO 2017, and the IEA's WEO 2016. The AEO and IEO projections are published pursuant to the Department of Energy Organization Act of 1977, which requires the EIA Administrator to prepare annual reports on trends and projections for energy use and supply.[225]

In the Study, NERA explains that it developed the possible choices for each uncertainty beginning with EIA's AEO 2017 Reference case—a DOE requirement of the Study. In addition, the 2018 Study discusses the U.S. and Rest of World natural gas market assumptions, including the linkages between the scenarios and publicly available projections from EIA and IEA. Appendix B to the Study describes the N_{ew}Era model and provides a detailed discussion of the natural gas supply elasticity estimates used in the U.S. supply scenarios, which were based on an analysis of four recent studies.[226] Appendix C provides the supply and demand ranges and probability scenarios.[227] Appendix E provides the detailed GNGM model results for the 54 scenarios considered in the 2018 Study, including levels of LNG exports, export revenues, natural gas production, natural gas consumption, Henry Hub prices, U.S. LNG destinations, and North American pipeline trade.[228] DOE/FE believes the incorporation of this extensive information about the data, assumptions, and models used in the 2018 Study satisfies the requirements of the DQA and the corresponding DOE guidelines. In short, DOE has ''disclose[d] the specific data sources that have been used and the specific quantitative methods and assumptions that have been employed.'' [229]

We note that IECA has not provided any evidence to support its claim that ''[t]hird party economists have concluded that the results of the study are not reproducible.'' [230] The public comment procedures followed by DOE/FE in this proceeding (as with its prior LNG export studies) allow IECA and other commenters to provide differing analyses about LNG exports—including third-party economic projections using EIA data—should they choose to do so. IECA elected not to submit any rebuttal studies, projections, or other evidence to counter the conclusions of the 2018 Study.

Next, even if the 2018 Study were ''influential'' under the DQA as IECA claims, the DOE Guidelines ''do not direct that all disseminated original and supporting data be subjected to the reproducibility requirement applicable to influential information.'' [231] The DOE Guidelines acknowledge that certain types of data are not practicably subject to replication due to ''confidentiality, privacy, trade secret, security, and intellectual property constraints,'' among others.[232] We further note that, in the DOE Guidelines, DOE declined to ''adopt a general prohibition against use of . . . 'third party proprietary models.' '' [233] DOE reasoned that such a prohibition was not required by the OMB Guidelines and ''would be too restrictive.'' [234]

Consistent with the DOE Guidelines, DOE/FE finds that, although NERA's proprietary GNGM and N_{ew}ERA models are intellectual property subject to trade secret and confidentiality constraints, the incorporation of the information about the data, assumptions, and models used in the 2018 Study satisfies the DQA and DOE's guidelines. For all of these reasons, we disagree with IECA's position that the 2018 Study fails to meet the reproducibility standard of the DOE Guidelines.[235]

ii. Objectivity

IECA acknowledges that the 2018 Study involved peer review by a panel of experts, but it attempts to discredit the Study by suggesting that the peer reviewers are financially self-interested in the outcome of the Study—specifically, in promoting the ''export of substantial volumes of LNG.'' [236] On this basis, IECA argues that the 2018 Study fails to meet the ''objectivity'' and ''integrity'' standards of the DOE Guidelines for this reason.[237] As explained below, however, IECA provides no evidence to support these allegations of bias, other than pointing to the professional affiliations of the peer review panel.

NERA explained the peer review process for the 2018 Study as follows:

> Nine experts on international LNG supply and demand, listed in the acknowledgement, agreed to review and comment on the proposed forecast assumptions and propose

[218] Comment of IECA at 4.

[219] *Id.* at 5.

[220] DOE Guidelines, 67 FR 62452.

[221] Comment of IECA at 5.

[222] *Id.*

[223] *Id.*

[224] Comment of Evans Schaaf Family at 1.

[225] *See* 2018 LNG Export Study at 80–95.

[226] *Id.* at 84–96 (Appx. B).

[227] *Id.* at 97–106 (Appx. C).

[228] *Id.* at 111 (Appx. E, with attached spreadsheet).

[229] DOE Guidelines, 67 FR 62452.

[230] Comment of IECA at 4.

[231] DOE Guidelines, 67 FR 62446, 62452.

[232] *Id.* at 62452.

[233] *Id.* at 62448.

[234] *Id.*

[235] We note that ''[t]he DOE Guidelines do not purport to impose legally binding substantive policies on DOE Elements.'' *Id.* at 62449. Additionally, ''neither section 515 [the DQA] nor the OMB Guidelines nor DOE's Guidelines create private rights or contemplate judicial oversight of its directives through judicial review.'' *Id.* at 62450.

[236] Comment of IECA at 5; *see also* Comment of Evans Schaaf Family at 1 (stating that the 2018 Study's probabilities are ''problematic'' because ''they are coming entirely from industry leaders who would likely have something to gain in developing LNG as a global commodity'').

[237] Comment of IECA at 5.

modifications to the probabilities assigned to each case. The reviewers were provided with a brief written report describing the proposed probabilities and assumptions. KeyLogic Systems, Inc. gathered the individual reviewer's responses and provided them to the study team for consideration.[238]

Each of these experts' names and institutional affiliations are identified in the Study.[239] Their invitation to participate as peer reviewers came directly from DOE/FE, consistent with standard protocols for peer review. In the Study (and as discussed above), NERA identified both the probability assumptions and any changes made to those assumptions based on input from the peer reviewers.[240]

IECA alleges that eight of the nine peer reviewers ''have or will receive financial benefits from the oil and natural gas industries.'' IECA expressly omits John Staub of EIA from this allegation—presumably because he works for the U.S. Government, whereas the other eight peer reviewers work for entities including universities, independent research firms, and consulting firms.[241]

IECA suggests that the peer reviewers' input to the 2018 Study is self-interested and lacking objectivity, such that NERA's modifications to the Study based upon the peer reviewers' feedback are likewise tainted. However, IECA fails to demonstrate how the professional affiliations of the peer reviewers create bias or how that alleged bias impacted the design or results of the 2018 Study.

IECA also does not acknowledge that NERA selected the peer reviewers because they are ''experts on the topic of global LNG supply and demand.'' [242] This is consistent with the DOE Guidelines, which note that, under OMB policy, peer reviewers should ''be selected primarily on the basis of necessary technical expertise.'' [243] In the Study, NERA explained its determination that these peer reviewers would assist in providing the ''broadest possible perspective on the potential range of natural gas supply and demand outcomes during the review period.'' [244] The participation of the peer reviewers thus enhanced, rather than undermined, both the objectivity and the integrity of the Study.

Finally, although IECA invokes the ''integrity'' standard under the DOE Guidelines, that standard pertains to ensuring that ''information has been secured and protected from unauthorized access or revision.'' [245] IECA has not presented any argument or evidence to suggest that the security of the 2018 Study was compromised, and therefore we decline to address this point.

2. Reliance on NERA's Analysis

a. Comments

John Young does not expressly oppose the 2018 Study, but he questions DOE's reliance on NERA's work in the 2018 Study for reasons independent of the Data Quality Act. Mr. Young asks whether DOE has examined NERA's ''track record in retrospect''—and, specifically, whether DOE has attempted to square NERA's ''optimism'' for U.S. LNG exports given that some proposed LNG projects have not yet moved forward or achieved revenue flow. He urges DOE to hire Synapse Energy Economics (Synapse) as a third party contractor to critique the 2018 Study. According to Mr. Young, Synapse has published critiques of LNG exports and natural gas projects, which he suggests would allow Synapse to critique the 2018 Study.

b. DOE/FE Response

In response, DOE/FE notes that the scenarios evaluated by NERA were based on four different uncertainties affecting natural gas markets, with three different cases for U.S. natural gas supply based on EIA's AEO 2017. As explained above, NERA enlisted external peer review of the Study's scenario design and probability assignments, and made modifications based on feedback from the peer reviewers. NERA also made clear that ''[its] findings . . . may contain projections based on current data and historical trends,'' and that ''[a]ny such predictions are subject to inherent risks and uncertainties.'' [246] Additionally, consistent with its past practice, DOE/FE has made the 2018 Study available for public comment. Commenters were free to submit a third-party critique of the 2018 Study by Synapse or other firms, although none did.

J. Potential Impact on DOE/FE's Regulatory Process

1. Pending Non-FTA Applications

a. Comments

The Evans Schaaf Family states that, ''given the 68% probability [in the 2018 Study] that U.S. LNG exports will be between 9.0 and 30.7 Bcf/d in 2040,'' DOE ''has an obligation to look closely at individual proposed projects, including where the gas is sourced, to determine whether or not projects are consistent with the public interest . . . .'' [247] In the Family's view, the 2018 Study implies that FE ''[should] approve all 55.04 Bcf/d LNG export projects for non-FTA export.'' [248] The Family disagrees with this implication, and urges DOE against assuming that ''all LNG projects are equal.'' [249]

Other commenters argue that, given the results of the 2018 Study and DOE's prior macroeconomic studies, DOE/FE should proceed expeditiously in reviewing and approving all pending applications to export LNG to non-FTA countries. API asserts that any unnecessary delay in approving non-FTA applications will put U.S. projects at ''a competitive disadvantage in the global race to construct LNG facilities,'' such that the United States will miss out on the economic and foreign policy gains associated with market-determined levels of U.S. LNG exports.[250] JCEP states that DOE/FE should promptly approve the pending applications following the completion of the environmental review for each facility.[251] CLNG similarly contends that, on the basis of the 2018 Study and DOE's LNG export regulatory program to date, ''DOE is fully armed to approve the remaining applications for export and should do so without delay.'' [252] LNG Allies states that DOE can now ''safely shift its policy perspective to grant approvals to all . . . export applications to non-FTA countries without the need for any further macroeconomic studies (at least for the next four to five years).'' [253] Citing the 2018 Study, NextDecade asserts that ''DOE should continue approving export applications so that regulatory barriers do not distort the proper functioning of the marketplace.'' [254] Finally, JCEP maintains that any opponent of LNG exports would need to make an

[238] 2018 LNG Export Study at 41.

[239] *Id.* at 1 (Acknowledgment).

[240] *See id.* 42–44.

[241] *See id.* at 1 (identifying the peer reviewers, besides John Staub of EIA, as: Kevin Book (ClearView Energy Partners, LLC); Dr. Fereidun Fesharaki (Facts Global Energy); Dr. Hillard G. Huntington (Stanford University, Dep't. of Management Science and Engineering); Vello A. Kuuskraa (Advanced Resources International, Inc.); Majed Limam and Mike Reimers (Poten and Partner's Americas LNG & Natural Gas Consulting); and Dr. Scott Tinker (University of Texas, Bureau of Economic Geology)).

[242] *Id.* at 1, 42.

[243] DOE Guidelines, 67 FR 62352 (citation omitted).

[244] 2018 LNG Export Study at 24.

[245] DOE Guidelines, 67 FR 62451.

[246] *Id.* at 1–2.

[247] Comment of Evans Schaaf Family at 8.

[248] *Id.*

[249] *Id.*

[250] Comment of API at 2.

[251] Comment of JCEP at 5–6.

[252] Comment of CLNG at 2; *see also id.* at 6.

[253] Comment of LNG Allies at 2.

[254] Comment of NextDecade Corp. at 4.

''overwhelming showing'' that an individual export proposal is inconsistent with the public interest, so as to overcome both the presumption in favor of exports codified in section 3(a) of the NGA and the findings of the 2018 LNG Export Study.[255]

b. DOE/FE Response

As mentioned above, the 2018 Study found a ''positive correlation between GDP and LNG exports for the more likely scenarios in 2040.'' [256] Under the NGA section 3(a), DOE examines each pending non-FTA application to determine whether the proposed exports are in the public interest.

As discussed in prior non-FTA orders, DOE/FE reviews a substantial administrative record for each application proceeding under NGA section 3(a). That record typically includes (but is not limited to) the following: The application; any motions to intervene, protests, and/or comments submitted in response to the notice of application; DOE's environmental studies (*i.e.,* the Addendum [257] and the Life Cycle Greenhouse Gas Report); [258] public comments received on DOE/FE's various analyses; any final environmental document for the export facility issued by FERC or the U.S. Maritime Administration (MARAD) under NEPA (such as a final environmental impact statement or environmental assessment); [259] and any order by FERC or MARAD granting or denying authorization for the applicant to site, construct, and operate the export facility. Accordingly, DOE/FE does not prejudge any of the pending non-FTA applications on the basis of the 2018 LNG Export Study alone. For the reasons discussed herein, the 2018 LNG Export provides significant supporting evidence in DOE/FE's public interest analysis under NGA section 3(a), but the 2018 Study is one of many considerations in DOE/FE's decision-making. Consistent with its past practice, DOE/FE will evaluate each pending non-FTA application as required under the NGA and NEPA, based on the administrative record compiled in each individual proceeding.

2. Extended Term of Non-FTA Authorizations

a. Comments

LNG Allies and Cheniere assert that the design of the 2018 Study will allow for greater flexibility for DOE/FE's regulatory process going forward. They point out that, whereas DOE's prior studies had a horizon of 20 years, the 2018 Study extends 30 years into the future (*i.e.,* through December 31, 2050). Therefore, Cheniere asserts, ''[t]he findings establish an evidentiary basis for DOE/FE to make public interest determinations and [issue] export authorizations for 30-year terms.'' [260] On this basis, these commenters urge DOE/FE to: (i) Grant new non-FTA authorizations for a term of 30 years, and (ii) initiate a consolidated proceeding to add an additional 10-year term to the existing 20-year LNG export authorizations for both FTA and non-FTA countries. They assert that the LNG industry would receive substantial benefits from extended 30-year authorizations—particularly since, for foreign buyers deciding between U.S. LNG and alternative long-term sources, longer authorization periods may prove decisive.

b. DOE/FE Response

A request to extend the term for existing or future non-FTA authorizations goes beyond the scope of this proceeding. If, in the future, DOE/FE decides to propose an extended export term for existing or future non-FTA orders, DOE/FE will commence a new docket proceeding and publish notice of the proposal in the **Federal Register.** Insofar as any authorization holder wishes to request a longer export term for an existing FTA authorization, it is free to do so at any time under NGA section 3(c).[261]

3. Policy Recommendations

a. Comments

IECA recommends that DOE/FE implement two policy changes to ensure that the U.S. economy benefits from LNG exports. First, IECA states that DOE/FE should ensure that price levels for U.S. LNG are not dictated by global demand, as is currently happening with prices for U.S. crude oil (in IECA's view). IECA states that DOE's policy should be ''to export LNG volumes to levels where demand in China, Japan, South Korea, India, and the EU [European Union] will not determine [U.S.] prices.'' [262] According to IECA, such a policy is especially important during the winter heating season because the largest LNG importing countries have winter at the same time as the United States—potentially resulting in global price spikes for heating and electricity.[263]

Second, IECA asks DOE/FE to ''issue an order that would specify that it is unlawful for U.S. LNG exports to be shipped to countries that subsidize natural gas to their manufacturing industry.'' [264] As discussed above, IECA argues that allowing exports of U.S. LNG to ''subsidizing'' countries damages the competitiveness of U.S. manufacturing and threatens U.S. jobs.

b. DOE/FE Response

The policy recommendations offered by IECA go beyond the scope of this proceeding. DOE/FE takes no position on the proposed policy recommendations at this time.

VII. Discussion and Conclusions

DOE/FE commissioned the 2018 LNG Export Study and invited the submission of responsive comments on the Study. DOE/FE has analyzed this material and determined that the 2018 Study provides substantial support for the pending non-FTA applications identified in this docket, as well as future non-FTA applications within the export volumes considered by the 2018 Study (0.1 to 52.8 Bcf/d of natural gas). Specifically, the conclusion of the 2018 LNG Export Study is that the United States will experience net economic benefits from issuance of authorizations to export domestically produced LNG. Other key findings of the 2018 Study include:

- ''Increasing U.S. LNG exports under any given set of assumptions about U.S. natural gas resources and their production leads to only small increases in U.S. natural gas prices.'' [265]

[255] Comment of JCEP at 6.

[256] 2018 LNG Export Study at 67.

[257] *Addendum to Environmental Review Documents Concerning Exports of Natural Gas From the United States,* 79 FR 48132 (Aug. 15, 2014). The Addendum and related documents are available at: *https://www.energy.gov/sites/prod/files/2014/08/f18/Addendum.pdf.*

[258] *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States,* 79 FR 32260 (June 4, 2014). The Life Cycle Greenhouse Gas Report is available at: *http://energy.gov/fe/life-cycle-greenhouse-gas-perspective-exporting-liquefied-natural-gas-united-states.*

[259] Typically, the Federal agency responsible for permitting the export facility—usually either FERC or MARAD—serves as the lead agency in the NEPA review process, and DOE serves as a cooperating agency. Where no other Federal agency is responsible for permitting the export facility, DOE serves as the lead agency in the NEPA review process.

[260] Comment of Cheniere at 2.

[261] 15 U.S.C. 717b(c) (requiring DOE to grant applications for FTA authorizations, including applications to amend such authorizations, ''without modification or delay'').

[262] Comment of IECA at 1 (defining ''subsidize'' as ''a foreign government and/or foreign government related entities that in whole or part, are either owned, controlled or regulated by such government entities, provide natural gas to their industrial and or electric generating sectors at prices that are below the market or purchased costs.'').

[263] *Id.*

[264] *Id.* at 7.

[265] 2018 LNG Export Study at 55.

• ''Increased exports of natural gas will improve the U.S. balance of trade and result in a wealth transfer into the United States.'' [266]

• ''Overall [U.S.] GDP improves as LNG exports increase for all scenarios with the same U.S. natural gas supply condition.[267]

• ''There is no support for the concern that LNG exports would come at the expense of domestic natural gas consumption.'' [268]

• ''[A] large share of the increase in LNG exports is supported by an increase in domestic natural gas production.'' [269]

• ''Natural gas intensive [industries] continue to grow robustly at higher levels of LNG exports, albeit at slightly lower rates of increase than they would at lower levels.'' [270]

We have evaluated the public comments submitted in response to the 2018 Study. None of the eight comments opposing the 2018 Study have provided sufficient evidence to rebut or otherwise undermine these findings.

Specifically, the opposing comments criticize aspects of the models, assumptions, and design of the 2018 Study. As discussed above, however, EIA's most recent projections in AEO 2018 continue to show market conditions that will accommodate increased exports of natural gas. When compared to prior AEO Reference cases (including AEO 2017's Reference case used in the 2018 Study), the AEO 2018 Reference case projects increases in domestic natural gas production—well in excess of what is required to meet projected increases in domestic consumption. Accordingly, DOE/FE finds that the 2018 LNG Export Study is fundamentally sound and supports the proposition that exports of LNG from the lower-48 states, in volumes up to and including 52.8 Bcf/d of natural gas, will not be inconsistent with the public interest.[271]

As stated above, DOE will consider each application as required under the NGA and NEPA based on the administrative record compiled in each individual proceeding.

Signed in Washington, DC, on December 20, 2018.

Steven E. Winberg,

Assistant Secretary, Office of Fossil Energy.

[FR Doc. 2018–28238 Filed 12–27–18; 8:45 am]

BILLING CODE 6450–01–P

[266] *Id.* at 64.

[267] *Id.* at 67.

[268] *Id.* at 77.

[269] *Id.* at 77.

[270] *Id.* at 70.

[271] 2018 LNG Export Study at 63 & Appx F.

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

[Docket No. EL19–16–000]

Michigan Electric Transmission Company, LLC; Notice of Institution of Section 206 Proceeding and Refund Effective Date

On December 20, 2018, the Commission issued an order in Docket No. EL19–16–000, pursuant to section 206 of the Federal Power Act (FPA), 16 U.S.C. 824e (2012), instituting an investigation into whether the transmission formula rate of Michigan Electric Transmission Company, LLC may be unjust, unreasonable, or unduly discriminatory or preferential. *Int'l Transmission Co., et al.,* 165 FERC 61,236 (2018).

The refund effective date in Docket No. EL19–16–000, established pursuant to section 206(b) of the FPA, will be the date of publication of this notice in the **Federal Register**.

Any interested person desiring to be heard in Docket No. EL19–16–000 must file a notice of intervention or motion to intervene, as appropriate, with the Federal Energy Regulatory Commission, 888 First Street NE, Washington, DC 20426, in accordance with Rule 214 of the Commission's Rules of Practice and Procedure, 18 CFR 385.214, within 21 days of the date of issuance of the order.

Dated: December 20, 2018.

Nathaniel J. Davis, Sr.,

Deputy Secretary.

[FR Doc. 2018–28253 Filed 12–27–18; 8:45 am]

BILLING CODE 6717–01–P

DEPARTMENT OF ENERGY

Federal Energy Regulatory Commission

Combined Notice of Filings #2

Take notice that the Commission received the following electric rate filings:

Docket Numbers: ER10–1276–008; ER10–1287–007; ER10–1292–007; ER10–1303–007; ER10–1319–009; ER10–1353–009.

Applicants: Consumers Energy Company, CMS Energy Resource Management Company, Grayling Generating Station Limited Partnership, Genesee Power Station Limited Partnership, CMS Generation Michigan Power, LLC, Dearborn Industrial Generation, L.L.C.

Description: Supplement to May 31, 2018 Notice of Non-Material Change-In-Status of Consumer Energy Company, et al.

Filed Date: 12/20/18.

Accession Number: 20181220–5208.

Comments Due: 5 p.m. ET 1/10/19.

Docket Numbers: ER10–2390–004.

Applicants: Bicent (California) Malburg LLC.

Description: Updated Market Power Analysis for the Southwest Region of Bicent (California) Malburg LLC.

Filed Date: 12/20/18.

Accession Number: 20181220–5190.

Comments Due: 5 p.m. ET 2/19/19.

Docket Numbers: ER12–1946–012; ER10–1333–012; ER13–2387–006; ER15–190–009; ER17–543–006; ER18–1343 003.

Applicants: Duke Energy Beckjord, LLC, Duke Energy Florida, LLC, Duke Energy Commercial Enterprises, Inc., Duke Energy Renewable Services, LLC, Duke Energy SAM, LLC, Carolina Solar Power, LLC.

Description: Notice of Change in Status of the Duke MBR Sellers.

Filed Date: 12/20/18.

Accession Number: 20181220–5192.

Comments Due: 5 p.m. ET 1/10/19.

Docket Numbers: ER18–920–001.

Applicants: Marco DM Holdings, L.L.C.

Description: Triennial Market Power Update for the Southwest Power Pool Region of Marco DM Holdings, L.L.C.

Filed Date: 12/20/18.

Accession Number: 20181220–5218.

Comments Due: 5 p.m. ET 2/19/19.

Docket Numbers: ER18–1646–001.

Applicants: Electric Energy, Inc.

Description: eTariff filing per 1450: Amended Show Cause Response to be effective 3/21/2018.

Filed Date: 12/20/18.

Accession Number: 20181220–5125.

Comments Due: 5 p.m. ET 1/10/19.

Docket Numbers: ER19–132–001.

Applicants: Niagara Mohawk Power Corporation, New York Independent System Operator, Inc.

Description: Compliance filing: NMPC Compliance: Depreciation Rates to be effective 4/1/2018.

Filed Date: 12/20/18.

Accession Number: 20181220–5127.

Comments Due: 5 p.m. ET 1/10/19.

Docket Numbers: ER19–329–001.

Applicants: AEP Texas Inc.

Description: Tariff Amendment: AEPTX-Shakes Solar Interconnection Agreement First Amend & Restated to be effective 12/14/2018.

Filed Date: 12/20/18.

Accession Number: 20181220–5106.

Comments Due: 5 p.m. ET 1/10/19.

Docket Numbers: ER19–627–000.

Applicants: Florida Power & Light Company.