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December 23, 2015

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Mr. John Anderson
Office of Fuels Programs, Fossil Energy
U.S. Department of Energy
Docket Room 3F-056, FE-50
Forrestal Building
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Re: In the Matter of Rio Grande LNG, LLC
FE Docket No. 15-190-LNG
Application for Long-Term Authorization to Export Liquefied Natural Gas to Free Trade Agreement and Non-Free Trade Agreement Countries

Dear Mr. Anderson:

Enclosed for filing on behalf of Rio Grande LNG, LLC ("Rio Grande LNG"), please find Rio Grande LNG's application for long-term, multi-contract authorization to engage in exports of up to 1.318 trillion cubic feet per year of natural gas in the form of liquefied natural gas ("LNG"), which is the equivalent of approximately 27 million metric tonnes per annum or 1.400 quadrillion British thermal units per year.[1] Rio Grande LNG seeks authorization for individual 20-year terms for each of the Rio Grande LNG export project's six (6) liquefaction trains, with such terms commencing on the earlier of (a) the date of first export of LNG produced by each respective train, or (b)(i) for the first four (4) trains to be constructed, seven (7) years from the date the authorization is issued, and (ii) for the last two (2) trains to be constructed, eight (8) years from the date the authorization is issued. Further, the request is for authorization to export LNG to any nation that currently has or develops the capacity to import LNG, whether or not the United States currently has, or in the future enters into, a Free Trade Agreement requiring the national treatment for trade in natural gas and LNG, so long as trade with such country is not prohibited by U.S. law or policy.

Should you have any questions about the foregoing, please feel free to contact the undersigned at 202-662-4555.

Respectfully submitted,

/s/ Erik J.A. Swenson
Erik J.A. Swenson
Islara U. Irgit
Attorneys for Rio Grande LNG, LLC

EJAS/IUI
Enclosure: Application for Authorization to Export LNG

[1] A check in the amount of $50.00 is being provided separately via courier as the filing fee stipulated by 10 C.F.R. § 590.207 (2015).

UNITED STATES OF AMERICA
BEFORE THE DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

In The Matter Of:	**)**	
	)	
RIO GRANDE LNG, LLC	**)**	**FE Docket No. 15-190-LNG**
	)	

APPLICATION FOR LONG-TERM, MULTI-CONTRACT AUTHORIZATION TO EXPORT LIQUEFIED NATURAL GAS

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APPLICATION FOR LONG-TERM, MULTI-CONTRACT AUTHORIZATION TO EXPORT LIQUEFIED NATURAL GAS

Pursuant to Section 3 of the Natural Gas Act ("NGA")[1] and Part 590 of the Department of Energy's ("DOE") regulations,[2] Rio Grande LNG, LLC ("Rio Grande LNG") hereby requests that DOE, Office of Fossil Energy ("FE"), grant long-term, multi-contract authorization for Rio Grande LNG to engage in exports of up to 1.318 trillion cubic feet per year ("Tcf/y") of natural gas in the form of liquefied natural gas ("LNG"), which is the equivalent of approximately 27 million metric tons per annum ("MTPA") and 1.400 quadrillion British thermal units per year ("Btu/y") or 1,400,000,000 million Btu/y of natural gas.[3] Rio Grande LNG requests this

[1] 15 U.S.C. § 717b (2012).

[2] 10 C.F.R. Part 590 (2015).

[3] Based on 0.6 billion cubic feet per day ("Bcf/d") per train and a maximum of 366 days per yer. The equivalent amount can also be derived from taking the project's rated output of 27 MTPA and multiplying by 48.7 Bcf per million metric tons of LNG of natural gas. *See Appendix 2: Conversion Table*, Center for Energy Economics, http://www.beg.utexas.edu/energyecon/lng/LNG_introduction_12.php (last visited Oct. 27, 2015) (listing conversion factors). The volumetric conversion of natural gas to heat content in Btu is based upon 1 cubic foot ("cf") = 1,062 Btu. This conversion factor represents the average heat content of 1 standard cubic foot of natural gas at Station 35 (Texas) of Williams' Transcontinental Pipeline from July 4, 2015 to October 1, 2015. *Daily Gas Quality Values*, Williams, http://www.1line.williams.com/SCADAData/jsp/GasQualityFilterTransco.jsp (last visited Oct. 23, 2015) (input "07/04/2015" into the "From" box and "10/01/2015" into the "To" box, select "Station 35," and click "view data"). During this period, the heat content ranged from a maximum of 1,076.7 Btu/cf to a minimum of 1,050.2 Btu/cf with a median of 1,062 Btu/cf and an average of 1,062 Btu/cf. *Id.* Any conversion between tonnes of LNG and cubic feet of natural gas is only approximate because the volume of a given mass of natural gas varies with the chemical composition of the natural gas. Similarly, the heat content of a given mass or volume of LNG or natural gas will vary according to the chemical composition of the LNG or natural gas.

authorization provide for individual 20-year terms[4] for each of the six (6) liquefaction trains at Rio Grande LNG's proposed LNG project ("Rio Grande LNG Project"). Rio Grande LNG further requests that such terms commence on the earlier of (a) the date of first export from each respective train, or (b)(i) for the first four (4) trains to be constructed, seven (7) years from the date authorization is issued to export LNG from the Rio Grande LNG Project, and (ii) for the last two (2) trains to be constructed, eight (8) years from the date such authorization is issued.

The Rio Grande LNG Project is to be located in Cameron County, Texas, along the north embankment of the Brownsville Ship Channel ("BSC").[5] Rio Grande LNG proposes to export LNG to (i) any nation that currently has or develops the capacity to import LNG via ocean-going carrier and with which the United States currently has, or in the future enters into, a Free Trade Agreement requiring the national treatment for trade in natural gas and LNG ("FTA Country" or "FTA Countries"); and (ii) any nation (a) with which the U.S. does not have an FTA requiring the national treatment for trade in natural gas and LNG; (b) that has, or in the future develops, the capacity to import LNG via ocean-going carrier; and (c) with which trade is not prohibited by

[4] Rio Grande LNG also requests authorization to continue exporting LNG for a total of up to three (3) consecutive years immediately following the end of each of the requested primary 20-year export terms (the "Make-Up Periods") as may be necessary to bring total exports up to the full volume of exports authorized during the primary term if circumstances make it impracticable to export such volume during the primary term. This request does not affect or modify the total volume of LNG requested for export herein, as Rio Grande LNG understands that to export additional volumes not previously authorized for export, it will be required to obtain appropriate authorization from the DOE/FE. *See generally Sabine Pass Liquefaction, LLC, 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*, DOE/FE Order No. 3669, Ordering Paragraph C, FE Docket Nos. 13-30-LNG, 13-42-LNG,13-121-LNG, at 215, 222-23 (June 26, 2015) [hereinafter *Sabine Pass, DOE/FE Order No. 3669*]; *Dominion Cove Point LNG, LP, Final Opinion and Order Granting Long-Term, Multi-Contract Authorization to Export Liquified Natural Gas by Vessel From The Cove Point LNG Terminal In Calvert County, Maryland, To Non-Free Trade Agreement Nations*, DOE/FE Order No. 3331-A, Ordering Paragraph C, FE Docket No. 11-128-LNG (May 7, 2015) (illustrating that the DOE/FE has authorized such a Make-Up Period) [hereinafter *Cove Point, DOE/FE Order 3331-A*].

[5] The Rio Grande LNG Project site is located at approximately Latitude (North): 26° 1' and Longitude (West): 97° 15". A locator map and additional graphical information showing the specific and relative location of the Rio Grande LNG Project site is attached hereto as Appendix A. Rio Grande LNG currently holds a Lease Option Agreement granting it the exclusive right to lease the approximately 1,000-acre Rio Grande LNG Project site from the current landowners, the Brownsville Navigation District. See Appendix B.

U.S. law or policy (a "Non-FTA Country" or "Non-FTA Countries"). Rio Grande LNG is requesting this authorization both on its own behalf and as agent for third parties who hold title to the LNG at the time of export.

In support of the instant application ("Application"), Rio Grande LNG states as follows:

I.
COMMUNICATIONS AND CORRESPONDENCES

Rio Grande LNG requests that all communications and correspondence regarding this Application, including all service of pleadings and notices, be directed to the persons listed on the cover page of this Application at the addresses provided.[6]

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II.
DESCRIPTION OF THE APPLICANT

The exact legal name of Rio Grande LNG is Rio Grande LNG, LLC. Rio Grande LNG is a limited liability company organized under the laws of Texas with its principal place of business located at 3 Waterway Square Place, Suite 400, The Woodlands, Texas 77380. Its telephone number is (713) 574-1880 and its fax number is (832) 403-3041.

[6] Rio Grande LNG requests waiver of Section 590.202(a) of the DOE regulations to the extent necessary to include outside counsel on the official service list in this proceeding. 10 C.F.R. § 590.202(a). Pursuant to 10 C.F.R. § 590.103(b), Rio Grande LNG hereby certifies that the persons listed herein are the duly authorized representatives of Rio Grande LNG.

Rio Grande LNG is 100% owned by NextDecade, LLC ("NextDecade"). NextDecade is a U.S. energy project development and management company formed around a team of professionals, each with decades of experience in international LNG projects and the energy industry. NextDecade is a limited liability company organized under the laws of Delaware with its principal place of business located at 3 Waterway Square Place, Suite 400, The Woodlands, Texas 77380. Its telephone number is (713) 574-1880 and its fax number is (832) 403-3041.

NextDecade has 12 investors, as follows:

1. Four of NextDecade's owners are investment funds managed by York Capital Management, L.P. (collectively, the "York Funds"). York Capital Management, L.P. is a limited partnership organized under the laws of Delaware, and its principal place of business is located at 2711 Centerville Road, Suite 400, Wilmington, Delaware 19808. Its telephone number is (212) 300-1304 (office of the General Counsel), and its fax number is (212) 300-1301. The individual York Funds and their respective ownership interests in NextDecade are:
    - York Select, L.P. (3.35%);
    - York Capital Management, L.P. (10%);
    - York Credit Opportunities Fund, L.P. (11.43%); and
    - York Global Finance 43, LLC (38.16%).

    Of the York Funds, only York Capital Management, L.P., York Credit Opportunities Fund, L.P. and York Global Finance 43, LLC individually possess 10% or more of the voting securities of NextDecade. No single entity possesses more than 10% of the voting securities in either the York Capital Management, L.P., York Credit Opportunities Fund, L.P. or York Global Finance 43, LLC. Each of the above

investor funds within the York Funds portfolio is organized under the laws of Delaware and has the following registered address: Corporation Service Company, 2711 Centerville Road, Suite 400, Wilmington, Delaware 19808.

2. Four of NextDecade's owners are investment funds managed by Valinor Management, L.P. (collectively, the "Valinor Funds"). Valinor Management, L.P. is a limited partnership organized under the laws of Delaware, and its principal place of business is located at 510 Madison Avenue, 25th Floor, New York, New York 10022. Its telephone number is (212) 918-5226, and its fax number is (212) 918-5246. The individual Valinor Funds and their respective ownership interests in NextDecade are:

    - Valinor Capital Partners SPV XIX, LLC (4.19%);
    - Valinor Capital Partners SPV XXI, LLC (9.56%);
    - Valinor Capital Partners SPV XXII, LLC (0.87%); and
    - VND Partners, LLC (4.79%).

    No single Valinor Fund possesses 10% or more of the voting securities of NextDecade. Each of the Valinor Funds is a limited liability company organized under the laws of Delaware and has the same principal place of business as Valinor Management, L.P. Any of the Valinor Funds can be contacted through Valinor Management, L.P.

3. Three of NextDecade's owners are investment funds managed by Halcyon Energy Investors LP (collectively, the "Halcyon Funds"). Halcyon Energy Investors LP is a limited partnership organized under the laws of Delaware, and its principal place of business is located at 477 Madison Ave. 8th Floor, New York, NY 10022. Its telephone number is (212) 303-9400, and its fax number is (212) 935-1831. The

individual Halcyon Funds and their respective ownership interests (rounded to the nearest one-hundredth of one percent) in NextDecade are:

- Halcyon Energy, Power, and Infrastructure Capital Master Fund LP (2.37%);
- HCN LP (4.05%); and
- Halcyon Mount Bonnell Fund LP (2.63%).

No single Halcyon Fund possesses 10% or more of the voting securities of NextDecade. Halcyon Energy, Power, and Infrastructure Capital Master Fund LP and HCN LP are limited partnerships organized under the laws of the Cayman Islands, and Halcyon Mount Bonnell Fund LP is a limited partnership organized under the laws of the state of Delaware. Each of these investment funds has the same principal place of business as Halcyon Energy Investors LP. Any of the Halcyon Funds can be contacted through Halcyon Energy Investors LP.

4. The remaining 8.59%[7] of NextDecade is owned by an individual, Ms. Kathleen Eisbrenner, who also serves as the company's Chief Executive Officer ("CEO"). Ms. Eisbrenner was previously the Chief Commercial Officer of El Paso Energy's Global LNG business unit, a founder and CEO of Excelerate Energy, and the Executive Vice President of Shell's Global LNG business unit. Other members of the executive management team of NextDecade also possess significant project development and marketing experience in the international LNG business. Ms. Eisbrenner is a U.S. citizen and can be contacted through NextDecade. The exact legal name of Rio Grande LNG is Rio Grande LNG, LLC. Rio Grande LNG is a limited liability

[7] Sum of identified interests does not equal 100% due to rounding stated ownership interests to the nearest one-hundredth of one percent.

company organized under the laws of Texas with its principal place of business located at 3 Waterway Square Place, Suite 400, The Woodlands, Texas, 77380. Its telephone number is (713) 574-1880, and its fax number is (832) 426-1874.

III.
EXECUTIVE SUMMARY

Rio Grande LNG hereby seeks multi-contract, long-term authorization to engage in exports of up to 1.318 Tcf/y of natural gas in the form of LNG to both FTA and Non-FTA Countries for 20-year terms (plus any Make-Up Periods) for each of the Rio Grande LNG's six (6) liquefaction trains. Rio Grande LNG further requests that such terms commence on the earlier of (a) the date of first export from each respective liquefaction train, or (b)(i) for the first four (4) trains to be constructed, seven (7) years from the date of issuance of the authorization requested herein, and (ii) for the last two (2) trains to be constructed, eight (8) years from such authorization.[8] Rio Grande LNG is requesting this authorization in order to act on its own behalf and as agent for third parties.

Rio Grande LNG is seeking this export authorization in conjunction with its proposal to construct, own, and operate the Rio Grande LNG Project.[9] The land-based Rio Grande LNG Project will have facilities for the receiving, treatment, compression, and liquefaction of natural

[8] Rio Grande LNG's request is for authorization to export up to 1.318 Tcf/y in the aggregate, divided in any manner it chooses between FTA and Non-FTA Countries. Rio Grande is not seeking authorization to export up to 1.318 Tcf/y of LNG to FTA Countries and up to an additional 1.318 Tcf/y to Non-FTA Countries for a potential total of 2.636 Tcf/y of LNG exports.

[9] Regulatory approval also must be obtained from the Federal Energy Regulatory Commission ("FERC") under Section 3 of the NGA for the siting, construction, and operation of the Rio Grande LNG Project and under Section 7 of the NGA for the siting, construction and operation of the affiliated Rio Bravo natural gas pipeline that will bring feed gas and fuel gas to the Rio Grande LNG Project. Rio Grande LNG and Rio Bravo Pipeline Company, LLC have already commenced the FERC's mandatory Pre-Filing Review Process to obtain such authorizations, and such matters have been assigned FERC Docket No. PF15-20-000. The potential environmental impacts of the Rio Grande LNG Project and the affiliated pipeline will be reviewed by the FERC in conjunction with that proceeding, which will provide the information required for the DOE/FE to fulfill its obligations under National Environmental Policy Act ("NEPA").

gas, as well as ancillary facilities needed to store, deliver, load and export LNG. The Rio Grande LNG Project will be capable of processing an average of approximately 1.318 Tcf/y (or approximately 3.6 Bcf per day ("Bcf/d")) of pipeline-quality natural gas. The gas will be delivered to the Rio Grande LNG Project through an approximately 137-mile-long pipeline ("RB Pipeline") that Rio Grande LNG's affiliate – Rio Bravo Pipeline Company, LLC – will develop. The northern terminus of RB Pipeline will be just east of the Energy Transfer King Ranch Gas Plant (formerly known as the "Exxon King Ranch Plant") in northern Kleberg County, TX, which is about 20 miles south of the Agua Dulce Gas Hub ("Agua Dulce Hub").[10] Terminating the RB Pipeline at this point will allow the Rio Grande LNG Project to readily interconnect with various interstate and intrastate natural pipelines in the area and take advantage of the natural gas pricing, and price transparency, of the Agua Dulce Gas Market Hub. Specifically, Rio Grande LNG intends to interconnect the Rio Grande LNG Project with eight (8) interstate and intrastate pipeline systems[11] via the RB Pipeline, thereby allowing natural gas to be supplied through displacement or direct access from a wide variety of supply sources.

The Rio Grande LNG Project, like other LNG export projects already pending before the DOE/FE, is a result of the surge in U.S. technically recoverable natural gas reserves despite declining domestic natural gas prices and expanding needs for LNG in international markets. As a result of these conditions, exporting LNG is now an economically attractive option that will

[10] The Agua Dulce Hub is located in Nueces County, Texas, and connects the following pipelines: Houston Pipe Line, Gulf South Pipeline, Kinder Morgan Texas Pipelines, Natural Gas Pipeline Co. of America, Transcontinental Gas Pipeline, Tennessee Gas Pipeline, TransTexas Gas, and the former EPGT Texas. *See*, *North American Natural Gas* , Platts (Aug. 2015) at 11, http://www.platts.com/IM.Platts.Content/methodologyreferences/methodologyspecs/na_gas_methodology.pdf.

[11] As discussed in more detail in Section V.A. below, the total estimated combined throughput of these pipelines is approximately 6.7 Bcf/d. The RB Pipeline's actual interconnects and delivery/receipt points ultimately will be determined in accordance with the needs of the users of the RB Pipeline. Significantly, there are various other natural gas pipelines crossed by, or in proximity to, the RB Pipeline's proposed route that may provide additional transportation options if needed.

transform the U.S. from a net importer to a net exporter of LNG.[12] Publicly available information establishes that domestic natural gas supplies far exceed existing and projected domestic demand during the requested 20-year primary term of exports from the Rio Grande LNG Project.[13] Such information also supports a conclusion that the price impact of Rio Grande LNG's proposed exports would not be substantial, and so, the Rio Grande LNG Project is not expected to negatively impact U.S. consumption of natural gas to any significant degree. The study commissioned by the DOE/FE and authored by NERA Economic Consulting ("NERA"), *Macroeconomic Impacts of LNG Exports from the United States* ("*NERA Report*"), further supports this position by concluding that "LNG exports have net economic benefits in spite of higher domestic natural gas prices."[14] NERA found exports to have net economic benefits even when LNG exports from the U.S. were unlimited.[15]

As discussed in Section VII of this Application, the Rio Grande LNG Project presents significant benefits to the public, including stimulation of the local and regional economies through direct job creation and increases in other forms of personal income; generation of

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[12] *See* Energy Information Administration *Annual Energy Outlook 2015*, at A-27, ES-4, 21 (Apr. 2015), *available at* http://www.eia.gov/forecasts/aeo/pdf/0383(2015).pdf (projecting that "[i]n all the [Annual Energy Outlook 2015] cases, the United States becomes a net exporter of natural gas in 2017, driven by LNG exports …, increased pipeline exports to Mexico, and reduced imports from Canada.") [hereinafter *AEO 2015*]. "In the AEO2015 Reference case, the United States becomes an overall net exporter of natural gas . . . one year earlier than in AEO2014." *Id.* at E-11. "Earlier this year, natural gas net imports fell to the lowest monthly level since 1987, averaging 2.3 Bcf/y in both May and June." EIA, *Short-Term Energy and Winter Fuels Outlook – Natural Gas*, at 12 (Oct. 6. 2015), http://www.eia.gov/forecasts/steo/report/natgas.cfm.

[13] The annual rate of domestic natural gas production is forecasted to grow at nearly three times the rate of annual growth in domestic natural gas demand between 2013 and 2040. *See AEO 2015*, *supra* note 12, at A-27 (forecasting that domestic dry natural gas production will increase by an average 1.4% per year between 2013 and 2040 while domestic demand for natural gas will grow at an annual average rate of 0.5% during the same time period). "EIA projects end-of-October 2015 [natural gas supply] inventories will total 3,956 Bcf, which would be 158 Bcf above the five-year average, and the highest end-of-October level on record." EIA, *Short-Term Energy and Winter Fuels Outlook – Natural Gas*, at 12 (Oct. 6. 2015), http://www.eia.gov/forecasts/steo/report/natgas.cfm.

[14] NERA Economic Consulting, *Macroeconomic Impacts of LNG Exports from the United States*, (Dec. 3, 2012), at 1, *available at* http://energy.gov/sites/prod/files/2013/04/f0/nera_lng_report.pdf [hereinafter *NERA Report*].

[15] *NERA Report*, *supra* note 14, at 12.

additional tax revenues and other fiscal benefits for governmental entities; stimulation of national economic activity; improvement of the U.S. balance of payments; and improvement of security for the U.S. and its trading partners.

IV.
AUTHORIZATION REQUESTED

Rio Grande LNG requests long-term, multi-contract authorization to export up to 1.318 Tcf/y of natural gas in the form of LNG, which is the equivalent of approximately 27 MTPA, from the Rio Grande LNG Project to both FTA and Non-FTA Countries. Rio Grande LNG requests this authorization for individual 20-year terms (plus any Make-Up Periods) for each of the Rio Grande LNG Project's six (6) liquefaction trains. Rio Grande LNG further requests that such terms commence on the earlier of (a) the date of first export from each respective liquefaction train, or (b)(i) seven (7) years from the date of issuance of the authorization requested herein for the first four (4) trains, and (ii) eight (8) years from the date of authorization requested herein for the last two (2) trains.

The term requested is uniquely structured, but appropriate, in this case, due to the scope of the Rio Grande LNG Project. Briefly, the Rio Grande LNG Project will be the largest LNG export project in the US to be developed in a single phase. Rio Grande LNG is proposing a project that will bring the benefits of LNG exports to the southernmost port in Texas, which is underutilized and in a region marked by relatively high unemployment. However, this location requires the build out of new pipeline infrastructure extending for a distance of approximately 137 miles from the Brownsville, Texas area to the Aqua Dulce Market Hub area, which entails considerable additional capital cost beyond the cost of the Rio Grande LNG Project itself. To produce LNG economically while paying such additional costs, a large project is necessary. While Rio Grande LNG is designing and permitting the project in a single stage and intends to

finance, as well as market the output of, the entire project in a single stage, the project will still require a substantial period of time to construct and place into service. To make this process practicable from a resource and economic standpoint, Rio Grande LNG intends to construct the Rio Grande LNG Project over a roughly seven year period (as measured from the start of site preparation (estimated February 2017) through the commencement of operation of the sixth train), bringing the first train on line in the fourth quarter of 2020 while construction of subsequent trains are commenced at six to nine month intervals, resulting in commissioning of the sixth and last train in 2024.

These circumstances makes the DOE/FE standard practice with respect to authorization terms for Non-FTA export authorizations (i.e., single 20-year term for the whole project commencing with the earlier of commercial operation of the first train and seven (7) years from the date of authorization) a mismatch with the Rio Grande LNG Project. In particular, the trains coming online later in the construction process would be limited to an appreciably shorter period of authorized exports than the first train to enter service (e.g., train 1 would benefit from 20 years of exports, while train 6 would be limited to about 16 years). Granting each train a 20-year export term based on the earlier of the individual train's start date, without some relief from the seven (7) years from the date of authorization term trigger, would only partially mitigate this issue. In particular, the seven (7) years from date of authorization trigger would not allow time for all of the following steps (which steps can occur only after the DOE's authorization is issued): finalize project financing, draw down funds to commence construction, mobilize construction crews, complete construction and commission the last one or two trains, or making normal allowance for construction contingencies. Support for this aspect of the requested authorization is provided in Sections VI and VII below.

Rio Grande LNG requests this authorization both on its own behalf and as agent for other parties who will hold title to the LNG at the time of export. Rio Grande LNG will comply with all DOE/FE requirements for exporters and agents, including the registration requirements as first established in *Freeport LNG Development, L.P.*, DOE/FE Order No. 2913, and most recently set forth in *Corpus Christi Liquefaction, LLC*, DOE/FE Order No. 3699.[16] To comply with these requirements, when acting as agent, Rio Grande LNG will register with the DOE/FE each LNG title holder for whom it seeks to export as agent and will provide the DOE/FE with a written statement by the title holder acknowledging and agreeing (1) to comply with all requirements in Rio Grande LNG's long-term export authorization and (2) to include those requirements in any subsequent purchase or sale agreement the title holder enters into. Rio Grande LNG also will file under seal with the DOE/FE any relevant long-term commercial agreements that it enters into with the LNG title holders on whose behalf the exports are performed.

Rio Grande LNG is not submitting long-term supply agreements and long-term export agreements with the instant Application and, therefore, requests that the DOE/FE make a similar finding to that in DOE/FE Order No. 2961 with regard to the transaction-specific information

[16] *See Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, Order Granting Long-Term Authorization to Export Liquefied Natural Gas from Freeport LNG Terminal to Free Trade Nations*, DOE/FE Order No. 2913, FE Docket No. 10-160-LNG, at 9-10 (Feb. 10, 2011) (Sabine Pass, DOE/FE Order No. 3669 is the most recent Non-FTA order regarding bulk LNG shipments made via specially designed LNG carriers as opposed to smaller LNG shipments made via ISO containers),; *see also Corpus Christi Liquefaction, LLC, Order Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Corpus Christi LNG Terminal in San Patricio and Nueces Counties, Texas, to Free Trade Agreement Nations*, DOE/FE Order No. 3699, FE Docket No. 15-97-LNG, at 13 (Aug. 27, 2015).

requested in Section 590.202(b) of the DOE regulations.[17] At present, Rio Grande LNG does not anticipate entering into any long-term gas supply or long-term export contracts in conjunction with the LNG export authorization requested herein. Rather, both Rio Grande LNG-affiliated and unaffiliated entities will enter into capacity use arrangements with Rio Grande LNG. It is these entities that will enter into long-term gas supply and export contracts. In accordance with the DOE/FE's stated policy in DOE/FE Order No. 2961, Rio Grande LNG will submit transaction-specific information when such contracts are executed.[18]

V.
DESCRIPTION OF THE PROJECT

A. Rio Grande LNG Project Facilities

As discussed above, the land-based Rio Grande LNG Project will be a natural gas liquefaction facility and LNG export terminal located in Cameron County, Texas, along the north embankment of the BSC. The project will be comprised of natural gas treatment, compression, and liquefaction facilities. It also will include ancillary facilities required to store and deliver LNG. Construction of the Rio Grande LNG Project will occur in stages. The facilities to be completed during the first stage of construction include two liquefaction trains, each capable of producing approximately 4.5 MTPA, two storage tanks, each with a pumpable capacity of approximately 180,000 cubic meters of LNG, and marine and truck loading facilities. The

[17] In the May 20, 2010 order granting Sabine Pass Liquefaction, LLC ("Sabine Pass") long-term export authorization to Non-FTA Countries, the DOE/FE found that Sabine Pass was not required to submit with its application transaction-specific information pursuant to Section 590.202(b) of the DOE regulations. DOE/FE found that given the state of development for the proposed Sabine Pass export project, it was appropriate for Sabine Pass to submit such transaction-specific information when the contracts reflecting such information are executed. *See Sabine Pass Liquefaction, LLC, Opinion and Order Conditionally Granting Long-Term Authorization to Export Liquefied Natural Gas from Sabine Pass LNG Terminal to Non-Free Trade Agreement Nations*, DOE/FE Order No. 2961, FE Docket No. 10-111-LNG, at 41 (May 20, 2011) [hereinafter *Sabine Pass, DOE/FE Order No. 2961*].

[18] DOE/FE has previously held that the commitment to file contracts once they are executed complies with the requirement of 10 C.F.R. § 590.202(b) to supply transaction-specific information "to the extent practicable." *Id*.

liquefaction facilities will utilize a closed-loop, mixed-refrigerant, cooling and heat exchange system. At the conclusion of the last stage of construction, the project will have six liquefaction trains with an aggregate production capacity of around 27 MTPA and four storage tanks with an aggregate storage capacity of 720,000 cubic meters of LNG. Common facilities will include a control room, gas treatment facilities, natural gas-fired back-up power generation, ground flares, and other ancillary systems. The marine facilities will include two berths with standard Chiksan® marine loading arms and a turning basin with a diameter of 1500 feet. The RB Pipeline will include twin 42" outside diameter pipelines, each approximately 137 miles long. The construction of the first pipeline will be timed so it will be able to commence operation when the Rio Grande LNG Project facilities completed during stage 1 of construction are ready to undergo testing and commissioning procedures..

The Rio Grande LNG Project will be located at a site situated between the BSC and the Brownsville-Port Elizabeth Highway, approximately 12 miles to the East-Northeast of Brownsville, Texas on an approximately 1,000-acre site. Rio Grande LNG holds an exclusive option to lease this site granted by the Brownsville Navigation District ("BND") – owner of the site.[19] Among the site's positive attributes are: (i) roughly 13,000 feet of channel frontage, (ii) zoning consistent with industrial use, and (iii) a distance of more than two (2) miles to the nearest occupied structure.

The LNG carriers that Rio Grande LNG expects to load with LNG at the Rio Grande LNG Project will likely be of a size that can traverse the new Panama Canal locks currently under construction. Given this size expectation and an approximate 27 MTPA LNG production

[19] A locator map and additional graphical information showing the specific and relative location of the Rio Grande LNG Project site is attached hereto as Appendix A.

rate, an estimated six (6) LNG carriers per week will call on the Rio Grande LNG Project when it is operating at full capacity, resulting in twelve (12) transits per week. With local pilots aboard, these ships will navigate to the Rio Grande LNG Project via the BSC. The LNG carriers will enter and leave one of the two Rio Grande LNG Project LNG loading berths by using, as necessary, the turning basin. The BSC is a federally managed waterway with a maintained depth of at least 42 feet between the proposed location of the Rio Grande LNG Project and the seaward end of the BSC. It is anticipated that the BND in conjunction with the U.S. Army Corps of Engineers will the deepen this portion of the BSC to a depth of 52 feet or greater.[20] Planned modifications to the BSC are part of a general channel improvement project – "Brazos Island Harbor Channel Improvement Project" – which was conceived of prior to, and is not dependent upon, the Rio Grande LNG Project.[21]

The Rio Grande LNG Project will be capable of processing an average of approximately 1.318 Tcf/y (or approximately 3.6 Bcf/d) of pipeline quality natural gas. Such gas will be delivered to the Rio Grande LNG Project through the RB Pipeline, which will provide gas supplies sourced through natural gas pipelines operating in the vicinity of the Agua Dulce Hub and connected to the RB Pipeline. As described previously, Rio Grande LNG intends to interconnect the Rio Grande LNG Project with eight (8) interstate and intrastate pipeline systems via the RB Pipeline,[22] thereby allowing natural gas to be supplied through displacement or direct

[20] *Brazos Island Harbor, Texas Channel Improvement Project*, US Army Corps of Engineers (June 25, 2014), http://www.usace.army.mil/Portals/2/docs/civilworks/CWRB/brazos/brazos.pdf.

[21] *See Id.*

[22] The relevant pipeline operators, pipeline systems, and their respective capacities are:

- Energy Transfer Partners – HGPC System – 0.75 Bcf/d
- Kinder Morgan Tejas – TGPL Mustang – 1 Bcf/d
- Natural Gas Pipeline of America – Gulf Coast Mainline – 0.5 Bcf/d

access from a wide variety of supply sources. The RB Pipeline will have a throughput capacity of at least 3.972 Bcf/d, which is an adequate amount to supply the Rio Grande LNG Project with both feed-gas for liquefaction and natural gas required to fuel any gas-fired facilities (*e.g.*, compressors) comprising part of the Rio Grande LNG Project or the RB Pipeline, taking into account any losses or shrinkage.[23] Should there be demand for additional capacity on the RB Pipeline for uses not associated with the Rio Grande LNG Project, the RB Pipeline may be expanded as operationally feasible and in accordance with applicable FERC policies and guidelines. This would ensure adequate capacity is available on the RB Pipeline for the Rio Grande LNG Project supply, regardless of the potential need to accommodate unrelated uses.

B. Export Sources

The Rio Grande LNG Project will benefit from the RB Pipeline's interconnections with various pipeline systems, which pipeline systems span states from Texas to Illinois to Pennsylvania and New Jersey and cross multiple conventional and unconventional gas plays. Each of these interconnecting pipeline systems has a developed network of additional interconnects with other natural gas pipeline companies. As a result, the Rio Grande LNG Project will have the ability to source gas from almost any point on the U.S. natural gas pipeline

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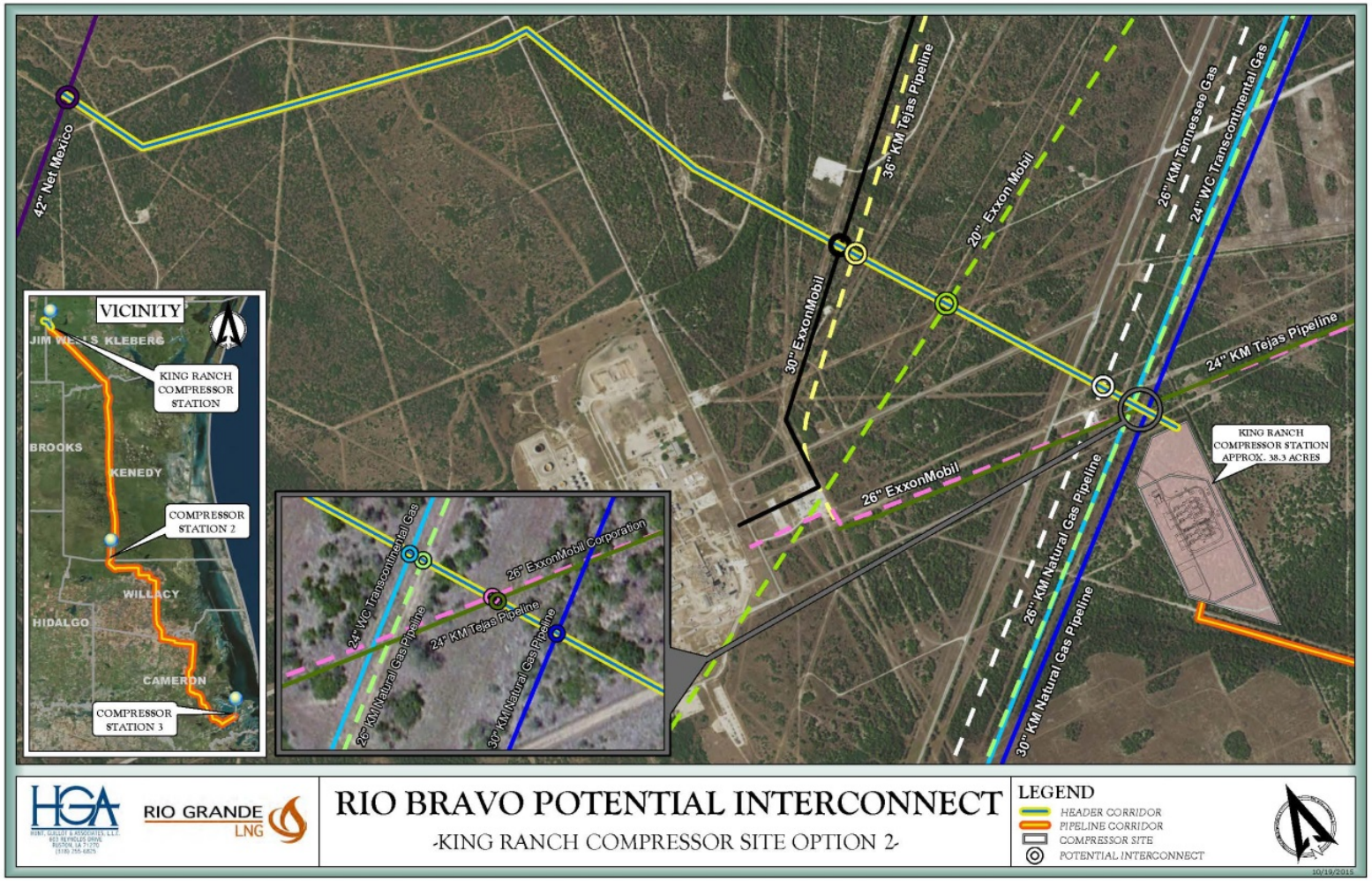
- NET Mexico Pipeline Partners – 2 Bcf/d
- Tennessee Gas Pipeline – TGP – 1 Bcf/d
- Texas Eastern Transmission Co. – TETCO STFE PETR – 0.6 Bcf/d
- Transcontinental Pipeline – North Padre Island – 0.37 Bcf/d
- Transcontinental Pipeline – Transco – 0.5 Bcf/d

This represents an existing total throughput capacity of just over 6.7 Bcf/d.

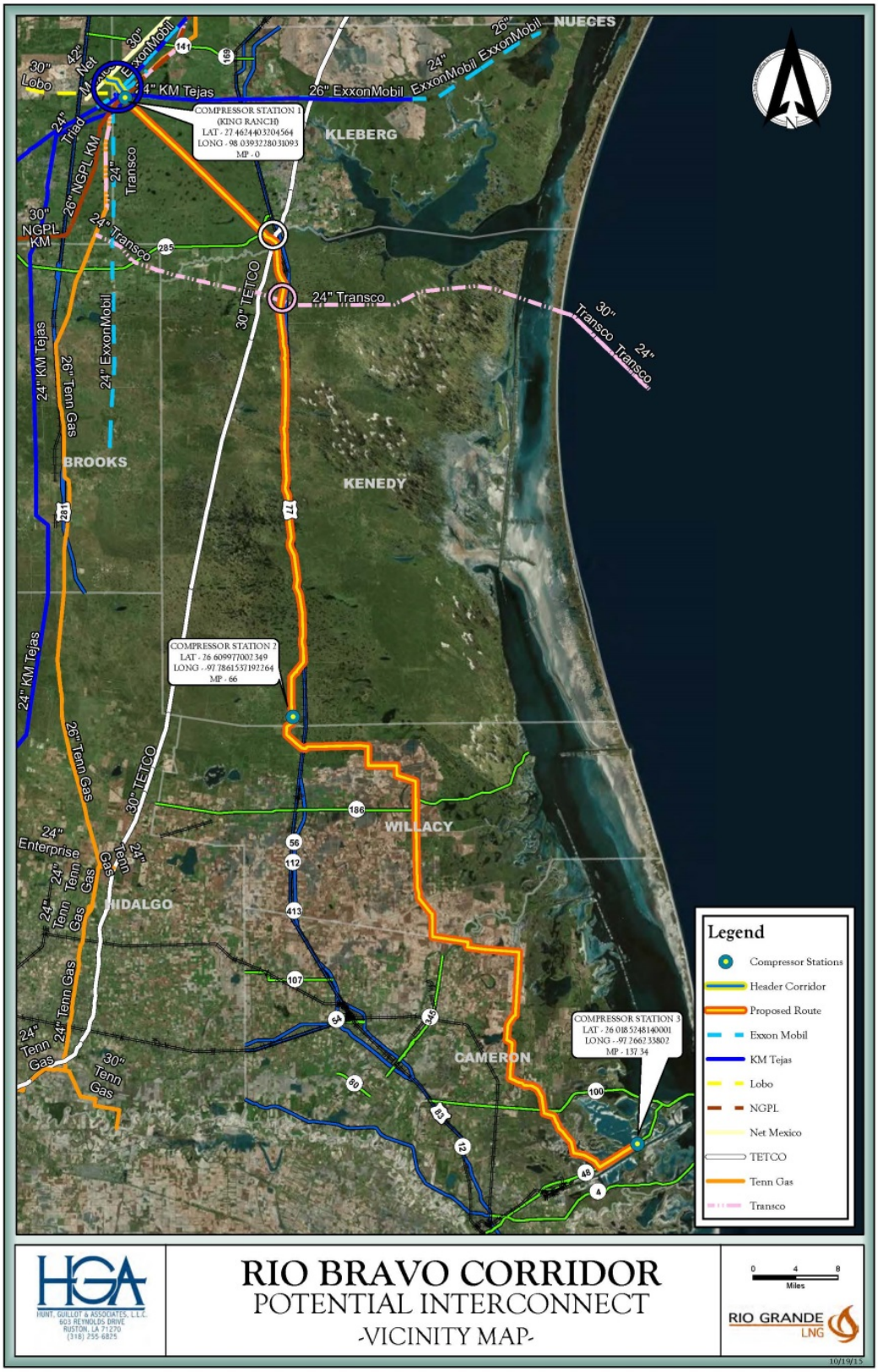
[23] Rio Grande LNG estimates that the additional demand associated with all necessary fuel gas and total operational losses (including losses associated with the RB Pipeline) equals 10% of the amount to be exported. Thus, (1.318 Tcf/y + 0.10 * 1.318 Tcf/y)/ 365 days/y = 3.972 Bcf/d = the pipeline capacity required to supply the Rio Grande LNG Project when operating at the maximum authorized export capacity, assuming the Rio Grande LNG Project operates at a constant level throughout the year.

grid through direct physical delivery or by displacement. Maps of the natural gas pipelines in the region, including those with which the Rio Grande LNG Project is currently planning to connect appear below:

Figure 1: Maps of Major Natural Gas Pipelines Near Rio Grande LNG Project[24]



[24] Although the first map of Figure 1 refers to "King Ranch Compressor Site Option 2," Rio Grande LNG has now selected this option for its final plan, and thus, the map reflects the current RB Pipeline route.


NUECES
KLEBERG
KENEDY
BROOKS
WILLACY
HIDALGO
CAMERON
COMPRESSOR STATION 1
(KING RANCH)
LAT - 27.462440.3204564
LONG - 98.0393228031093
MP - 0
COMPRESSOR STATION 2
LAT - 26.609977002.349
LONG - 97.7861537192.264
MP - 66
COMPRESSOR STATION 3
LAT - 26.018.5248140001
LONG - 97.2662.33802
MP - 137.34
26" ExxonMobil
24" ExxonMobil
30" Lobo
42" Net Mexico
24" KM Tejas
24" Triad
26" NGPL KM
24" Transco
30" NGPL KM
30" TETCO
30" Transco
24" Transco
24" ExxonMobil
26" Tenn Gas
24" Enterprise
24" Tenn Gas
30" Tenn Gas
Legend
Compressor Stations
Header Corridor
Proposed Route
Exxon Mobil
KM Tejas
Lobo
NGPL
Net Mexico
TETCO
Tenn Gas
Transco
HGA
HUNT, GUILLOT & ASSOCIATES, L.L.C.
603 REYNOLDS DRIVE
RUSTON, LA 71270
(318) 255-6825
RIO BRAVO CORRIDOR
POTENTIAL INTERCONNECT
-VICINITY MAP-
0 4 8
Miles
RIO GRANDE LNG
10/19/15

With regard to physical deliveries, the Rio Grande LNG Project's proximity to the Eagle Ford and conventional South Texas natural gas production makes those areas good candidates for providing natural gas for export. Additionally, the RB Pipeline's interconnects offer access to the shale plays in the East and Southern regions of the U.S., such as the Marcellus, Haynesville, Utica and Woodford formations[25] as well as conventional Gulf Coast and North American production. Overall, U.S. gas production is projected to be plentiful and growing.[26]

The aggregate capacity of the pipelines to which the RB Pipeline is expected to interconnect currently stands at about 6.7 Bcf/d; however, this amount is expected to increase due to new pipeline additions, looping, the additional of compression, capacity expansions on existing pipelines, as well as changes in flow characteristics and directions of existing pipelines. With regard to physical increases to pipeline carrying capacity, growing overall market demand in the region, of which the Rio Grande LNG Project will only be one component of a much larger trend, is likely to induce pipeline companies to implement wide-spread system enhancements (e.g., looping, additional compression, installation of larger pipelines, etc.) in the region. These system enhancements will further increase the throughput capacity of the relevant connecting pipelines or other pipelines that may provide competing transportation for shippers currently using those pipelines to which the Rio Grande LNG Project will connect via the RB

[25] "[G]ross withdrawals from shale gas wells increased from 5 Bcf/d in 2007 to 33 Bcf/d in 2013, representing 40% of total natural gas production, and surpassing production from nonshale natural gas wells. … [Texas, Pennsylvania, Louisiana, and Arkansas] accounted for 26 Bcf/d, or 79%, of U.S. shale production in 2013." EIA, *Shale Gas Provides Largest Share of U.S. Natural Gas Production in 2013* (Nov. 25, 2014), http://www.eia.gov/todayinenergy/detail.cfm?id=18951. *See also AEO 2015*, *supra* note 12 at 20 (noting the growth in dry natural gas production "resulted largely from the development of shale gas resources in the Lower 48 states (including natural gas from tight oil formations), which more than offset declines in other Lower 48 onshore production. In the AEO 2015 Reference case, more than half of the total increase in shale gas production over the projection period comes from the Haynesville and Marcellus formations."). AEO 2015, *supra* note 12, at 20. "Increases in shale gas production are made possible by the dual application of horizontal drilling and hydraulic fracturing." *Id*., at E-11.

[26] The EIA projects a 45% increase in total U.S. natural gas production from 2013 to 2040. *AEO* 2015, *supra* note 12, at 20.

Pipeline. For example, on August 28, 2015, the Comisión Federal de Electricidad ("CFE") issued a request for proposals to construct a new natural gas header and pipeline with a capacity of 2.6 Bcf/d from Nueces County to Brownsville, Texas. This pipeline will interconnect with a new pipeline to run south into Mexico.[27] The header system of the new CFE pipeline would include substantial interconnects with many of the same pipelines with which the Rio Grande LNG Project is expected to interconnect, as well as several other pipelines. The U.S. Energy Information Administration ("EIA") has identified other announced, applied for, approved, or under construction Texas pipeline enhancement projects, which have a total anticipated cost of approximately $1.4 billion and involve at least 288 miles of pipeline and an additional total capacity of over 7.7 Bcf/d. Almost all of these pipelines have target in-service dates of no later than 2018.[28] None of the already proposed system enhancements are based on any commitment by the Rio Grande LNG Project developers to utilize any new or existing pipeline transportation capacity.

Pipeline enhancement projects are part of an on-going pattern in Texas. According to EIA data, from 2000 through 2010, over $7.3 billion was expended in Texas for the construction of new natural gas pipelines and laterals, the expansion of existing natural gas pipelines, and the conversion of existing pipelines to natural gas service.[29] These pipeline projects involved 4,762 miles of pipeline with a summed capacity of over 32 Bcf/d.[30] Similarly, from 2011 through June

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[27] *First Amended and Restated Request for Proposals for the Development of a Natural Gas Header and Pipeline from Nueces County to Brownsville, Texas,* Comisión Federal de Electricidad, at 1 (Aug. 28, 2015), *available at* http://www.cfe.gob.mx/Proveedores/3_Licitacionesprincipales/SiteAssets/AmendedandRestatedRequestforProposalsNuecesBrownsville28082015.pdf.

[28] *See*, Pipeline Projects Spreadsheet, EIA Natural Gas Data, http://www.eia.gov/naturalgas/data.cfm (open the "Pipelines" tab on the page; then click on the Excel spreadsheet entitled "Pipeline projects") (last visited Oct. 9, 2015).

[29] *Id.*

[30] *Id.*

of 2015, at least another $257 million was spent to complete an additional 762 miles of pipeline improvements in Texas with a summed capacity of over 8 Bcf/d.[31]

The ability of the region's pipelines to supply gas to the Rio Grande LNG Project can also be affected by changes in flow direction and characteristics. In recent years various major natural gas pipelines have changed their physical flow characteristics due to a shift in the location of key natural gas production regions within North America,[32] and this appears to be a continuing trend supporting additional exports of LNG from the Gulf of Mexico coastal region.[33] Specifically, natural gas production has increased in the Texas/Eagle Ford Shale region by 317%, with production in October of 2007 at 1,643,915 Mcf/d and production in October of

[31] *Id.*

[32] *See US Gas Pipelines Reverse Course*, Platts, (April 7, 2014), http://www.platts.com/news-feature/2014/naturalgas/us-pipeline-reversals/index?wt.mc_id=ngam2014we_us-pipeline-reversal&wt.tsrc=eloqua (reporting on the scheduled commencement of flows through three pipelines – the ANR Pipeline Lebanon Lateral Project, the Tennessee Gas Pipeline Utica Back-Haul Project, and Rockies Express Pipeline – over the next 3 months). *See also NiSource Reports Second Quarter 2012 Earnings*, NiSource (July 31, 2012), http://ir.nisource.com/releasedetail.cfm?releaseid=696709 (in response to the changing supply and demand markets, Columbia Gas Transmission and Columbia Gulf Transmission are planning a $200 million project to reverse the flow of gas on part of the pipeline system to transport approximately 500,000 dekatherms per day of Marcellus gas production to Gulf Coast markets); *Empire Pipeline, Inc., Filing to Comply with Certificate order and Incorporate ACA Surcharge*, FERC Docket No. RP11-2456-000 and RP11-2456-001, (Oct. 26, 2011) (approving tariff changes filed to reflect the reversal of flow in connection with the Tioga County Expansion Project); *IHS CERA 2015: North American Pipeline Flows Changing Dramatically: Kinder*, Platts (Apr. 22, 2015) http://www.platts.com/latest-news/natural-gas/houston/cera-2015-north-american-pipeline-flows-changing-21334707 (noting that Kinder Morgan, "which owns four major interstate gas pipelines that stretch from the Gulf Coast region of Texas and Louisiana to market areas in the Northeast . . . .[has] turned three of them around to move gas back down [to the Gulf Goast].). [hereinafter *IHS CERA*].

[33] In an article in Natural Gas Intelligence's ("NGI") *Shale Daily*, NGI director of Strategy and Research Patrick Rau was quoted as saying: "The proposed pipeline reversals would likely have additional implications on the U.S. Gulf Coast, which is still a major source of U.S. production, despite several years of gradual decline," and "[t]he more gas that flows into the Gulf Coast, the more Gulf Coast production could be displaced, everything else being equal. However, an increase in petrochemical demand in the Gulf Coast, along with emerging gas liquefaction and export capacity in the area, more pipeline exports to Mexico, and additional deliveries west to California and east to serve growing gas-fired power generation in the U.S. Southeast are all possibilities to absorb the excess Gulf Coast supply." Josh Fisher, *Northeast Gas Surplus Spurs Pipe Flow Reversals, Capacity Additions*, NGI's Shale Daily (Mar. 12, 2014), http://www.naturalgasintel.com/articles/97680-northeast-inspiring-pipe-flow-reversals-capacity-additions. *See also IHS CERA 2015*, *supra* note 32 (noting that Richard Kinder, CEO of Kinder Morgan, "sees a need for significant growth in the gas infrastructure projects in the Southeast to service the expected growth in industrial demand along the Gulf Coast.").

2015 at 6,854,955.[34] This new gas supply to the region will likely be distributed throughout the Texas Gulf Coast and even Mexico chiefly through the eight (8) interstate and intrastate pipelines discussed previously, plus any additional new pipelines and pipeline expansions.

C. Commercial Arrangements

Rio Grande LNG has not entered into any contractual or other capacity arrangements at this time. As discussed above, Rio Grande LNG does not currently anticipate entering into any long-term gas supply or long-term export contracts in conjunction with the LNG export authorization requested herein. In this regard, Rio Grande LNG likely will structure its commercial arrangements in a manner that provides for third parties to hold liquefaction capacity in the Rio Grande LNG Project. Customers contracting for such capacity will be responsible for sourcing their own gas supplies and arranging the delivery of the gas to the Rio Grande LNG Project, including obtaining transportation capacity on the RB Pipeline. An affiliate of Rio Grande LNG is likely to be among the customers contracting for capacity at the Rio Grande LNG Project.

VI. APPLICABLE LEGAL STANDARD

Pursuant to Section 3 of the NGA, the DOE/FE is required to authorize exports to a foreign country unless there is a finding that such exports "will not be consistent with the public interest."[35] Specifically, Section 717b(a) of the NGA states in relevant part:

[34] EIA, *Drilling Productivity Report*, http://www.eia.gov/petroleum/drilling/#tabs-summary-2 (follow "Report data" hyperlink) (last visited Oct. 26, 2015).

[35] 15 U.S.C. § 717b(a).

(a) Mandatory authorization order

> [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 Commission authorizing it to do so. The Commission shall issue such order upon application, unless, after opportunity for hearing, it finds that the proposed exportation or importation will not be consistent with the public interest.[36]

Section 717b(a) thus creates a statutory presumption in favor of approval of this Application, which opponents bear the burden of overcoming.

Moreover, the statutory presumption in favor of approval of this Application is irrebuttable with respect to exports to FTA Countries.[37] The DOE/FE has consistently found that in light of its statutory obligation, there is no need for it to engage in an analysis of factors affecting the public interest in acting on such applications. In this regard, in *Jordan Cove Energy Project, L.P.*, the DOE/FE noted that its authority under NGA Section 3(c), as amended by the Energy Policy Act of 1992, is limited to two (2) areas: "(1) to ensure that applications are filed with sufficient information to confirm that the applicant is engaged in a meaningful (*i.e.*, not frivolous) effort to undertake natural gas export or import activities, and (2) to provide in any

[36] *Id*. (emphasis added).

[37] *See* 15 U.S.C. §717b(c) "exportation of natural gas to a nation with which there is in effect a free trade agreement requiring national treatment for trade in natural gas, *shall be deemed, in the public interest, and applications for such . . . exportation shall be granted without modification or delay.*") (emphasis added). *See also Sabine Pass Liquefaction, LLC, Order Granting Long-Term Authorization to Export "Liquefied Natural Gas From Sabine Pass LNG Terminal to Free Trade Nations*, DOE/FE Order No. 2833, at 5 (Sept. 7, 2010); *Jordan Cove Energy Project, L.P., Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Jordan Cove LNG Terminal to Free Trade Agreement Nations*, DOE/FE Order No. 3041, FE Docket No. 11-127-LNG, at 11 (Dec. 7, 2011) [hereinafter *Jordan Cove, DOE/FE Order No. 3041*]; *Carib Energy (USA) LLC, Order Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas to Free Trade Agreement Nations in Central America, South America, or the Caribbean by Vessel in ISO Containers*, DOE/FE Order No. 2993, FE Docket No. 11-141-LNG, at 4 (July 27, 2011).

order granting a section 3(c) application that the applicant will report its export or import activities in sufficient detail to enable DOE to monitor import and export activities."[38]

With respect to requests to export to Non-FTA Countries, the DOE/FE has consistently applied the principles described in DOE Delegation Order No. 0204-111, which focuses primarily on (i) whether there is a domestic need for natural gas that trumps exports, and (ii) the Secretary's natural gas policy guidelines,[39] which presume the normal functioning of the competitive market will benefit the public. Although DOE Delegation Order No. 0204-111 is no longer in effect, the DOE/FE's review of export applications in decisions under current delegated authority has continued to focus on (i) the domestic need for natural gas proposed to be exported; (ii) whether the proposed exports pose a threat to the security of domestic natural gas supplies; and (iii) any other issue determined to be appropriate, including "whether the arrangement is consistent with DOE/FE's policy of promoting competition in the marketplace" by allowing commercial parties to freely negotiate their own trade arrangements.[40] In the past, the DOE/FE also has considered local interests, international effects, and the environment as factors relevant to the public interest determination.[41]

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[38] *Jordan Cove,* DOE/FE Order No. 3041, *supra* note 37 at 8-9.

[39] *Policy Guidelines and Delegation Orders Relating to the Regulation of Imported Natural Gas,* 49 Fed. Reg. 6,684 (Feb. 22, 1984) [hereinafter *Policy Guidelines*].

[40] *Sabine Pass, DOE/FE Order No. 3669*, *supra* note 4, at 17-18. In this regard, in DOE/FE Order No. 2961, the first DOE/FE order authorizing exports from the Lower 48 states of domestically produced LNG to Non-FTA Countries, DOE/FE confirmed that although DOE Delegation Order No. 0204-111 is no longer in effect, it continues to focus on the principles set forth therein in reviewing export applications, as seen most recently in DOE/FE Order No. 3669. *See Sabine Pass, DOE/FE Order No. 2961*, *supra* note 17, at 29; *Sabine Pass, DOE/FE Order No. 3669*, *supra* note 4, at 17-18.

[41] For example, in DOE/FE Opinion and Order No. 2500, which granted ConocoPhillips Alaska Natural Gas Corporation and Marathon Oil Company authorization to export LNG from Alaska, the DOE/FE considered the regional need for the gas by reviewing the natural gas supply and demand projections submitted, cited or relied on, by the parties in the proceeding and determined that there was a reasonable basis for concluding that local supplies were adequate to support the proposed export as well as to meet local demand requirements during the term of the proposed blanket authorization. *ConocoPhillips Alaska Natural Gas Corp., Order Granting Authorization to Export Liquefied Natural Gas from Alaska*, DOE/FE Order No. 2500, FE Docket No. 07-02-LNG, at 47 (June 3, 2008)

In the context of the instant Application and existing natural gas market conditions, the longstanding principles of minimizing federal control and involvement in natural gas markets articulated in the *Policy Guidelines* are particularly relevant.[42] The *Policy Guidelines* emphasize free market principles and promote limited government involvement in federal natural gas regulation:

> The market, not government, should determine the price and other contract terms for imported [and exported] gas. U.S. buyers [and sellers] should have full freedom - along with the responsibility - for negotiating the terms of trade arrangements with foreign sellers [and buyers].
>
> The government, while ensuring that the public interest is adequately protected, should not interfere with buyers' and sellers' negotiation of the commercial aspects of import [and export] arrangements. The thrust of this policy is to allow the commercial parties to structure more freely their trade arrangements, tailoring them to the markets served.[43]

The *Policy Guidelines* also provide some insight into the public interest standard for evaluating potential import and export applications. In this regard, they state that the "policy

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[hereinafter *ConocoPhillips, DOE/FE Order No. 2500*]. In addition, DOE found that: (1) local interests would be well served by a grant of the requested authorization because the continued operation of the applicant's liquefaction plant provided significant benefits to the local economy; (2) exportation of LNG would help to improve the United States' balance of payments with Pacific Rim countries during the term of the proposed blanket authorization; and (3) there was no significant environmental impact. *Id.* at 57-58. *See also Cheniere Marketing, Inc., Order Granting Authorization to Export Liquefied Natural Gas*, DOE/FE Order No. 2651, FE Docket No. 08-77-LNG , at 14 (June 8, 2009) (explaining that, consistent with the *Policy Guidelines* and applicable precedent, the DOE considers the potential effects of proposed exports on aspects of the public interest other than domestic need, including international effects and the environment) [hereinafter *CMI, DOE/FE Order No. 2651*].

[42] While the *Policy Guidelines* deal specifically with imports, the principles are applicable to exports as well. *See Phillips Alaska Natural Gas Corp. and Marathon Oil Co., Order Extending Authorization to Export Liquefied Natural Gas from Alaska*, DOE/FE Order No. 1473, FE Docket No. 96-99-LNG, at 14 (Apr. 2, 1999) [hereinafter *Phillips Alaska, DOE/FE Order No. 1473*].

[43] *Policy Guidelines*, *supra* note 39, at 6685. The macroeconomic analysis provided in the *NERA Report* reinforces the DOE/FE's continued reliance on the *Policy Guidelines*' free market approach. In concluding that LNG exports will have net economic benefits in spite of higher domestic natural gas prices, NERA states "[t]his is exactly the outcome that economic theory describes when barriers to trade are removed."

cornerstone of the public interest standard is competition."[44] Competitive import/export arrangements are therefore an essential element of the public interest and, so long as the sales agreements are set in terms that are consistent with market demands, they should be considered to "largely" meet the public interest standard.[45] The guidelines continue by saying that "[t]his policy approach presumes that buyers and sellers, if allowed to negotiate free of constraining governmental limits, will construct competitive import [and export] agreements that will be responsive to market forces over time."[46] To date, DOE/FE orders granting authorization to export natural gas have continued to reflect and reinforce the principles laid out in the *Policy Guidelines* – embracing the concepts of free trade and limited government involvement.[47]

The DOE/FE's past practice of limiting the authorization of LNG exports to Non-FTA Countries to a single, unified 20-year term, tied to the earlier of the first exports from the facility and seven (7) years from the date of the relevant authorization, is not based on an express statutory limitation or DOE/FE regulation. Therefore, the above-discussed public interest standard also controls whether or not Rio Grande LNG is entitled to an export authorization that establishes individual 20-year terms linked to the earlier of (a) the start of exports from individual liquefaction trains, or (b) up to eight (8) years from the date of authorization. Support for such authorization terms is provided in following section of this Application.

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[44] *Policy Guidelines*, *supra* note 39, at 6687.

[45] *Id.*

[46] *Id.* (with reference to "exports" inserted to reflect DOE policy that "the principles are applicable to exports as well" as enunciated in *Phillips Alaska, DOE/FE Order No. 1473*, *supra* note 42, at 14).

[47] *See, e.g.*, *Sabine Pass, DOE/FE Order No. 2961*, *supra* note 17, at 29 (referencing DOE's policy of promoting competition in the marketplace by allowing commercial parties to freely negotiate their own trade arrangements); *Phillips Alaska, DOE/FE Order No. 1473*, *supra* note 42, at 51 (stating that the public interest is generally best served by a free trade policy); *ConocoPhillips, DOE/FE Order No. 2500*, *supra* note 41, at 44-45 (stating that DOE's general policy is to minimize federal government involvement and allow commercial parties to freely negotiate their own trade arrangements).

VII.
PUBLIC INTEREST ANALYSIS

The Rio Grande LNG Project has been proposed, in part, due to the hugely positive outlook for domestic natural gas reserves and production. Improved drilling techniques and extraction technologies have contributed to the rapid growth in new supplies from unconventional gas-bearing formations across the U.S. and have been utilized to enhance production in some conventional fields.[48] Such developments have completely changed the complexion of the U.S. natural gas industry and radically expanded the resource base.

LNG exports via the Rio Grande LNG Project constitute a market-driven vehicle for deploying the country's vast energy reserves in a manner that will meaningfully contribute to the public interest through a variety of benefits. These benefits include:

- More jobs[49] and personal income, greater tax revenues, and increased economic activity;
- Improved U.S. balance of payments through the exportation of natural gas and the displacement of imports of other petroleum liquids;
- Enhanced national security, as a result of the U.S.'s larger role in international energy markets, assistance provided to our allies, and reduced U.S. dependency on foreign oil through domestic oil and natural gas production;[50]

[48] *AEO 2015*, *supra* note 12 at E-11.

[49] The numerous other applicants for approval to export LNG to Non-FTA Countries have consistently shown in their filings with the DOE/FE that exporting LNG from the U.S. via U.S. LNG export terminals will create jobs. For example, in Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC's (FE Docket No. 10-161-LNG) and Corpus Christi Liquefaction, LLC's (FE Docket No. 15-97-LNG) requests for authorization to export LNG from facilities in Texas, the applicants submitted expert-prepared reports concluding that that projects will spur substantial job creation. *Freeport LNG Expansion, L.P. and FLNG Liquefaction, LLC, Application for Long-term Authorization to Export LNG*, FE Docket No. 10-160-LNG, at Appendix D (June 1, 2015); *Corpus Christi Liquefaction, LLC, Application of Corpus Christi Liquefaction, LLC For Long-Term Authorization to Export Liquefied Natural Gas*,, FE Docket No. 15-97-LNG, at Appendix B (Dec. 17, 2010) *The NERA Update* notes with regard to job creation that "between 2014 and 2018, [Congressional Budget Office] projects that the economy will continue operating below its potential and that unemployment will gradually fall to the "natural" or full employment rate of 5.5% by 2018. During this period of time, the increase in GDP caused by LNG exports would lead to reductions in unemployment and a more rapid achievement of full employment." *NERA Update*, *supra* note 52, at 117).

[50] A March 2013 American Security Project paper authored by Nick Cunningham concludes:

- Better opportunities to market U.S. products and services abroad as a result of new, competitively-priced, gas supplies introduced into world markets and, consequently, improved economies among the U.S.'s trading partners;

- Increased economic trade and closer ties with foreign trading partners and hemispheric allies, while displacing environmentally damaging fuels in those countries;

- Increased production capacity that is better able to adjust to varying domestic demand scenarios; and

- Dampened volatility in domestic natural gas prices.

These benefits and others discussed in this Application demonstrate that Rio Grande LNG's export proposal is not inconsistent with the public interest. That stance is buttressed by the independent *NERA Report*, which includes overwhelmingly positive key findings related to the macroeconomic impacts of LNG exports. For example, NERA found that "[a]ll export

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> There are likely to be significant geopolitical benefits if exports of LNG proceed in large volumes. Many of America's closest allies are in need of reliable energy partners, while others are at the mercy of unfriendly neighbors. U.S. LNG exports can provide an alternative source.
>
> Allowing American natural gas to reach world markets will lower the price, offer energy diversity, and undermine expensive oil-indexed contracts. This will enhance our allies' energy security, and weaken the grip of their adversaries. There are significant and real geopolitical benefits of removing restrictions on LNG exports.

Nick Cunningham, *The Geopolitical Implications of U.S. Natural Gas Exports*, American Security Project, at 9 (Mar. 2013), *available at* http://americansecurityproject.org/ASP%20Reports/Ref%200116%20%20The%20Geopolitical%20Implications%20of%20U.S.%20Natural%20Gas%20Exports.pdf. *See also* John Deutch, *The U.S. Natural-Gas Boom Will Transform the World*, Wall St. J. (Aug. 14, 2012), http://online.wsj.com/article/SB10001424052702303343404577514622469426012.html; P. Dobriansky, B. Richardson, & J. Warner, *The Shale Factor in U.S. National Security*, Reuters (Feb. 6, 2014), http://blogs.reuters.com/great-debate/2014/02/06/the-shale-factor-in-u-s-national-security/ (concluding that "energy exports . . . should be viewed as a tool of economic statecraft that can help keep international markets supplied and global prices stable. . . . it would strengthen the power of U.S. sanctions on countries like Iran, while lessening their impact on U.S. consumers and increasing international collaboration."). *Hurd Supports Streamlined Permitted Process for LNG Exports*, Congressman Will Hurd 23rd District of Texas (Jan. 29, 2015) (stating that "[b]olstering LNG will enhance our . . . American national security . . . . When other nations are buying liquefied natural gas from us, they're not buying it from countries like China or Russia, and that's a good thing.").

scenarios are welfare-improving for U.S. consumers. The welfare improvement is the largest under the high export scenarios even though the price impacts are also the largest."[51]

In 2014, NERA released an updated version of the *NERA Report*.[52] The *NERA Update* reached conclusions similar to those contained in the *NERA Report*¸ refuting allegations by some that the original report was outdated. Among other things, the *NERA Update* states: "Across the scenarios, U.S. economic welfare consistently increases as the volume of natural gas exports increases. This includes scenarios in which there are unlimited exports. Unlimited exports always create greater benefits than limited exports in comparable scenarios."[53]

With regard to gross domestic product ("GDP"), NERA found that "[i]n the short run, the GDP impacts are positive as the economy benefits from investment in the liquefaction process, export revenues, resource income, and additional wealth transfer in the form of tolling charges. In the long run, GDP impacts are smaller but remain positive because of higher resource income."[54] NERA also found that results related to aggregate consumption "suggest that the wealth transfer from exports of LNG provides net positive income for the consumers to spend after taking into account potential decreases in capital and wage income from reduced input."[55]

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[51] *NERA Report*, *supra* note 14, at 55.

[52] Robert Baron, et. al, *Updated Macroeconomic Impacts of LNG Exports from the United States*, NERA Economic Consulting, (2014), *available at*, http://www.nera.com/content/dam/nera/publications/archive2/PUB_LNG_Update_0214_FINAL.pdf [hereinafter *NERA Update*]. The *NERA Update* has been placed on the record in DOE/FE Dockets No. 13-30-LNG, 13-42-LNG and 13-121-LNG, and Rio Grande LNG requests the DOE/FE to take administrative notice of this document for in the current docket as well.

[53] *Id.* at 7, 9.

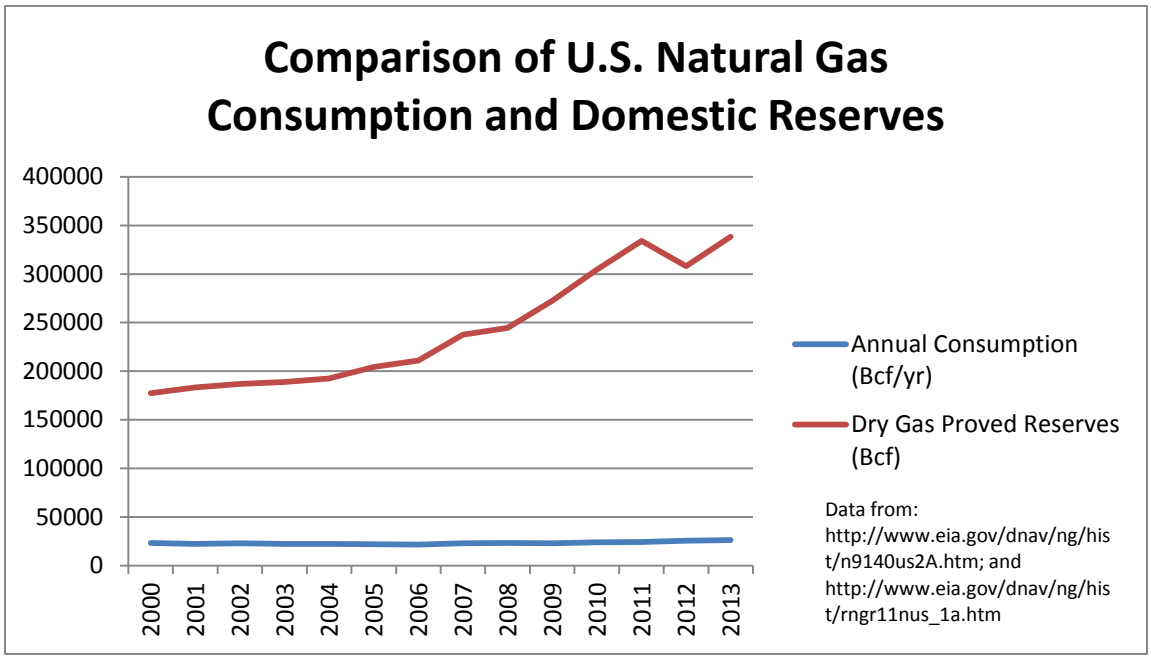
[54] *NERA Report*, *supra* note 14, at 56; *NERA Update*, *supra* note 52, at 86.

[55] *Id.* at 57; *NERA Update*, *supra* note 52, at 87.

A. Analysis Of Domestic Need For Gas To Be Exported

As discussed below, the domestic supply base of natural gas is sufficient to meet future domestic demand and Rio Grande LNG's proposed export volumes over the term of the authorization. In this regard, proved U.S. reserves of dry natural gas have increased by 93.6 Tcf (38.3%) between 2008 and 2013.[56] However, as illustrated by the following graph, consumption has grown at a far slower rate:

Figure 2: U.S. Natural Gas Consumption Compared to Proved Reserves



Along with the increases in proved reserves, technological improvements in drilling productivity and extraction have enabled rapid, economical, growth in the overall U.S. natural

[56] *Natural Gas Reserves Summary as of Dec. 31*, EIA, (Dec.. 4, 2014), http://www.eia.gov/dnav/ng/ng_enr_sum_dcu_NUS_a.htm.

gas production capabilities, thereby increasing the economically recoverable reserves,[57] as well as the technically recoverable reserves.[58]

As a result, U.S. natural gas prices have significantly decreased. The monthly average Henry Hub price for natural gas fell from over $10.00 per MMBtu in late 2005 to around the $3 mark in late 2014 and 2015, which represented the lowest levels to which "natural gas prices [had] . . . dropped since September 2012."[59] In the *AEO 2015* Reference case, the EIA projects that the annual average Henry Hub spot market price for natural gas will rise at an average rate of 2.8% through 2040,[60] reaching just $4.88 per MMBtu by 2020 and remaining under $8.00 per MMBtu through 2040.[61] In all cases, 2015 prices are lower than those of the average Henry Hub spot price in 2013, which was $3.73 per MMBtu.[62] Prices for natural gas in the U.S. market are now substantially below those of most other major gas-consuming countries.[63] While U.S. gas

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[57] *See* Arthur P. Steinmetz, *Investing in the U.S. Energy Revolution*, The Atlantic (Oct. 24, 2013), http://www.theatlantic.com/sponsored/oppenheimer/2013/10/investing-us-energy-revolution/23/. The author is the Oppenheimer Funds President & Chief Investment Officer. *Id*.

[58] *See Press Release: Potential Gas Committee Reports Significant Increase in Magnitude of U.S. Natural Gas Resource Base*, Potential Gas Committee (Apr. 9, 2013), http://potentialgas.org/press-release; *see Understanding Potential Supply of Natural Gas in the United States (Technically Recoverable Natural Gas Resources and Proved Reserves)*, American Gas Association (Apr. 8, 2015), https://www.aga.org/sites/default/files/ea_2015-02_understanding_potential_supply_of_natural_gas_in_the_united_states.pdf (finding that for year-end 2014, "the . . . assessment of domestic technically recoverable resources reached 2,515 Tcf, which is 131 Tcf more (+6%) than the year-end 2013 reported value of 2,384 Tcf. . . .").

[59] EIA, *Henry Hub Gulf Coast Natural Gas Spot Price* (Oct. 15, 2015), http://www.eia.gov/dnav/ng/hist/rngwhhdm.htm [hereinafter *Henry Hub*]. *Natural Gas Prices Drop Following Strong Production Growth*, EIA (Jan. 28, 2015), http://www.eia.gov/todayinenergy/detail.cfm?id=19751. Of course, short term effects lead to transient peaks and valleys. In April 2012, the monthly average Henry Hub price for natural gas was as low as $1.95 per MMBtu, while in February 2014 the average Henry Hub price was $6.00. *Id*.

[60] *See AEO 2015*, *supra* note 12, at A-1.

[61] *Id*. at 6.

[62] *Id*. at 6.

[63] *See World Bank Commodities Price Data (The Pink Sheet)*, The World Bank (Oct. 2015), http://pubdocs.worldbank.org/pubdocs/publicdoc/2015/10/399311444847624975/Pnk-1015.pdf.

prices are now similar to or less than they were a decade ago,[64] prices for LNG in other major gas consuming countries have increased markedly over the past decade.[65] The result is that domestic gas can be liquefied and exported to foreign markets on a very competitive basis.[66] As discussed below, such exports can be expected to have only a nominal effect on U.S. prices.

1. *National Supply - Overview*

In recent years, the U.S.'s total natural gas recoverable resource base has increased. In 2015, the EIA estimated technically recoverable natural gas resources in the U.S. to be 2,276.5 Tcf.[67] The break-even prices for basins like the Barnett and Haynesville Shales range from $5-$6 per Mcf,[68] while in other U.S. locations, breakeven prices are below $2.[69] These prices

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[64] *See Henry Hub*, *supra* note 59 (referencing a monthly average Henry Hub price of $4.13 per MMBtu in October 2002).

[65] *See World Bank Commodity Price Data (The Pink Sheet) Annual Prices, 1960 to Present*, The World Bank (Oct. 2, 2015), http://siteresources.worldbank.org/INTPROSPECTS/Resources/334934-1304428586133/pink_data_a.xlsx. *See also* Matthew Brown, *Gas Golden Age Darkens in Europe on U.S. Coal: Energy Markets*, Bloomberg (Oct. 30, 2012), http://www.bloomberg.com/news/2012-10-31/gas-golden-age-darkens-in-europe-on-u-s-coal-energy-markets.html (noting that, in late October 2012, gas traded at more than double the price from four (4) years ago in Europe, reducing the competitiveness of major European industrial users); *see also* Dan Milmo, *Nuclear Crisis Forces Up UK Gas Prices*, The Guardian (Mar. 14, 2011), http://www.guardian.co.uk/business/2011/mar/14/japan-disaster-lng-gas-uk (following Japan's Fukushima nuclear power plant incident, prices for LNG delivery to the UK rose by 6%); *see also* Lindsay Wright, *Pipeline Politics: Russia's Natural Gas Diplomacy*, Pipeline & Gas J. (Aug. 2009), http://www.pipelineandgasjournal.com/pipeline-politics-russia%E2%80%99s-natural-gas-diplomacy?page=show (noting price increases due to politically motivated disruptions in gas transit to parts of Europe from Russia).

[66] The EIA noted in AEO 2015 that "even with low natural gas prices, total U.S. domestic dry natural gas production grows sufficiently to satisfy higher levels of domestic consumption, as well as higher pipeline and LNG exports." AEO 2015, *supra* note 12, at 6.

[67] EIA, *Assumptions to the Annual Energy Outlook 2015*, 130 tbl. 9.2 (September 10, 2015), http://www.eia.gov/forecasts/aeo/assumptions/pdf/oilgas.pdf [hereinafter *2015 Assumptions*].

[68] *Energy Observer*, Morningstar at 5 (Feb. 2014), http://marcelluscoalition.org/wp-content/uploads/2014/03/Morning-Star_EnergyObserverFebruary2014.pdf.

[69] Naureen S. Malik; *Natural Gas Shale Drillers Undaunted by 32% Price Plunge*, BloombergBusiness (Feb. 5, 2015 1:50 pm) ("[b]reak-even prices for Marcellus producers have dropped below $2 per thousand cubic feet . . . from around $4 in 2008. . . .").

represent a significant cost decrease compared to the end of the prior decade.[70] Further, in 2015, the EIA estimated U.S. onshore, lower-48- states, technically recoverable, natural gas resources to be 1,679.3 Tcf.[71] Other recent assessments continue to add to the total estimated U.S. gas resources. For example, a study released in July 2015 estimated the total mean recoverable gas resource of the Utica Shale exceeded 782 Tcf.[72] In contrast, the EIA total estimates for unproved technically recoverable natural gas both in the U.S. and in the onshore, lower-48-states, rely on an estimate of only 54.6 Tcf of natural gas in the Utica Shale,[73] suggesting that the EIA's totals grossly understate the current best estimates of total technically recoverable natural gas reserves in these categories. With copious reserves available, natural gas production is poised to rise with increases in demand. In 2015, the EIA projected natural gas production from onshore shale gas and tight oil plays in the lower-48-states would reach 15.44 Tcf in 2020 and upped its projection for 2035 to 18.85 Tcf.[74] The EIA also estimates that U.S. dry natural gas production was 24.40 Tcf in 2013, increasing from 24.06 Tcf in dry natural gas production in 2012.[75] In *AEO 2015*, the EIA indicates that U.S. natural gas production is projected to increase

[70] Kenneth B. Medlock III et al., *Shale Gas and U.S. National Security*, Energy Forum: James A. Baker III Institute for Public Policy, at 23-24 (July 2011), http://www.bakerinstitute.org/publications/EF-pub-DOEShaleGas-07192011.pdf. The break-even price is the average price needed for development of up to 60% of the identified technical recoverable resource. *Id.*

[71] *See 2015 Assumptions*, *supra* note 67, at 130 tbl. 9.2.

[72] John Hickman et al., *A Geologic Play Book Utica Shale Appalachian Basin Exploration*, Utica Shale Appalachian Basin Exploration Consortium, at 168 (July 2015), http://nrcce.wvu.edu/wp-content/uploads/FINAL_UTICA_REPORT_07012015.pdf [hereinafter *ABEC Study*].

[73] *See 2015 Assumptions*, *supra* note 67, at 133 tbl. 9.3. In the eastern U.S., proven technically recoverable reserves tend to be approximately 15% of estimated unproven technically recoverable reserves. *See id.* at 130 tbl. 9.2.

[74] *AEO 2015*, *supra* note 12, at A-28 tbl.A14. The 2013 estimate of production for shale gas only was 15.33 Tcf. EIA, *AEO2013 Early Release Overview* at 148 tbl. A14. (Dec. 5, 2012), *available at* http://www.eia.gov/forecasts/aeo/er/pdf/0383er(2013).pdf [hereinafter *AEO 2013*].

[75] *Id.*

by 1.4% per year.[76] Shale gas production in the Lower 48 (including natural gas from tight oil formations) is predicted to increase 73% between 2015 and 2040. This increase in shale gas production contributes to a "45% increase in total U.S. dry natural gas production, from 24.4 Tcf in 2013 to 35.5 Tcf in 2040."[77]Additionally, after years of decline, annual offshore natural gas production is expected to start growing in 2015, eventually increasing to 2.81 Tcf in 2040.[78]

The EIA's projections reflect, among other things, strong growth in domestic natural gas production and reduced pipeline imports.[79] U.S. domestic dry natural gas production growth is such that it will satisfy higher levels of consumption along with higher pipeline and LNG exports.[80]

These studies and reports indicate that the U.S. has an inventory of recoverable natural gas resources sufficient to last beyond any practicable planning horizon. Indeed, in his 2012 State of the Union Address, President Obama stated: "We have a supply of natural gas that can last America nearly 100 years."[81] Since then, estimates of gas resources have increased. ICF International recently produced a paper for the Interstate Natural Gas Association of America Foundation, Inc., that reported the North America natural gas resource base is sufficient to

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[76] *Id.*

[77] *Id.* at 20.

[78] *Id.* at 21; *see AEO 2013*, *supra* note 74, at 9 (discussing the years of decline of offshore natural gas production).

[79] *AEO 2015*, *supra* note 12, at 21.

[80] *Id*. at 6.

[81] *President Obama's State of the Union Address*, N.Y. Times (Jan. 24, 2012), http://www.nytimes.com/2012/01/25/us/politics/state-of-the-union-2012-transcript.html?pagewanted=all. In his 2013 State of the Union Address, the President added: "We produce more natural gas than ever before …." and pledged that his "administration will keep cutting red tape and speeding up new oil and gas permits" to keep the gas boom going. *Remarks by the President in the State of the Union Address*, The White House: Office of the Press Secretary (Feb. 12, 2013), http://www.whitehouse.gov/the-press-office/2013/02/12/remarks-president-state-union-address.

"supply U.S. and Canadian gas markets for almost 150 years at current consumption levels."[82] This inventory is expected to continue growing as further advancements in drilling technology are deployed to exploit additional shale gas development opportunities.[83]

2. *Regional Supply*

The proposed Rio Grande LNG Project will be located in an area with robust access to natural gas supplies through the highly integrated and well-developed interstate and intrastate natural gas pipeline system.

The large number of natural gas pipelines the RB Pipeline will cross reflects the natural gas transportation industry's capability to build and expand the capacity of pipeline infrastructure as needed to ensure adequate regional supplies. Extensive local natural gas reserves and production lend additional support to the proposition that the relevant regional natural gas supply is adequate to meet both the domestic needs of the area and the demand for exported natural gas. The EIA estimates that there are 172.5 Tcf of technically recoverable dry natural gas resources in the Gulf Coast Region.[84] At the current production rate of 400 Bcf/y,[85] such a level of recoverable resources would support continued Eagle Ford production for another 431 years. Even if Eagle Ford production were increased to 1.718 Tcf/yr (*i.e.*, existing production plus all of the natural gas Rio Grande LNG is seeking to export on an annual basis and assuming Rio

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[82] Interstate Natural Gas Association of America Foundation, Inc., *North American Midstream Infrastructure through 2035: Capitalizing on Our Energy Abundance* (March 8, 2014), http://www.ingaa.org/File.aspx?id=21498.

[83] *See* Karen Boman, *Oil & Gas Technology Trends to Look For in 2015*, RigZone (Jan. 2, 2015), http://www.rigzone.com/news/oil_gas/a/136449/Oil_Gas_Technology_Trends_to_Look_For_in_2015; *AEO 2013*, *supra* note 74, at 5. *See also* U.S. Geological Survey, Assessment of Potential Additions to Conventional Oil and Gas Resources in Discovered Fields of the United States from Reserve Growth, 2012 (Aug. 2012) http://pubs.usgs.gov/fs/2012/3108/FS12-3108.pdf.

[84] *Assumptions to the Annual Energy Outlook 2015*, EIA at 130 tbl. 9.2 (Apr. 2015), http://www.eia.gov/forecasts/aeo/assumptions/pdf/oilgas.pdf.

[85] *See* EIA, *Table 4. Principal shale gas plays: natural gas production and proved reserves, 2012-2013*, http://www.eia.gov/naturalgas/crudeoilreserves/pdf/table_4.pdf (last visited Oct. 22, 2015).

Grande LNG is able to obtain further authorizations to export the same amount after an initial 20 year authorization expires) the supply in the Eagle Ford would be sufficient to last more than 100 years.

3. *National Natural Gas Demand*

Over the past decade, the U.S. has experienced little growth in the demand for natural gas in the U.S.[86] In 2015 the EIA estimated long-term annual U.S. consumption growth of only 0.4%, with consumption projected to reach 26.47 quadrillion btu/year in 2035 (compared to 23.96 quadrillion btu/ year of actual demand in 2012).[87] The EIA most recently projected that natural gas consumption in the Reference case would rise from 26.2 Tcf in 2013 to 29.7 Tcf in 2040.[88] The table below presents a comparison of actual consumption and prices in 2013 and forecasted consumption and prices in the year 2040, based on information presented in the *AEO 2015.*[89]

Table 1: Present and Future Consumption and Pricing[90]

	2013	**2040**
Natural Gas Consumption (Tcf)	26.2	29.7
Henry Hub Spot Price ($/MMBtu)	3.73	7.85

As discussed in Section VII.A.1. above, the EIA estimates that the U.S. has 2,276.5 Tcf of recoverable natural gas resources.[91] Even at 100% utilization,[92] the Rio Grande LNG Project

[86] In 2014, natural gas consumption was approximately 19% higher than in 2004. *See* EIA, *Monthly Energy Review Table 4.3 Natural Gas Consumption by Sector* (Sept. 25, 2015), http://www.eia.gov/totalenergy/data/browser/xls.cfm?tbl=T04.03&freq=m.

[87] *AEO 2015*, *supra* note 12, at A-5 tbl. A2.

[88] *Id.* at A-28 tbl. A14.

[89] *Id.*

[90] *Id.* at A-27 tbl. A13.

[91] *See* Section VII.A.1, *supra*; *2015 Assumptions*, *supra* note 67, at 130 tbl. 9.2.

would result in maximum natural gas requirements, inclusive of fuel used at the project and losses associated with the project and its affiliated RB Pipeline, of 29 Tcf over the 20-year term of the requested authorization.[93] This represents only 1.27% of the EIA estimate of the total of all technically recoverable U.S. natural gas resources. If the EIA estimate is adjusted for the recent increase assessed for the technically recoverable reserves from the Utica Shale, then this percentage drops to 0.97%.[94]

4. *Supply-Demand Balance Demonstrates the Lack of National and Regional Need*

As discussed in Section VII.A.3. above, the enormous available domestic supply of natural gas dwarfs current U.S. demand, and, even under the extreme case of operating at 100% utilization, the natural gas to be exported over twenty years from the Rio Grande LNG Project is only on the order of one percent (1%) of the available resources. The current low prices of natural gas are a consequence of a buyer's market with plentiful supply and limited domestic needs. The interest in exporting gas from the U.S. despite the billions of dollars of investment needed to develop a single LNG export terminal is driven by these market conditions. Rising domestic prices would tend to reduce overall foreign demand for U.S. produced LNG and would

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[92] Such an assumption is conservative for multiple reasons. For example, it is neither economically nor physically practicable to export LNG using partially loaded LNG vessels. (In order to prevent dangerous dynamic loads from LNG slosh, "LNG vessels normally operate in a fully laden condition or with a minimum of cargo (heel) during the ballast voyage. In a fully laden condition the typical filling level is greater than 95% of the tank height, and in ballast condition less than 10%. The current design (tank insulation and scantlings) is effective in preventing sloshing impact loads when the vessel is carrying heel only." *Problem of Partial Loading of Cargo Tanks & Filling Limits – LNG Carrier Guideline*, Liquefied Gas Carrier, http://www.liquefiedgascarrier.com/sloshing.html (last visited Oct. 21, 2015)). Thus, annual output of full cargoes to the nearest full cargo that is less than the authorized export amount, and demand for gas supply will track the amount of LNG exported.

[93] This number was calculated by multiplying 1.318 Tcf/y times 20 years and increasing the result by 10% to allow for losses and gas to operate the Rio Grande LNG Project.

[94] As discussed previously, EIA estimated unproven technically recoverable Utica Shale reserves at 54.6 Tcf; adjusting this number upward by 15% to extrapolate EIA's estimate of proven and unproven technically recoverable Utica Shale reserves yields 63.03 Tcf. This amount is 718.97 Tcf less than estimated by the more recent *ABEC Study*. *ABEC Study*, *supra* note 72, at 168. Adding this shortfall to the EIA estimate for the U.S. as whole yields a revised estimate for total U.S. technically recoverable reserves of 2,995.47 Tcf. The Rio Grande Project's 20-year natural gas requirements, 29 Tcf, is 0.97% of this amount.

simultaneously induce additional U.S. natural gas production, thereby helping to keep supply and demand in balance and ensuring domestic and regional gas needs are satisfied.

5. *Price Impacts – Natural Gas*

In 2014, the Majority Staff of the U.S. House of Representatives' Committee on Energy and Commerce addressed the impact of LNG exports on domestic U.S. gas prices, stating: "Some policymakers have expressed concern over the price impacts of allowing U.S. natural gas exports. However, the body of evidence, including the study requested by DOE, suggests that price impacts will be moderate and unlikely to be driven by the volume of U.S. gas exported."[95]

Similar views also have been voiced within the U.S. Senate; Senator Murkowski's whitepaper, entitled *The Narrowing Window: America's Opportunity to Join the Global Gas Trade,* states: [96]

> Certain interests have objected to the possibility of LNG exports from the U.S. Some petrochemical producers have argued that exports of natural gas would raise the domestic price of natural gas, undercutting their own businesses and product exports by raising the cost of their fuel and feedstock.
>
> A robust debate occurred in the analytical community, comprising universities, think-tanks, consultancies, and other research institutions. After months of discussion and analysis, the majority of reports concluded that LNG exports would provide net economic benefits to the U.S. and should be approved in a timely fashion. Virtually all of these reports concluded that the impact on domestic natural gas prices would be manageable and limited. In addition, many of these reports have found that higher domestic natural gas prices would also actually serve to increase (and stabilize) natural gas production in the U.S. by making it economical to produce additional natural gas resources.

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[95] U.S. House of Representatives – Committee on Energy and Commerce, Majority Staff, *Prosperity at Home and Strengthened Allies Abroad – A Global Perspective on Natural Gas Exports*, The Policy Paper Series, at 6 (Feb. 4, 2014), http://energycommerce.house.gov/sites/republicans.energycommerce.house.gov/files/analysis/20140204LNGexports.pdf.

[96] Lisa Murkowski, *The Narrowing Window: America's Opportunity to Join the Global Gas Trade*, Energy 20/20 White Paper, at 13 (Aug. 6, 2013), http://www.energy.senate.gov/public/index.cfm/files/serve?File_id=986351eb-316d-4dc9-9d1a-b75abcf4b5fc (footnotes omitted).

Nor is this opinion limited to U.S. legislators, the *NERA Update* opined:

> Although there are costs to consumers in the form of higher energy prices …, these costs are more than offset by increases in export revenues, along with wealth transfers from overseas received in the form of payments for liquefaction services. The net result is an increase in U.S. households' real income and welfare.
>
> ***
>
> Our analysis suggests that there is no support for the concern that LNG exports, even in the unlimited export case, will obstruct a chemicals or manufacturing renaissance in the United States.[97]

Similarly, a 2013 study by the Deloitte Center for Energy Solutions and Deloitte MarketPoint LLC entitled *Exporting the American Renaissance Global impacts of LNG exports from the United States* concluded: "Prices are projected to . . . only marginally increase in the U.S. [due to studied LNG exports]. The projected increase of average U.S. prices from 2016 to 2030 is about $0.15/MMBtu . . . . "[98] The EIA projects that changes in energy prices due to natural gas exports could average as low as 4% over the 2015-2040 period.[99] Further, DOE/FE Order No. 3699 addressed concerns regarding natural gas price volatility associated with LNG exports and found that "on balance we are not persuaded that LNG exports will substantially increase the volatility of domestic natural gas prices."[100]

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[97] *NERA Update*, *supra* note 52, at 7 and 14; *see also Liquified Natural Gas Export – America's Opportunity and Advantage*, American Petroleum Institute at 7 (May 2015), http://www.api.org/~/media/files/policy/lng-exports/lng-primer/liquefied-natural-gas-exports-lowres.pdf (citing the White House Council of Economic Advisers Annual Report, which stated that "An increase in U.S. exports of natural gas, and the resulting price changes, would have a number of mostly beneficial effects on natural gas producers, employment, U.S. geopolitical security, and the environment. . . [E]xpanded natural gas exports will create new jobs in a range of sectors including natural gas extraction, infrastructure investment, and transportation." *Economic Report of the President Together With the Annual Report of the Council of Economic Advisers*, The White House (Feb. 15), at 261-62.).

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

[99] *Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets*, EIA at 12 (Oct. 2014), http://www.eia.gov/analysis/requests/fe/pdf/lng.pdf [hereinafter *Effect of Increased Exports*].

[100] *Sabine Pass, DOE/FE Order 3669*, *supra* note 4 at 137-39.

Moreover, Rio Grande LNG's parent company, NextDecade, commissioned Deloitte MarketPoint LLC ("Deloitte") to report on the regional and national price impacts of LNG exports from the Rio Grande LNG Project – the World Gas Model Global Natural Gas and LNG Market Analysis, December 2015 ("Deloitte Rio Grande LNG Export Report"). This report, which is appended hereto as Appendix F, addresses the impact of LNG exports from the Rio Grande LNG Project out through the year 2045 and confirms Rio Grande LNG's assertion that the proposed exports would have minimal impacts on the price of natural gas in the region and the nation.

In particular, the Deloitte Rio Grande LNG Export Report considered the impact of adding 27 MTPA of LNG export capacity at the Rio Grande LNG Project's proposed site along with another 13 MTPA of export capacity in the Houston/Beaumont region of the Gulf of Mexico on top of 74 MTPA of liquefaction capacity represented by the Sabine Pass, Cameron, Freeport, Corpus Christi, and Cove Point LNG projects. *See* Deloitte Rio Grande LNG Export Report at 3. These additional volumes increased Henry Hub prices only slightly to $4.37/MMBtu in 2020 (compared to $4.34/MMBtu in the reference case) and $5.34/MMBtu in 2025 (compared to $5.23/MMBtu in the reference case) and actually decreased prices slightly to $8.80/MMBtu in 2045 (compared to $8.83/MMBtu in the reference case). *Id.* at 9. At the closest regional hub to the Rio Grande LNG Project (the Agua Dulce Hub) these same conditions led to an expectation that the spread between the prices at Agua Dulce Hub and Henry Hub is expected to widen from about $0.10/MMBtu today to $0.28/MMBtu in 2020 and $0.29/MMBtu in 2025 as LNG exports begin, but then narrow back to just $0.16/MMBtu by 2045. *Id.* at 3.

Two additional scenarios studied beyond the above base case showed larger impacts on the price of natural gas but they still did not show substantial impacts on the price of gas at

Henry Hub. *Id.* These scenarios were styled: "High Mexico Exports Case" and "High Renewables Case". *Id.*

In the High Mexico Exports Case, the report assumed higher natural gas demand from Mexico, leading to higher demand for natural gas exports into Mexico from South Texas. In this case, the Henry Hub price rose an additional $0.09/MMBtu and $0.13/MMBtu above the base case by 2025 and 2045, respectively. Agua Dulce Hub prices also rose more than other neighboring market hubs in the Gulf of Mexico (GOM) that were analyzed, reaching $0.33/MMBtu above the base case in 2021 as the terminal begins to come online but falling to just $0.15/MMBtu by 2026 and remains at this level through 2045. The impact on basis prices near other LNG export facilities was much smaller, with prices at Katy and Corpus Christi Hubs peaking $0.16/MMBtu above the base case in 2036 and dropping off to about $0.13/MMBtu and $0.11/MMBtu in 2045, respectively. *Id.* at 3-4.

In the High Renewables Case, the report assumed more moderate growth in both the power and industrial sectors in North America post-2020. In addition, it assumed that total LNG export capacity from the GOM is not fully utilized. The Rio Grande LNG Project is still assumed to be built. In this case, Henry Hub prices fall below base case prices, reaching a discount of $0.18/MMBtu in 2020, $0.35/MMBtu in 2025, and $1.05/MMBtu by 2045. Regionally, prices at Agua Dulce Hub fall further below the base case over time with relatively lower domestic demand. Prices fall $0.13/MMBtu below the base case in 2020, $0.12/MMBtu in 2025, and $1.01/MMBtu in 2045. *Id.* at 4.

The Deloitte Rio Grande LNG Export Report also examined the impact that the Rio Grande LNG Project could have on natural gas prices in the Northeast US. In the three studied cases, basis prices at Tetco M3 are at a premium to Henry Hub through 2020. However, by

2025, when the assumed LNG export facilities are in service, prices at Tetco M3 become discounted to Henry Hub in all three cases. This discount averages about $0.05/MMBtu in the base case, but grows to average about $0.10/MMBtu in both the High Mexico Export and High Renewables cases. *Id.* at 4.

Because the Deloitte World Gas Model simulates market dynamics to adjust both supply and demand based on their interactions, *Id.* at 4-6, these modest price impacts also support the conclusion that adequate domestic gas supplies will exist in the event that the DOE/FE grants this Application.

B. Other Public Interest Considerations

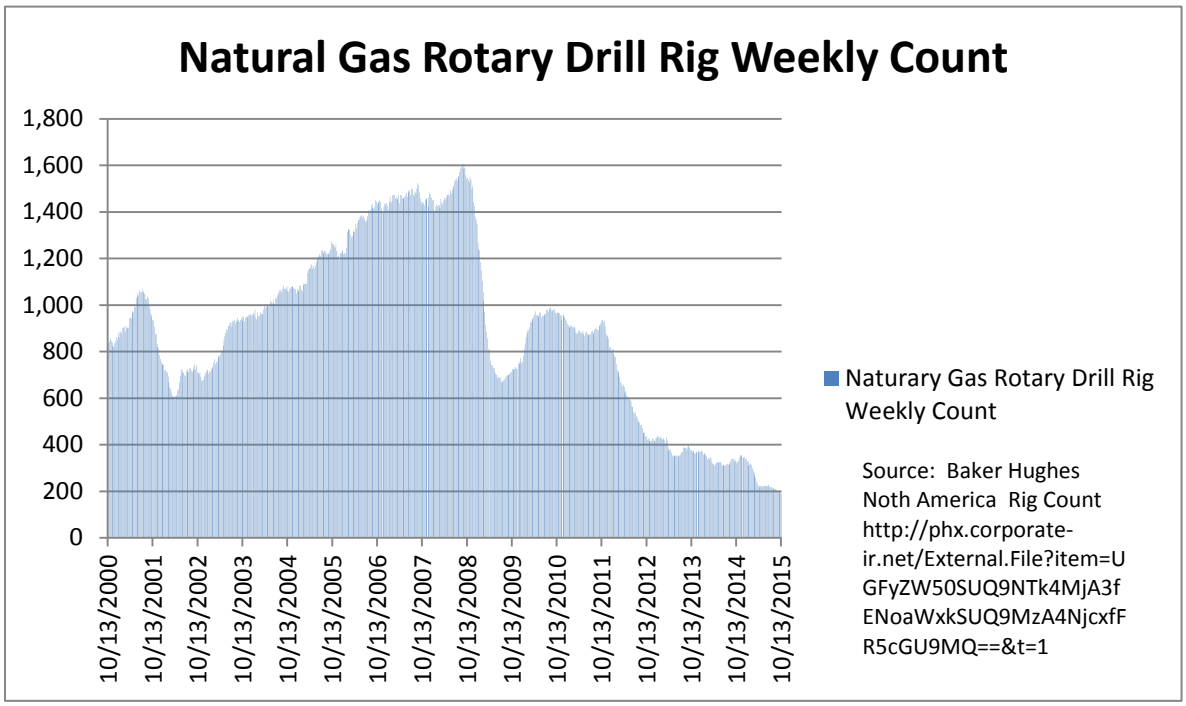
1. *Promote Long-Term Stability in Natural Gas Markets*

Lower U.S. natural gas prices have led to decreased capital spending on dry natural gas drilling and development activities.[101] As shown in Figure 3, in mid-October 2015 the U.S. natural gas rotary drilling rig count dropped to its lowest point at any time in the last 15 years.[102]

[101] *See, e.g.*, Marcus V. McGregor, *The American Shale Gas Revolutions: Fundamental Winners and Losers*, Asset Management Viewpoint, Vol. 16, No. 2, at 2 (Apr. 2012), *available at* https://www.conning.com/uploadedFiles/Asset_Management/Point_of_View/Viewpoint/04-2012%20Shale%20Gas%20Revolution%20FINAL.pdf (noting: "Operators have been allocating more capital to exploration and production of liquids in order to mitigate the recent decline in natural gas spot prices …"); *see also* Chesapeake Energy, *Investor Presentation*, at 11 (last updated Dec. 26, 2014), *available at* http://www.chk.com/investors/documents/latest_ir_presentation.pdf (noting that, in response to low natural gas prices, Chesapeake Energy has been aggressively shifting its capital expenditures to liquid-rich plays).

[102] In fact, the weekly rig count was lower than at any point during the full period reflected in Baker Hughes's on-line records (*i.e.*, July 17, 1987). *See* Baker Hughes, *North American Rotary Rig Count* (Oct. 15, 2015) available at: http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9NTk4MjA3fENoaWxkSUQ9MzA4NjcxfFR5cGU9MQ==&t=1.

Figure 3: Natural Gas Rotary Drill Rig Weekly Count



While, due to increased productivity, a lower rig count does not necessarily correlate to lower gas production, it does represent fewer jobs in the exploration and production sector of the natural gas industry and reduced opportunity to deploy capital profitably. Exporting natural gas would create increased demand for domestically produced gas and, as noted above, contribute to a small increase in domestic natural gas prices. Both of these factors would help encourage investment and thereby help to stabilize the natural gas industry.[103]

Of broader importance is the stabilizing effect increased exports would have on both the

[103] For example, in the February 2012 issue of *World Oil Online*, the authors, from Barclays Capital, reported on the results of a survey of 351 oil and gas operating companies: "[r]oughly 27% of companies surveyed plan on increasing spending [on natural gas exploration and production activities] if natural gas prices average $4.50/MMbtu in 2012, and 70% would do so if they average $5.00/MMbtu. Nearly half of surveyed companies would cut back spending if gas averaged $3.50/MMbtu, while $3.00/MMbtu was the most popular threshold for companies to reduce budgets." James C. West et al., *2012 Forecast: E&P Spending to Reach Record $600 Billion*, World Oil Online, Vol. 233, No. 2 (Feb. 2012),http://www.worldoil.com/February-2012-EP-spending-to-reach-record-600-billion.html*; Effect of Increased Exports, supra* note 99, at 12 ("increased energy production spurs investment, which more than offsets the adverse impact of somewhat higher energy prices . . . .")

price and availability of natural gas for domestic uses. The stabilizing effects would stem from multiple causes:

First, simply by increasing the size and diversity of the demand for natural gas to include consumers in other nations, the volatility in demand decreases, which contributes to more stable prices in the U.S. A 2007 paper by Ian Down, Associate Professor of Political Science at the University of Tennessee, precisely explained this basic economic concept.[104] In that paper, Dr. Down states:

> The greater the number of buyers and sellers the greater the likelihood that shocks emanating from any one source will be offset by equally sized opposite shocks emanating from another source. Moreover, the greater the number of market participants the smaller will be the contribution to total volatility of any single participant, *ceteris paribus*. Accordingly, larger, deeper markets will display less volatility than smaller, shallower markets. The greater size and depth of international markets relative to the markets of any single national economy implies the international economy is less volatile than any of its constituent national components. Thus, greater trade openness entails a greater degree of domestic production and consumption oriented towards larger, deeper, more stable international markets and away from smaller, shallower, more volatile domestic markets.[105]

Second, an increased domestic production base and upgraded gas transmission capabilities would present an opportunity for rapid, voluntary diversion of gas supply to domestic purposes should domestic demand change rapidly. For example, if the U.S. were to have a catastrophic event that broadly impacted a large segment of the U.S. electric generating industry in a manner similar to what Japan experienced with the Fukushima disaster, there could be a sudden demand for increased natural gas-fired generation that could only be immediately

[104] *See* Ian Down, *Trade Openness, Country Size and Economic Volatility: The Compensation Hypothesis Revisited*, Business and Politics, Vol. 9, Iss. 2, Art. 3 (2007), http://www.unc.edu/depts/europe/conferences/tgsw/iandown-trade_openness.pdf.

[105] *Id*. at 5.

satisfied if sufficient natural gas production and transportation infrastructure were already in place. A U.S. natural gas industry that had already expanded production and transportation infrastructure to serve the export market would be in a better position to respond quickly through a global least cost solution than a smaller natural gas industry sized only to meet U.S. demand as it existed prior to the incident would be.

Subject to jurisdictional and commercial requirements, exporters could choose to voluntarily cancel export shipments, thereby immediately freeing up additional natural gas supplies for use in domestic natural gas fired generating facilities. In contrast, a smaller U.S. natural gas industry prepared to serve only the pre-existing domestic demand would not have the option to redeploy foreign bound gas, and production and transportation capabilities would be more limited. In that case, producing more gas immediately would not be an option, and trying to expedite the drilling of new wells on an emergency basis would increase the level of environmental risk. The only immediately available course of action would involve establishing a new short-term equilibrium in a domestic-only market with fewer options, leading to much higher prices and a greater potential for scarcity of both natural gas and electricity.

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

Every entity proposing to export LNG from the U.S. that has studied the issue to date has found the proposed exports would benefit the economy at the local, regional and national levels. Rio Grande LNG submits that there is nothing unique about its proposed exports or the Brownsville area that would support a conclusion that exports made from Brownsville through an export terminal located there would not lead to similar benefits to the Brownsville area, Texas

or the nation.[106] Like any other LNG export project, during construction, the Rio Grande LNG Project will be a source of employment, economic activity and tax revenues to the local, regional and national economies. Following completion of construction, the Rio Grande LNG Project, as is the case with all other LNG export projects considered by the DOE, would continue to provide considerable economic benefits through creating permanent jobs,[107] purchasing goods and services,[108] and paying taxes.

Rio Grande LNG commissioned The Perryman Group to conduct a study investigating the potential impact of the proposed LNG export facility and the RB Pipeline on the local, regional, and national economies.[109] The study, attached here, concluded that "[c]onstruction and operation of the [Rio Grande LNG] facilities would involve significant economic and fiscal benefits for the local area, Texas, and the United States."[110]

In the construction and non-operational phase, the Perryman Study found that anticipated total expenditures associated with the Rio Grande LNG Project in the US were

[106] An ICF International study approaches this issue from another direction – calculating the sum total of the benefits of U.S. exports of LNG to individual states. With respect to Texas in the year 2035, this study found increased income for Texas to be between $5.2 and $34.1 billion (in 2010 dollars) and an uptick in maximum state employment of between 28,019 and 155,713 jobs. *U.S. LNG Exports: State-Level Impacts on Energy Markets and the Economy*, ICF International, at 40, 49 (Nov. 13, 2013), http://www.api.org/~/media/Files/Policy/LNG-Exports/API-State-Level-LNG-Export-Report-by-ICF.pdf. (The study also concluded that "LNG exports have a net positive impact, or negligible net impact, across all states."). *Id.* at 27.

[107] *See The Benefits of Natural Gas Production and Exports for U.S. Small Businesses*, Small Business & Entrepreneurship Council, at 4 (May 2013) (finding that "[c]learly, LNG exports guided by market forces mean further expanding opportunity for small and midsize businesses to be created, to grow, and to create jobs.").

[108] *See* Pete Sepp, *Energy Saves the Day*, U.S. News (Nov. 24, 2014) (noting that between 2005 and 2012, while the economy generally lost more than 378,000 jobs, "energy production and the industries that directly support it created more than 293,000 positions . . . [not counting] the ripple effect . . . [of] jobs created in the other segments of the economy because of increased demand for and services in non-energy industries.").

[109] The Perryman Group, *The Potential Impact of the Proposed Rio Grande Liquefied Natural Gas (LNG) and Rio Bravo Pipeline Facilities on Business Activity in Cameron County, Texas, and the United States* (Dec. 2015) [hereinafter *Perryman Study*]. See Appendix E.

[110] *Id.* at 1.

$77,116 million.[111] Total expenditures for Texas are anticipated to be $48,774 million, and for Cameron County, total expenditures are anticipated to be $12,007 million.[112]

Regarding employment during the construction and non-operational phase, the Perryman study anticipates that, in the U.S., total employment from the project will be 413,434 person-years.[113] In Texas, total employment is anticipated to be 277,003 person-years, and in Cameron county, the study anticipates 74,374 person-years of employment.[114]

The construction and non-operational phase will also present tax benefits. "Incremental tax receipts total over $3 billion for the federal government, $1.2 for Texas, and $116.5 million for local taxing entities in Cameron County."[115]

As the above numbers indicate, even if the Rio Grande LNG facility were built but never used, it would still present enormous benefit to the local, regional, and national economies. However, the benefits of the Rio Grande LNG Project are anticipated to be even greater once the project commences commercial operations. "Once the trains and associated facilities are operational, they will begin to generate an ongoing economic stimulus."[116]

The total anticipated annual expenditures associated with the operation of the Rio Grande LNG Project at maturity in the U.S. is $2,318 million, and the annual totals for Texas and Cameron County are $2,116 million and $1,432 million, respectively.[117] In terms of employment at maturity, the Rio Grande LNG Project is anticipated to create 4,901 permanent jobs in the

[111] *Id.* at 14.

[112] *Id.*

[113] *Id.*

[114] *Id.*

[115] *Id.* at 13.

[116] *Id.* at 15.

[117] *Id.* at 17.

U.S., 4,492 permanent jobs in Texas, and 3,256 permanent jobs in Cameron County.[118] "Incremental tax receipts for the project as a whole are estimated to include approximately $34.5 million in federal taxes, $24.1 million to the state of Texas, and about $5 million to local entities in the Cameron County area (adjusted for typical abatements and including all indirect effects)."[119]

Finally, the cumulative benefits of both the construction and non-operational phases and the ongoing operations of the Rio Grande LNG project are projected to be immense. During the construction phase and the first 25 years of operations, the Rio Grande LNG Project is anticipated to, in the U.S., have a total expenditure of $81,319 million.[120] The total expenditure in Texas is anticipated to be $66,843 million, and the total expenditures in Cameron County are anticipated to be $38,035 million.[121]

The Perryman study also projects that the Rio Grande LNG Project's ongoing operations will generate significant employment. In the United States, the anticipated person-years of employment to be created by the project are 259,120.[122] In Texas, the Rio Grande LNG Project is anticipated to generate 202,865 person-years of employment.[123] Finally, in Cameron County, the project is anticipated to create 103,688 person-years of employment.[124]

Regarding tax revenues, the Perryman study predicts that "[i]ncremental tax receipts associated with [the Rio Grande LNG Project] . . . include more than $3.8 billion to the Federal

[118] *Id.*

[119] *Id.* at 16.

[120] *Id.* at 19.

[121] *Id.*

[122] *Id.*

[123] *Id.*

[124] *Id.*

Government, $1.8 billion to the state of Texas, and $268 million to local entities in Cameron County (including indirect revenues and assuming a standard abatement scenario)." [125]

As these figures indicate, the proposed exports would benefit the economy at the local, regional and national levels.

3. *Benefits from Stimulation of the Natural Gas Industry*

Exports through the Rio Grande LNG Project will also likely stimulate additional development of natural gas resources by expanding the market for North American natural gas, thereby greatly magnifying the overall benefits derived from the Rio Grande LNG Project. This development involves sizable investment in exploration and production activity and thus creates further economic stimulus.

4. *International Considerations*

International considerations also support the export of LNG requested herein. Supplying global markets with U.S.-sourced natural gas will provide both economic and strategic benefits to the U.S. and its allies.[126] Recent world events, such as the continuing weakness of certain European Union member country economies, have served as ample reminder that the welfare of U.S. citizens is interdependent on the health of the world economy.

In May 2012, the Brookings Institution's Energy Security Initiative released its Policy Brief 12-01, entitled "Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural

[125] *Id.*

[126] *Sabine Pass, DOE/FE Order No. 3669, supra* note 4, at 195-96.

Gas." In analyzing the international implications of LNG exports, the Brookings Study's authors broke the subject down into three components: pricing, geopolitics, and the environment.[127]

With respect to pricing, the Brookings Study observes: "LNG exports will help to sustain market liquidity in what looks to be an increasingly tight LNG market beyond 2015."[128] Looser or more liquid markets help place downward pressure on the pricing terms of oil-linked contracts, which are common in the world markets for LNG.[129] This has resulted, in turn, in the renegotiation of some contracts, particularly in Europe.[130] Of course, lower prices for energy in Europe and elsewhere can contribute to an uptick in the world economy, fueling increased trade with the U.S. On the other hand, denying our trading partners a source of reliable, reasonably-priced energy can harm the U.S. economy. As a March 2014 paper published by the Brookings Institute notes: "[T]the U.S. economy is increasingly integrated into the global economy and increasingly trade dependent . . . [exposing] the U.S. to the energy insecurity of its trading partners. If they suffer, it will suffer too."[131] As of 2013, trade represented 30% of the United States' GDP. [132]

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[127] Charles Ebinger et al., *Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural Gas*, The Brookings Energy Security Initiative, 38 (May 2012), http://www.brookings.edu/~/media/research/files/papers/2012/1/natural%20gas%20ebinger/natural_gas_ebinger.pdf [hereinafter *Brookings Study*].

[128] *Id.* at 39.

[129] *Id.* at 38.

[130] *Id.*

[131] Bruce Jones *et al.*, *Fueling a New Order? The New Geopolitical and Security Consequences of Energy*, Project on International Order and Strategy At Brookings, 10 (March 2014), http://www.brookings.edu/~/media/research/files/papers/2014/04/14%20geopolitical%20security%20consequences%20energy%20jones/14%20geopolitical%20security%20energy%20jones%20steven_fixed.pdf (footnote omitted).

[132] *Trade (% GDP)*, The World Bank (2015), http://data.worldbank.org/indicator/NE.TRD.GNFS.ZS.

With respect to geopolitics, the Brookings Study concludes: "A large increase in U.S. LNG exports would have the potential to increase U.S. foreign policy interests in both the Atlantic and Pacific basins."[133]

> [T]he addition of a large, market-based producer [*i.e.*, the U.S.] will indirectly serve to increase gas supply diversity in Europe, thereby providing European consumers with increased flexibility and market power. *** Increased LNG exports will provide similar assistance to strategic U.S. allies in the Pacific Basin. By adding supply volumes to the global LNG market, the U.S. will help Japan, Korea, India, and other import-dependent countries in South and East Asia to meet their energy needs. *** As U.S. foreign policy undergoes a 'pivot to Asia,' the ability of the U.S. to provide a degree of increased energy security and pricing relief to LNG importers in the region will be an important economic and strategic asset.[134]

Finally, as to the environment, the Brooking Study states:

> According to the [International Energy Agency], natural gas in general has the potential to reduce carbon dioxide emissions . . . . Natural gas – in the form of LNG – also has the potential to displace more carbon-intensive fuels in other major energy users, including across the EU and in Japan, which is being forced to burn more coal and oil-based fuels to make up for the nuclear generation capacity lost in the wake of the Fukushima [nuclear] disaster. In

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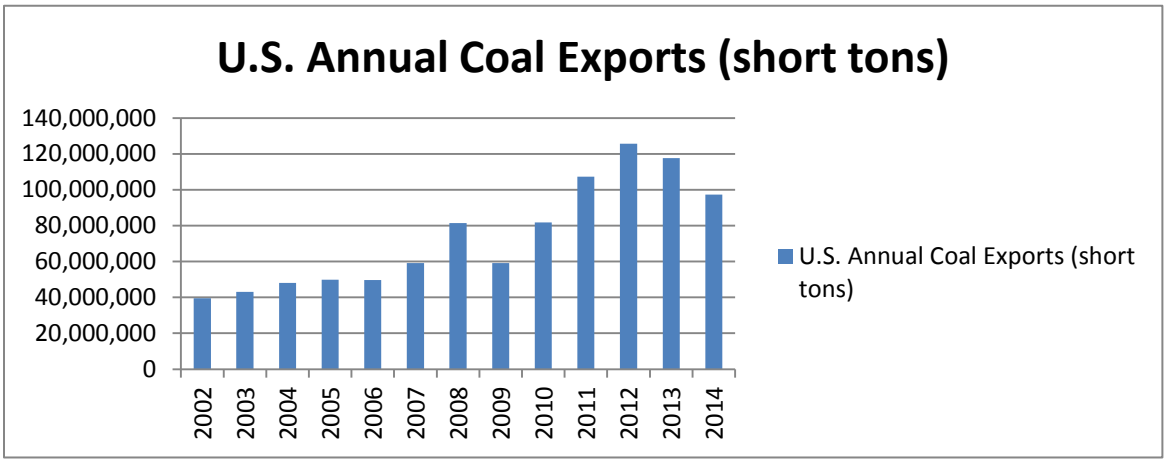
[133] *Brookings Study*, *supra* note 127, at 41; *See also* Charles K. Ebinger and Govinda Avasrala, *The Case for U.S. Liquefied Natural Gas Exports*, Brookings (Feb. 2013), http://www.brookings.edu/research/articles/2013/02/us-lng-exports-ebinger-avasarala (determining that LNG exports will have an unquantifiable impact on geopolitics because "[a]dditional volumes of US LNG will be beneficial to the global gas market, potentially helping US allies in Europe and Asia that are dependent on natural gas for energy. . . . US exports will provide liquidity to natural gas consumers around the world, potentially improving the energy costs for consumers in LNG-dependent countries like Japan and India.").

[134] *Id.* at 43. European nations are looking to diversify their energy supply. Central Europe Energy Partners, *American LNG: An Opportunity for Greater energy Security in Europe* (Aug. 27, 2015). http://www.ceep.be/american-lng-an-opportunity-for-greater-energy-security-in-europe/. Recent tensions between Russia and the European Union relating to Russia's annexation of Ukraine underscore the need for U.S. LNG exports. Jason Czerwiec, *East Europe Moves Toward Energy Independence* (Apr. 2, 2015), http://www.nationalreview.com/articles/416312/breaking-russias-chokehold). U.S. LNG exports will also help Asian countries meet their energy needs. "Regardless of their maturity and size, most Asian countries will need to import more gas to meet demand growth, as production (when relevant) fails to grow at the same pace as consumption. Over the medium term, half of the anticipated increase in gas consumption will require additional imports. . . . LNG is expected to continue to play a leading role. Hence, Asia is forecast to absorb 80% of the incremental LNG imports over the medium term." Anne-Sophie Corbeau et. al, *The Asian Quest for LNG in a Globalising Market*, International Energy Agency (2014), at 10, *available at* http://www.iea.org/publications/freepublications/publication/PartnerCountrySeriesTheAsianQuestforLNGinaGlobalisingMarket.pdf.

> addition to its relatively lower carbon-dioxide footprint, natural gas produces lower emissions of pollutants such as sulfur dioxide nitrogen oxide and other particulates than coal and oil.[135]

While the U.S. proceeds to plod forward with LNG export authorizations at a subdued pace, slowing the rate at which natural gas can be brought to overseas markets, the coal industry has been rapidly growing its exports, with the U.S. government willingly taking on the role of a key supplier. Figure 4 depicts growing U.S. coal exports between 2002 and 2014 as reported by the E.I.A.

Figure 4: U.S. Annual Coal Exports



In 2002, coal exports were the energy equivalent of approximately 972 Bcf/yr of natural gas. By 2012, coal exports had grown to the equivalent of 2.91 Tcf/yr – more than double the amount of the natural gas Rio Grande LNG proposes to export. While it appeared that the U.S.

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[135] *Id.* at 44; *Does Natural Gas Reduce Greenhouse Gas Emissions*, ConocoPhillips, http://www.conocophillips.com/sustainable-development/common-questions/Pages/does-natural-gas-reduce-greenhouse-gas-emissions.aspx (last visited Oct. 22, 2015) (discussing that "[m]any studies have shown that electric power plants fueled with natural gas emit far less greenhouse gas . . . than coal-fired plants. Reduction estimates . . . [range] from 37% to 54%.") . The DOE/FE found in its May 2014 study regarding greenhouse gas lifecycles that "[i]n general, . . . for most scenarios in both the European and Asian regions, the generation of power from imported natural gas has lower life cycle [greenhouse gas] emissions than power generation from regional coal." National Energy Technology Laboratory, *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied antural Gas from the United States*, The Department of Energy, at 9 (May 29, 2014), http://energy.gov/sites/prod/files/2014/05/f16/Life%20Cycle%20GHG%20Perspective%20Report.pdf.

had turned a corner on coal exports in 2013, a front-page, above-the-fold article of the October 16, 2015 edition of The Washington Post entitled: "*U.S. exports its greenhouse-gas emissions – as coal*" paints a different picture of the future. The paper reported:

> [N]early half a billion tons of [coal] are hauled from the [Powder River Basin] region's vast strip mines and millions of tons are shipped overseas for other countries to burn. Government and industry reports predict a surge in exports of Powder River coal over the next decade, at a time when climate experts are warning of an urgent need to reduce coal burning to prevent global temperatures from soaring.
>
> Each shipment highlights what critics describe as a hypocrisy underlying U.S. climate policy: While boasting of pollution cuts at home, the United States is facilitating the sale of large quantities of government-owned coal abroad.
>
> 'We're a fossil-fuel-exporting super-power that goes around lecturing the rest of the world about cutting emissions,' said Paul Bledsoe, who was an adviser on climate during the Clinton administration. 'The United States is reducing its domestic coal use and then simply exporting some of those emissions abroad.'
> The production of electricity is the leading source of man-made greenhouse gases in the atmosphere, and the global demand for electricity, particularly in developing nations, will only grow. Coal accounts for 40 percent of the electricity produced globally — and more in China and India.[136]

The paper went on to note: "The Interior Department is finalizing leases for 2.5 billion tons of Powder River coal, and agency documents released earlier this year propose making an additional 10 billion tons available for mining — and, potentially exporting — over the next 25 to 30 years."[137] This is the annual energy equivalent of more than six times what Rio Grande LNG proposes to export each year.[138] Surely, if it is good policy to export coal, which contains

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[136] Joby Warrick, *U.S. exports its greenhouse-gas emissions — as coal. Profitable coal*, The Washington Post (Oct. 15, 2015), https://www.washingtonpost.com/world/us-exports-its-greenhouse-gas-emissions--as-coal-profitable-coal/2015/10/08/05711c92-65fc-11e5-bdb6-6861f4521205_story.html.

[137] *Id.*

[138] Powder River Basin coal has an average heat content of 8,800 Btu/pound, making the export of this coal over a 25 year period equivalent to 8.8 quadrillion Btu/yr. *Coal News and Markets*, U.S. Energy Information Administration, http://www.eia.gov/coal/news_markets/ (last visited Oct. 15, 2015).

elevated amounts of carbon, mercury, sulfur and other pollutants compared to natural gas, then it must be even better policy to export clean LNG, which has the potential to suppress increases in foreign dependence on coal.

The Brookings Study, discussed above, notes that some have expressed concern that lower gas prices may lead to increased carbon dioxide emissions due to the displacement of nuclear and renewable energy by cheap natural gas.[139] Rio Grande LNG asserts that such concerns are misplaced. First, as the Brookings Study concludes, the export of U.S. natural gas would not make a substantial impact on the need for other energy sources to generate electricity.[140] Second, U.S. LNG exports are driven by the price differential between the destination markets and the U.S. natural gas market. Destination markets must command a significant price premium in order to cover the cost of liquefaction, transportation and regasification. Such considerations all favor the use of nuclear and renewable energy sources overseas relative to their competitiveness against natural gas in the U.S. Moreover, any tendency on the part of LNG exports to raise the cost of U.S. domestic gas supplies not only tends to reduce the volume of exports, but it also contributes to the increased use of alternative forms of generation in the U.S., making nuclear and renewable energy relatively more cost-effective. Thus, any loss of competitiveness of such generating technologies abroad would be at least partially mitigated by increased competitiveness of these technologies in the U.S.

[139] *Brookings Study*, *supra* note 127, at 44.

[140] *Id.*

Exporting LNG from the Rio Grande LNG Project will also improve the U.S. balance of trade. The U.S. has been experiencing large trade deficits for several decades.[141] In 2014, the U.S. trade deficit was over $500 billion.[142] So far, simply taking advantage of low domestic natural gas prices to produce things more cheaply in the U.S. has not substantially reversed the trade deficit. To the contrary, the strengthening U.S. dollar and weak Chinese economy have contributed to a deteriorating situation. A recent Wall Street Journal article summed things up by stating: "One of the fastest-growing U.S. exports right now is air." The article explained:

> Shipments of empty containers out of the U.S. are surging this year, highlighting the impact the economic slowdown in China is having on U.S. exporters. The U.S. imports more from China than it sends back, but certain American industries—including those that supply scrap metal and wastepaper—feed China's industrial production.
>
> Those exporters have suffered this year as China's economy has cooled. In September, the Port of Long Beach, Calif., part of the country's busiest ocean-shipping gateway, handled 197,076 outbound empty boxes. They accounted for nearly a third of all containers that moved through the port last month. September was the eighth straight month in which empty containers leaving Long Beach outnumbered those loaded with exports.
>
> The empties are shipping out at a faster rate at many U.S. ports, particularly those closely tied to trade with China, while shipments of containers loaded with goods are declining as exporters find it tougher to make foreign sales. That's at least partly because the strong dollar makes American goods more expensive.[143]

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[141] U.S. Dep't of Commerce, Census Bureau, *U.S. Trade in Goods and Services – Balance of Payments Basis, 1960 through 2014* (June 3, 2015), http://www.census.gov/foreign-trade/statistics/historical/gands.txt."The United States had been running consistent trade deficits since 1976 due to high imports of oil and consumer products." *United States Balance of Trade*, Trading Economics, http://www.tradingeconomics.com/united-states/balance-of-trade (last visited Oct. 21, 2015). In fact, the U.S. "recorded a trade deficit of $48.3 billion in August of 2015, up $6.5 billion from $41.8 billion in July." *Id.*

[142] *See* U.S. Bureau of Econ. Analysis, U.S. Dep't of Commerce, *U.S. International Trade in Goods and Services Exports, Imports and Balances*, http://www.bea.gov/newsreleases/international/trade/trad_time_series.xls (last updated Oct. 6, 2015).

[143] Erica E. Phillips, *At U.S. Ports, Exports Are Coming Up Empty*, The Wall Street Journal (Oct. 13, 2015), http://www.wsj.com/articles/at-u-s-ports-exports-are-coming-up-empty-1444768094.

The article offered the following expert opinion: "'This is a thermometer,' said Jock O'Connell, an international-trade economist at Beacon Economics.[144] 'The thing to worry about is if the trade imbalance starts to widen.'"[145] It went on to report: "The U.S. trade gap has expanded sharply in recent months as exports have slipped, growing 15.6% in August to a seasonally adjusted $48.3 billion, according to the Commerce Department. U.S. exports fell 2% in the month to their lowest level since October 2012."[146] While it is not possible to fill those empty containers with natural gas instead of air, LNG exports can accomplish the next best thing by sending full LNG tankers abroad and returning them empty. The DOE/FE has recognized that LNG exports would have a positive role on U.S. trade with destination countries and would reduce U.S. trade imbalances.[147]

Beyond that, such LNG exports could help stimulate foreign economies by providing a lower cost fuel source. Healthier foreign economies could then raise demand for other U.S. products that could fill those empty shipping containers.

C. Application of Public Interest Considerations to Requested Authorization Term

Rio Grande LNG is requesting a modest departure from past DOE/FE practice with regard to the term of authorization for the requested exports. In the past, DOE/FE has authorized exports for "a term of 20 years to commence on the earlier of the date of first commercial export or seven years from the date that [the relevant export authorization order] is issued."[148] In doing

---

[144] *Id.*

[145] *Id.*

[146] *Id.*

[147] *See, e.g., Sabine Pass, Order No. 2961, supra* note 17, at 35-36. *See also, CMI, DOE/FE Order No. 2651, supra* note 41, at 14; *ConocoPhillips, DOE/FE Order No. 2500, supra* note 41, at 58; *Sabine Pass, DOE/FE Order No. 3669, supra* note 4, at 195-96; *see also Brookings Study, supra* note 127, at vi (stating that U.S. LNG exports are likely to make a positive contribution to the U.S. trade balance).

[148] *See, e.g., Cove Point, DOE/FE Order 3331-A,* Ordering Paragraph A, *supra* note 4, 107.

so, DOE/FE has explained that its caution with respect to not authorizing terms longer than 20 years beyond the commencement of exports stems from the fact that its NERA Report contains projections over a 20-year period beginning from the date of first export, that such period is adequate to allow the exporter to recoup its investment in the LNG terminal, and the contracts for liquefaction services or LNG purchases employ a consistent 20-year term.[149] Rio Grande LNG's current request to use export authorization terms tied to the date of first export from each liquefaction train, rather than the first export from any liquefaction train at the project, is consistent with the NERA Report and simply treats each liquefaction train as a separate increment of exports. In practice, this is analogous to the DOE/FE not tying all liquefaction facilities' 20-year export authorization terms to the first export by any authorized liquefaction facility. Additionally, as previously described, due to the spread of initial operating dates for the various trains at the project and the extra cost of developing the supporting pipeline for the project, the use of a single term tied to first train to commence exporting would significantly impair both (a) the ability of Rio Grande LNG and its pipeline affiliate to recover their costs, and (b) the marketability of the service Rio Grande LNG is able to offer from the trains that will come online years after the first export at the project. Further, Rio Grande LNG intends to market its services in the form of 20-year tolling agreements tied to specific trains. As such, terms tied to the first export of LNG from individual trains fit its business model, while a single 20-year term does not.

DOE/FE's past authorizations were issued in response to applications seeking approvals for exports for a smaller number of trains and, consequently, with more contemporaneous initial exports dates for each train covered by a particular authorization. This approach is not favored

[149] *Id.* at 100.

for larger scale projects, like the Rio Grande LNG Project, with longer construction times. For the reasons stated previously, it is not practicable for Rio Grande LNG to scale back its project to fit DOE/FE's past practice. Because of the many benefits that the Rio Grande LNG Project will bring to the Brownsville, Texas area, South Texas and the US generally, the public interest would be served by granting this aspect of Rio Grande LNG's Application.

With regard to the condition that exports must commence within seven years of the relevant export authorization, the DOE/FE has stated: "The purpose of this condition is to ensure that other entities that may seek similar authorizations are not frustrated in their efforts to obtain those authorizations by authorization holders that are not engaged in actual export operations."[150] Since, under DOE/FE's prior orders, this condition can be satisfied for a multi-train facility by the exporter commencing exports from even a single train, Rio Grande LNG's request actually seeks less generous treatment than given to prior applicants. In particular, Rio Grande LNG would have each train treated as a separate facility, such that operation of the first train would not relieve subsequent trains from the obligation of meeting their applicable deadlines. In the case of the first four trains, they would each need to commence operations within seven years of issuance of an export authorization by the DOE/FE. The last two trains would be given an extra year to commence exports in order to reflect the realities of the construction schedule for the project. However, the fact that Rio Grande LNG would have proceeded with four of the six trains by year seven and its affiliate would have already constructed the approximately 137-mile-long natural gas pipeline system needed to supply the project with natural gas should eliminate any concern that Rio Grande LNG is attempting to "bank" LNG export authorizations at the expense of other potential exporters.

[150] *Id.* at 101.

With regard to the combined impact of allowing for individual 20-year terms for each train and allowing two of the trains to commence exports as late as eight years after the date of the authorization order, Rio Grande LNG submits that the balance of considerations leads to the conclusion that such an approach is not inconsistent with the public interest. The Deloitte Rio Grande LNG Export Report's reasoning supports the conclusion that LNG exports from the Rio Grande LNG Project would not have a significant negative impact on domestic gas markets through at least 2045. Further, the many benefits of the proposed exports described herein would be enhanced, rather than diminished, by virtue of spreading the development of the Rio Grande LNG Project and its LNG exports over a broader period, compared to the more rapid development schedule and compressed exports that would be needed to fit into past DOE/FE practice. Among other things, the direct and indirect jobs created and the investment provided by the Rio Grande LNG Project and the supporting pipeline, the transportation of natural gas to and production of natural gas for the project, and the payment by foreign entities for LNG exported by the project would be smoothed and stretched with respect to time, thereby reducing strains on infrastructure and markets and reducing the boom/bust effect on the construction and natural gas industries. For example, the demand for natural gas by the project would ramp up at the start and decrease at the end more slowly under an eight-year development process than under a seven-year development process. This will facilitate adjustment by natural gas markets to the presence, and eventual withdrawal, of the project from the market.

VIII.
RELATED AUTHORIZATIONS AND ENVIRONMENTAL IMPACTS

Rio Grande LNG will request NGA Section 3 authorization from the FERC so that it may site, construct and operate the Rio Grande LNG Project. Rio Grande LNG commenced the FERC's mandatory pre-filing process in April of this year[151] and plans to file its formal application for a Section 3 authorization in the first quarter of 2016. As necessary to support the Rio Grande LNG Project schedule, Rio Bravo Pipeline Company, LLC is participating in the FERC's pre-filing process, and an application for NGA Section 7(c) authorization to construct, own and operate the RB Pipeline will be filed with the FERC at the same time that the Rio Grande LNG Project's FERC application is filed.

The potential environmental impacts of the Rio Grande LNG Project will be reviewed by the FERC under NEPA. Consistent with the NEPA scheme applicable to applications for authorizations under NGA Section 3 delineated by Congress in the Energy Policy Act of 2005,[152] the FERC is acting as the lead agency with the DOE/FE invited to participate as a cooperating agency, in connection with the Rio Grande LNG Project.[153]

Rio Grande LNG anticipates that the DOE/FE will cooperate with the FERC in the development of an Environmental Impact Statement ("EIS") for the Rio Grande LNG Project.[154] Further, Rio Grande LNG expects that the DOE/FE will adopt the FERC's EIS if the DOE/FE

[151] Letter from Ann Mires, Director, Office of Energy Projects, Approving Rio Grande LNG's Pre-Filing Request (Apr. 13, 2015) (on file with the FERC at FERC Docket No. PF15-20-000).

[152] Pub. L. No. 109-58, 119 Stat. 594 (2005).

[153] *See*, *Notice of Intent to Prepare an Environmental Impact Statement for the Planned Rio Grande LNG Project and Rio Bravo Pipeline Project, Request for Comments on Environmental Issues, and Notice of Public Scoping Meeting*, FERC Docket No. PF15-20 (July 23, 2015) at 6.

[154] 10 C.F.R. § 1021.342 (2015).

concludes that its comments and suggestions have been satisfied.[155] To the extent it reaches such conclusion, the DOE/FE may then promptly issue a record of decision pursuant to NEPA and issue a final order on this Application pursuant to Rio Grande LNG's request herein.

IX.
REPORT CONTACT INFORMATION

The contact for any reports required in connection with the requested authorization is as follows:

Shaun Davison
Senior Vice President
Rio Grande LNG, LLC
3 Waterway Square Place
Suite 400
The Woodlands, TX 77380
Telephone & Facsimile: (832) 403-3040
Email: shaun@next-decade.com

X.
APPENDICES

The following appendices are attached hereto and incorporated by reference herein:

Appendix A:	Locator Map and Project Location Information
Appendix B:	Evidence of Proposed Site's Availability to Rio Grande LNG
Appendix C:	Verification
Appendix D:	Opinion of Counsel
Appendix E:	Perryman Study
Appendix F:	Deloitte Rio Grande LNG Export Report

[155] *See* 40 C.F.R. § 1506.3(c) (2015). ("A cooperating agency may adopt without recirculating the environmental impact statement of a lead agency when, after an independent review of the statement, the cooperating agency concludes that its comments and suggestions have been satisfied.").

XI.
CONCLUSION

For the foregoing reasons, Rio Grande LNG respectfully requests that DOE/FE grant Rio Grande LNG's request for long-term, multi-contract authorization to engage in total exports of up to approximately 1.318 Tcf/y of natural gas in the form of LNG, which is the equivalent of approximately 27 MTPA, from the Rio Grande LNG Project to both FTA and Non-FTA Countries under individual 20-year terms for each of the six (6) liquefaction train plus any applicable Make-Up Periods. Rio Grande LNG further requests that such terms commence on the earlier of (a) the date of first export from each respective train, or (b)(i) seven (7) years from the date of issuance of such authorization for the first four (4) trains to be constructed, and (ii) eight (8) years from the date of issuance of such authorization for the final two (2) trains to be constructed.

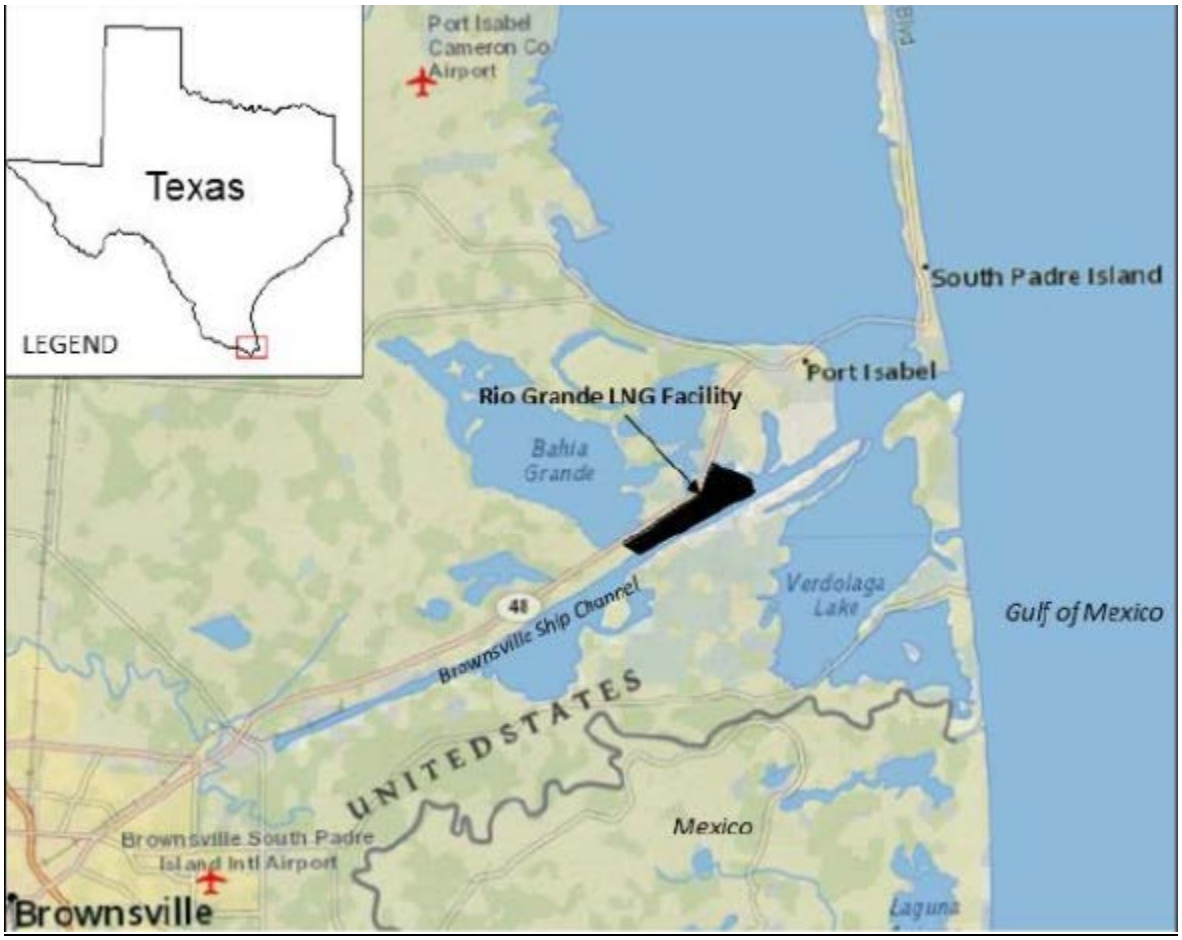
Respectfully submitted,

/s/ Erik J.A. Swenson
Erik J.A. Swenson
Islara U. Irgit
Attorneys for Rio Grande LNG, LLC

Dated: December 21, 2015

APPENDIX A

LOCATOR MAP AND PROJECT LOCATION INFORMATION



APPENDIX B

EVIDENCE OF PROPOSED SITE'S AVAILABILITY TO RIO GRANDE LNG, LLC

MEMORANDUM OF FIRST AMENDMENT TO OPTION TO LEASE

THE STATE OF TEXAS §

§ **KNOW ALL MEN BY THESE PRESENTS:**

COUNTY OF CAMERON §

This MEMORANDUM OF FIRST AMENDMENT TO OPTION TO LEASE (this "Memorandum of Option") is made and entered into effective as of the 6th day of November, 2014 by and between the **BROWNSVILLE NAVIGATION DISTRICT OF CAMERON COUNTY, TEXAS**, a navigation district organized, created and existing under and by virtue of the laws of the State of Texas, with its domicile in Brownsville, Cameron County, Texas, ("Optionor") and the **NEXT DECADE, LLC** ("Optionee").

Optionor and Optionee are parties to the Option to Lease dated as November 6, 2013 (said Option to Lease, as heretofore amended, the "Option Agreement"), covering certain real property situated in Cameron County, Texas, and more particularly described on Exhibit "A" attached hereto and incorporated for all purposes (the "Property"). Pursuant to the terms of the Option Agreement, Optionor granted to Optionee an option to lease the Property, as more particularly described in the Option Agreement. Optionor and Optionee agreed on November 6, 2014 to increase the size of the optioned Premises under the Agreement by 500.00 acres. Said 500.00 acre tract is described in the attached Exhibit "B" attached hereto and incorporated for all purposes (the "Increased Property). The Option Agreement as amended expires on May 5, 2015; however, Optionee may extend the term of the Option Agreement through November 5, 2017 pursuant to the terms of the amended Option Agreement.

NOW, THEREFORE, the parties hereto have entered into this Memorandum of Option to acknowledge and place as a matter of public record the aforementioned Option Agreement. Nothing in this Memorandum of Option shall alter or amend any of the terms of the Option Agreement.

EXECUTED effective as of the date first above written.

OPTIONOR:

Brownsville Navigation District
Of Cameron County, Texas

By: _____
Ralph Cowen, Chairman

Attested to:

By: _____
Secretary

OPTIONEE:

Next Decade, LLC

By: _____

Name: KATHLEEN EISENHOWER

Its: CEO

STATE OF TEXAS §
COUNTY OF CAMERON §

This instrument was acknowledged before me on the 4th day of March, 2015, by **Ralph Cowen** in his capacity as Chairman of the Board of Navigation and Canal Commissioners of the **Brownsville Navigation District of Cameron County, Texas.**

BEATRICE G ROSENBAUM
My Commission Expires
February 17, 2017

_____
Notary Public in and for the State of Texas

STATE OF TEXAS §
COUNTY OF Montgomery §

This instrument was acknowledged before me on the 3rd day of March, 2015, by Kathleen Eisenhower in his capacity as CEO of **Next Decade, LLC.**

CHRISTINE MARIE COIT
Notary Public, State of Texas
My Commission Expires
November 17, 2015

_____
Notary Public in and for the State of Texas

Exhibit A to Memorandum

EXHIBIT "A"

NEXT DECADE, LLC
METES AND BOUNDS DESCRIPTION
500.0 ACRE TRACT

November 26, 2013

BEING 500.0 ACRES of land out of Share 3, San Martin Grant, Cameron County, Texas, said 500.0 Acre Tract being more particularly described as follows:

BEGINNING at the intersection point of the U.S.E.D. Station 40+626.52 and the North 6+00 Reference Line from the original centerline of the Brownsville Ship Channel, said point being the Southeast corner of the 200.0 Ft. Gayman Channel Easement, for the Southwest corner and **PLACE OF BEGINNING** of this tract;

THENCE along the East line of said 200.0 Ft. Gayman Channel Easement, North 55 deg. 54 min. 55 sec. West, 2,225.49 feet to the Northeast corner of said Gayman Channel Easement, said point being on the South Right-of-Way line of State Highway No. 48, for the Northwest corner of this tract;

THENCE along the South Right-of-Way line of said State Highway No. 48, North 57 deg. 38 min. 35 sec. East, 1,728.00 feet to a point for a corner of this tract;

THENCE South 86 deg. 49 min. 22 sec. West, 205.11 feet to a point on the South Right-of-Way line of said State Highway No. 48, for a corner of this tract;

THENCE along the South Right-of-Way line of said State Highway No. 48, North 57 deg. 38 min. 35 sec. East, 8,375.96 feet to a point for the Northeast corner of this tract;

THENCE South 55 deg. 54 min. 55 sec. East, 2,690.41 feet to a point on the North 6+00 Reference Line from the original centerline at the Brownsville Ship Channel, for the Southeast corner of this tract;

THENCE along the North 6+00 Reference Line from the original centerline of the Brownsville Ship Channel, South 62 deg. 25 min. 27 sec. West, 3,647.96 feet to the point of curvature of a curve to the left for a corner of this tract;

THENCE continuing along the North 6+00 Reference Line from the original centerline of the Brownsville Ship Channel and along said curve to the left having a radius of 6,354.65 feet, a delta of 04 deg. 46 min. 52 sec. and a total length curve of 530.29 feet, to the point of tangency on the Corps of Engineers Station 34+680.76 for a corner of this tract;

THENCE continuing along the North 6+00 Reference Line from the original centerline of the Brownsville Ship Channel, South 57 deg. 38 min. 35 min. West, 5,945.76 feet to the **PLACE OF BEGINNING**, containing 500.0 Acres of land more or less.

This description is not based on an on-the-ground survey.

Exhibit B to Memorandum

EXHIBIT B

NEXT DECADE, LLC
METES AND BOUNDS DESCRIPTION
500.0 ACRE TRACT "B"

January 16, 2015

BEING a 500.0 Acre Tract of land out of Santa Isabel Grant, Cameron County, Texas, said 500.0 Acre Tract being more particularly described as follows:

COMMENCING at the intersection point of U.S.E.D. Station 40+626.52 and the North 6+00 Reference Line from the original centerline of the Brownsville Ship Channel, said point being the Southeast corner of the 400.0 Ft. Gayman Channel Easement, thence along the North 6+00 Reference line from the original centerline of the Brownsville Ship Channel, North 57 deg. 38 min. 35 sec. East, 5,945.76 Ft. to the point of curvature of a curve to the right having a radius of 6,354.65 feet, a delta of 04 deg. 46 min. 52 sec. and a total length curve of 530.29 feet to the point of tangency for a corner, thence along the North 6+00 Reference line from the original centerline of the Brownsville Ship Channel, North 62 deg. 25 min. 27 sec. East, 3,647.96 feet for the Southwest corner and **PLACE OF BEGINNING** of this tract;

THENCE along the East line of a 500.00 Acre Tract leased to Next Decade, LLC North 55 deg. 54 min. 55 sec. West, 2,690.41 feet to a point on the South Right-of-Way of State Highway No. 48, for the Northwest corner of this tract;

THENCE along the South Right-of-Way line of said State Highway No. 48, North 57 deg. 38 min. 35 sec. East, 470.30 feet to the point of curvature of a curve to the left for a corner of this tract;

THENCE continuing along the South Right-of-Way line of said State Highway No. 48 and along said curve to the left, having a radius of 1,532.79 feet, a delta of 38 deg. 39 min. 00 sec. and a total length curve of 1,033.98 feet to the point of tangency for a corner of this tract;

THENCE continuing along the South Right-of-Way line of said State Highway No. 48, North 18 deg. 59 min. 26 sec. East, 3,229.89 feet to a point for a corner of this tract;

THENCE continuing along the South Right-of-Way line of said State Highway No. 48, North 22 deg. 08 min. 24 sec. East, 505.99 feet to a point for a corner of this tract;

THENCE South 60 deg. 24 min. 32 sec. East, 4,510.94 feet to a point for a corner of this tract;

THENCE South 31 deg. 28 min. 34 sec. East, 1,582.41 feet to a point on the North 6+00 Reference Line from the original centerline of the Brownsville Ship Channel for the Southeast corner of this tract;

THENCE along the North 6+00 Reference Line from the original centerline of the Brownsville Ship Channel, South 62 deg. 25 min. 27 sec. West, 5,402.16 feet to the **PLACE OF BEGINNING,** containing 500.0 Acres of land more or less.

This description is not based on an on-the-ground survey.

NextDecade, LLC
3 Waterway Square Place, Suite 400
The Woodlands, TX 77380
001-713-574-1880
info@next-decade.com
www.next-decade.com

NEXTDECADE
A Portfolio LNG Company

Brownsville Navigation District
1000 Foust Road
Brownsville, Texas 78521
Attn: Port Director/Chief Executive Officer

The Rentfro Law Firm
Post Office Box 6355
Brownsville, Texas 78523
Attn: Daniel L. Rentfro Jr.

May 5, 2015

Subject: Exercise of Option specified under Option to Lease ("***Option Agreement***") dated November 6, 2013, between the Brownsville Navigation District of Cameron County, Texas ("***Optionor***") and Next Decade LLC ("***Optionee***"), and First Amendment to Option to Lease ("***Amendment***") dated effective as of November 6, 2014 between Optionor and Optionee. Capitalized terms not defined herein shall have the meaning set forth in the Option Agreement and Amendment.

Ladies and Gentlemen,

Pursuant to Paragraph 5 of the Option Agreement, this letter is to inform you that Optionee elects to exercise its renewal option to extend the Term for the Third Renewal Term as adjusted in the Amendment. Further, pursuant to Paragraph 3 of the Amendment, Optionee agrees to pay $[redacted] as consideration for the Third Renewal Term ending on November 5, 2015.

Sincerely,

Next Decade LLC
Ray Eisbrenner
Chief Administrative Officer

NEXTDECADE
A Portfolio LNG Company

NextDecade, LLC
3 Waterway Square Place, Suite 400
The Woodlands, TX 77380
001-713-574-1880
info@next-decade.com
www.next-decade.com

Brownsville Navigation District
1000 Foust Road
Brownsville, Texas 78521
Attn: Port Director/Chief Executive Officer

The Rentfro Law Firm
Post Office Box 6355
Brownsville, Texas 78523
Attn: Daniel L. Rentfro Jr.

October 15, 2015

Subject: Exercise of Option specified under Option to Lease ("***Option Agreement***") dated November 6, 2013, between the Brownsville Navigation District of Cameron County, Texas ("***Optionor***") and Next Decade LLC ("***Optionee***"), and First Amendment to Option to Lease ("***Amendment***") dated effective as of November 6, 2014 between Optionor and Optionee. Capitalized terms not defined herein shall have the meaning set forth in the Option Agreement and Amendment.

Ladies and Gentlemen,

Pursuant to Paragraph 5 of the Option Agreement, this letter is to inform you that Optionee elects to exercise its renewal option to extend the Term for the Fourth Renewal Term as adjusted in the Amendment. Further, pursuant to Paragraph 4 of the Amendment, Optionee agrees to pay $[redacted] as consideration for the Fourth Renewal Term ending on November 5, 2016.

Sincerely,

NextDecade, LLC
Ray Eisbrenner
Chief Administrative Officer

APPENDIX C

VERIFICATION

UNITED STATES OF AMERICA DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY

VERIFICATION

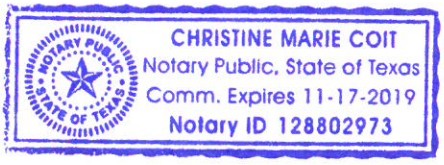
Krysta De Lima, first being sworn, states that she is the General Counsel for Rio Grande LNG, LLC with responsibility for legal matters affecting the proposed Rio Grande LNG Project; that she is duly authorized to execute this Verification; that she has read the foregoing filing and is familiar with the contents thereof; and that all of the statements of fact therein contained are true and correct to the best of her knowledge and belief.

Krysta De Lima
On behalf of
Rio Grande LNG, LLC

STATE OF TEXAS)

Subscribed and sworn to before me on this 21st day of December, 2015, by Krysta De Lima proved to me on the basis of satisfactory evidence to be the person who appeared before me.

NOTARY PUBLIC SIGNATURE



NOTARY PUBLIC SEAL

APPENDIX D

OPINION OF COUNSEL

RIO GRANDE
LNG

3 Waterway Square Place, Suite 400
The Woodlands, TX 77380
001-844-807-4564
info@riograndelng.com
www.RioGrandeLNG.com

OPINION OF COUNSEL

December 21, 2015

Mr. John A. Anderson
Office of Fossil Energy
U.S. Department of Energy
FE-34
1000 Independence Avenue, S.W.
Washington, DC 20585

RE: Rio Grande LNG, LLC
DOE/FE Docket No. 15- _____ -LNG
Application for Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas

Dear Mr. Anderson:

This opinion of counsel is submitted pursuant to Section 590.202(c) of the regulations of the U.S. Department of Energy, 10 C.F.R.§ 590.202(c) (2015). I am the General Counsel for Rio Grande LNG, LLC ("Rio Grande LNG"). I have reviewed the organizational and internal governance documents of Rio Grande LNG, a Texas limited liability company, and other documents and authorities as necessary for purposes of this opinion. On the basis of the foregoing, it is my opinion that the proposed long-term, multi-contract export of liquefied natural gas by Rio Grande LNG, as described in the above-referenced application, is within the limited liability company powers of Rio Grande LNG.

Respectfully submitted,

Krysta De Lima

APPENDIX E

PERRYMAN STUDY

December 2015

The Potential Impact of the Proposed Rio Grande Liquefied Natural Gas (LNG) and Rio Bravo Pipeline Facilities on Business Activity in Cameron County, Texas, and the United States

THE PERRYMAN GROUP

510 N. Valley Mills Dr., Suite 300

Waco, TX 76710

ph. 254.751.9595, fax 254.751.7855

info@perrymangroup.com

www.perrymangroup.com

Contents

Summary of Study Findings

Rio Grande LNG is a proposed natural gas liquefaction and Liquefied Natural Gas (LNG) export facility to be located on the Brownsville Ship Channel, near Brownsville, Texas. Construction and operation of the facilities would involve significant economic and fiscal benefits for the local area, Texas, and the United States.

Natural gas has now become a viable source of exports for the nation, as supplies and production are in excess of domestic needs. The ability to export domestic gas as LNG greatly expands the market scope and access for domestic natural gas producers, thus encouraging domestic production at times when US market prices might not otherwise be favorable.

The Perryman Group evaluated the potential net economic impacts of the Rio Grande LNG facility and the associated Rio Bravo Pipeline and other investments on business activity. Sources of economic benefits measured include the impacts of construction and non-operational activity, ongoing operations, enhanced exploration and production of natural gas, and associated potential development of facilities utilizing by-products.

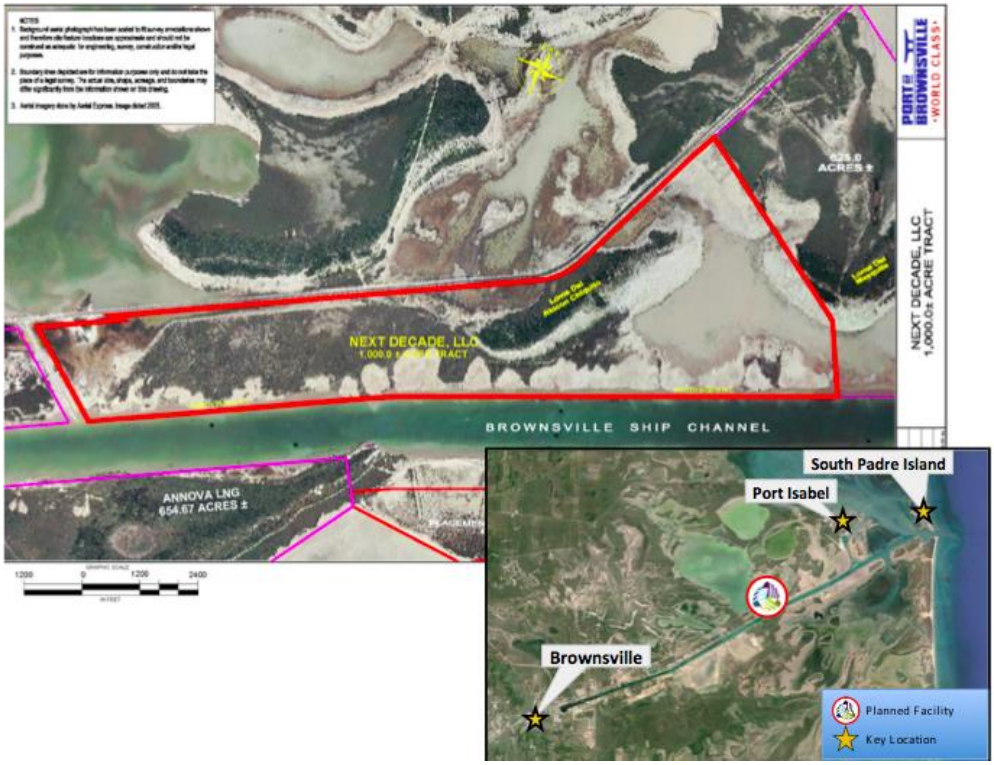
Summary of Economic and Fiscal Impacts of Construction and Operation of Rio Grande LNG and Associated Facilities*
(including multiplier effects)

	United States	*Texas*	*Cameron County*
CONSTRUCTION AND NON-OPERATIONAL PERIOD			
Gross Product	$35,130 million	$23,184 million	$5,938 million
Employment	413,434 person-years	277,003 person-years	74,374 person-years
Tax Receipts	$3.0 billion	$1.2 billion	$136.9 million
OPERATIONS (AT MATURITY)			
Gross Product	$560 million per year	$513 million per year	$326 million per year
Employment	4,901 permanent jobs	4,492 permanent jobs	3,256 permanent jobs
Tax Receipts	$34 million per year	$24 million per year	$5 million per year

SOURCE: The Perryman Group
NOTE: Includes the Rio Grande LNG terminal, Rio Bravo Pipeline, and related facilities. Further detail including methods and assumptions, additional measures of impacts, alternate time periods, and the effects of natural gas exploration as well as facilities utilizing by-products are presented in the accompanying report. Additional detail is included in the Appendices. Note that the tax estimates incorporate extensive spinoff effects and assume that incentives are provided which are consistent with current law and in line with those provided to similar projects in recent years.

Introduction and Overview

Rio Grande LNG is a proposed natural gas liquefaction and Liquefied Natural Gas (LNG) export facility to be located on the Brownsville Ship Channel, near Brownsville, Texas. The project involves six liquefaction trains, a terminal, pipeline connections, and other necessary facilities. Each train would have a nominal LNG output capacity of 4.5 million metric tons per year, and construction is scheduled to begin in 2017. Rio Grande LNG, LLC and Rio Bravo Pipeline Company, LLC are special purpose entities created to develop and operate the terminal and pipeline; they are subsidiaries of NextDecade, LLC.



Construction and operation of the facilities would involve significant economic benefits for the local area, state of Texas, and United States. The investment and ongoing spending by the facility would provide a notable economic stimulus, as well as supporting the development of natural gas reserves and the potential to stimulate incremental petrochemical production. Exporting LNG would also result in positive effects on the US position in international trade.

The Perryman Group was asked to analyze current economic conditions in the Cameron County area. In addition, the potential impact of the construction and ongoing operation of Rio Grande LNG on business activity in the local area, Texas, and the United States was examined. Other potential benefits of the facility such as its positive effect on the US balance of trade were also quantified. This report presents the findings from TPG's analysis.

Socioeconomic Conditions in Cameron County

The population of Cameron County has increased slightly in the last few years from 406,220 in 2010 to 420,392 in 2014, a 3.5% rise.[1] Some 48.3% of residents were male (202,933) and 51.7% were female (217,459).[2] The median age in the area was 31.4, with men being 29.4 and women 33.3.[3] About 31.6% of the population was younger than age 18 and 12.4% was aged 65 years or older.[4] By comparison, 26.4% of the Texas population was younger than 18 and 11.5% over 65.[5]

The median household income in Cameron County in 2013 was $34,374, significantly lower than median levels for the United States ($52,250) or Texas ($51,704).[6] About 23.4% of households had incomes below $15,000 (compared to 12.9% in the US and 12.6% in Texas). Some 4.5% of households in the county had incomes above $150,000, less than half the proportion in the United States (9.9%) and Texas (9.9%).[7]

About 47.8% of the population age 16 and over was employed in 2013 and 45.2% was not in the labor force, reflecting a much lower employment rate and much higher level of the population outside the labor force than the corresponding rates for the United States (57.9% and 36.4%, respectively) and Texas (59.9% employed and 35.1% not in the labor force).[8] Of those employed, approximately 74.2% were private wage and salary workers, while 17.7% were government workers. Another 7.8% were self-employed in non-incorporated businesses.[9]

In 2013, 64.1% of people age 25 and older in Cameron County had at least graduated high school. An estimated 17.1% had a Bachelor's degree or higher.[10] These levels of educational attainment are somewhat lower than those for Texas or the United States as a whole.

There were 118,546 households in Cameron County as of 2013. The average household size was 3.5 people. About 78.5% of the households were family households with 68.5% of those being

[1] Annual Estimates of the Resident Population for Selected Age Groups by Sex for the United States, States, Counties and Puerto Rico Commonwealth and Municipios, April 2010 to July 1, 2014, US Census Bureau, Population Division, June 2015.
[2] Ibid.
[3] Ibid.
[4] Ibid.
[5] Ibid.
[6] US Census Bureau American Fact Finder, American Community Survey, 2013 1-Year Estimates.
[7] Ibid.
[8] Ibid.
[9] Ibid.
[10] Ibid.

married couple families. In addition, 46.2% of all households had at least one person under the age of 18, and 38.7% had at least one person 60 years or older.[11]

Cameron County had a total of 144,522 housing units in 2013, approximately 18.0% of which were vacant. Of the total housing units, about 67.7% were single-unit structures, 20.9% were multi-unit structures, and 11.4% were mobile homes. Some 40.9% of the units were built since 1990, and 76.4% of the housing units have 3 or more bedrooms. Of the 118,546 occupied housing units, 81,426 (68.7%) were owner occupied and 37,120 (31.3%) were renter occupied.[12]

For homeowners with a mortgage, the median monthly housing cost was $1,026; for owners without a mortgage it was $354. For renters, the median monthly housing cost was $612. About 29.5% of owners with mortgages, 12.2% of owners without mortgages, and 52.7% of renters spent 30% or more of household income on housing.[13]

The Perryman Group's latest long-term forecast for the Brownsville-Harlingen Metropolitan Statistical Area (Cameron County) calls for moderate growth. Real gross product (in constant 2009 dollars) is forecast to expand from an estimated 2015 level of $8.8 billion to almost $19.1 billion by 2040, a $10.3 billion increase. Wage and salary employment is projected to grow from an estimate of approximately 148,493 in 2015 to 224,577 in 2040, a 76,084 increase over the period. A summary of several key indicators is provided in the table below; the detailed projections are provided in the Appendix.

Outlook for Brownsville-Harlingen MSA
Economic Indicators 2015 - 2040

Key Indicator	2015 Level	Projected 2040 Level	Projected Growth Rate*	Projected Increase
Real Gross Product*	$8.799 billion	$19.069 billion	3.14%	$10.270 billion
Population	432,602	611,605	1.39%	179,003
Wage & Salary Employment	148,493	224,577	1.67%	76,084
Real Personal Income*	$10.468 billion	$27.425 billion	3.93%	$16.957 billion
Real Retail Sales*	$4.102 billion	$10.664 billion	3.90%	$6.562 billion
Housing Permits	1,002	1,185	0.67%	183

**Compound Annual Growth Rate, meaning that it reflects changes in the base from which growth is calculated. Real Gross Product and Real Retail Sales are computed in 2009 dollars. Real Personal Income by place of residence, in 2009 dollars. See the Appendices for further information.*

[11] Ibid.
[12] Ibid.
[13] Ibid.

Natural Gas Industry Overview and the Role of the Rio Grande LNG Facility

US Natural Gas Industry Overview

According to data maintained by the US Energy Information Administration (EIA), total dry natural gas production in the United States increased by almost 21% from 2010 to 2014. Production growth resulted largely from the development of shale gas resources in the Lower 48 states (including natural gas from tight oil formations), which more than offset declines in other Lower 48 onshore production. Drilling productivity gains enabled this rapid growth in supplies from unconventional, and particularly shale, gas-bearing formations. Technological advances and new techniques in drilling greatly enhanced the ability to tap unconventional natural gas resources, and potential production rapidly increased.

However, the EIA is projecting that natural gas production across all major US shale regions will decrease for the first time in September in response to lower prices and drilling activity. Production from shale regions reached a high in May at 45.6 billion cubic feet per day (Bcf/d) and is expected to decline to 44.9 Bcf/d in September. In each region, production from new wells is not large enough to offset production declines from existing, legacy wells.

Strong development of natural gas supplies over the past few years is contributing to lower natural gas prices in the future (compared to what they would be in the absence of shale gas development). By allowing consumer and business resources to be expended in more productive ways, lower prices will contribute to economic growth. Natural gas also has desirable environmental properties compared to many fuels and will likely serve as an important energy source given efforts to reduce carbon dioxide emissions. In addition, increasing domestic supplies and reserves contributes to US energy security. In fact, natural gas has now become a viable source of exports for the nation, as supplies and production are in excess of domestic needs.

While the recent surge in production and capacity of natural gas has had desirable outcomes, falling prices have simultaneously worked to decrease the incentives to develop further resources. Reduced drilling is already affecting production totals, as noted above, but the market remains in a state of oversupply. Natural gas has now become a viable source of exports for the nation, as supplies and production are in excess of domestic needs.

Rio Grande LNG Project

The Rio Grande LNG project would help ensure the ongoing maintenance and development of US natural gas resources by providing access to world markets. International demand for natural gas is enhanced by its favorable environmental properties as well as its potential role as a backup fuel to intermittent renewable energy sources. Both developing and industrialized economies around the world are also in need of a reliable supply of low-cost, environmentally friendly fuels to facilitate growth.

The ability to export domestic gas as LNG greatly expands the market scope and access for domestic natural gas producers, encouraging domestic production at times when US market prices might not otherwise be favorable.

Economic Benefits of the Rio Grande LNG Facility

The Perryman Group evaluated the potential net economic impacts of the Rio Grande LNG facility and the associated pipeline and other investments on business activity in the local area, Texas, and the United States. Several sources of economic benefits stemming from the initiative were measured. These include the impacts of

- construction and non-operational activity for the first stage of construction (trains 1 and 2 and necessary infrastructure to commence commercial operations of the partially completed project), the project as a whole (all six proposed trains and necessary infrastructure), and the Rio Bravo Pipeline;
- ongoing operations both commencing with the completion of the first stage of the project (trains 1 and 2) and at upon maturity (including the total project);
- enhanced exploration and production of natural gas; and
- associated potential development of facilities utilizing by-products.

In addition, The Perryman Group analyzed the project's potential positive effect on US trade imbalances. Further detailed results, including a sectoral breakout of gains in business activity, are presented in the Appendices to this report, together with additional methodological explanation.

Measuring Economic Impacts

Any investment or corporate activity generates multiplier effects throughout the economy. Construction and development of a facility leads to purchases ranging from concrete to engineering services to landscaping to sophisticated equipment such as compressors, gas turbines, and heat exchangers. Ongoing operations also stimulate business activity through purchases and the expenditures by employees of payroll dollars for various goods and services.

In addition, operation of a liquefaction facility will encourage further development of natural gas resources by providing a ready market for LNG exports. Exploration, drilling, production, servicing, pipeline development and operations, royalty payments, and other direct expenditures associated with natural gas exploration and production involve substantial gains.

Direct investments to construct and operate Rio Grande LNG and associated facilities thus lead to a sizable stimulus in a variety of sectors, as well as generating spillover benefits for an even wider range of businesses. It also supports substantial fiscal revenues for governments at all levels. Tax effects assume the project receives tax abatements comparable to those granted for several other LNG and major refining and petrochemical facilities recently implemented in the Texas Gulf Coast as described in the Appendices.

The Perryman Group developed a model more than 30 years ago (with continual updates and refinements since that time) to describe these interactions. This dynamic input-output assessment model uses a variety of data (from surveys, industry information, and other sources) to describe the various goods and services (known as resources or inputs) required to produce another good/service. An associated fiscal model allows for estimation of tax receipts to state and local entities. It has been used in thousands of applications, including numerous studies of refining and petrochemical activity, energy resource development and production, and international trade. In fact, several LNG projects have also been analyzed. The submodels used in the current analysis reflect the specific industrial composition and characteristics of Cameron County and other affected counties, Texas, and the United States.

Impacts are expressed in terms of several different indicators of business activity.

- **Total expenditures** (or total spending) measures the dollars changing hands as a result of the economic stimulus.
- **Gross product** (or output) is production of goods and services that will come about in each area as a result of the activity. This measure is parallel to the gross domestic product numbers commonly reported by various media outlets and is a subset of total expenditures.
- **Personal income** is dollars that end up in the hands of people in the area; the vast majority of this aggregate derives from the earnings of employees, but payments such as interest and rents are also included.
- **Job gains** are expressed as person-years of employment (one person working for one year) for temporary projects (such as construction of a facility or cumulative assessments over time) or as permanent jobs when evaluating ongoing annual effects.

All results are expressed on an annual or a cumulative basis in constant (2015) dollars. Results are presented for three geographic areas:

- Cameron County, which is equivalent to the Brownsville-Harlingen Metropolitan Statistical Area (MSA);
- the state of Texas (including the effects on business activity within Cameron County as well as spillover to other parts of the state); and
- the United States (which includes effects for Texas and spillover to other states).

Construction and Non-operational Activity

Construction and other non-operational development (including the pipeline and terminal) lead to sizable gains in business activity in the local area, with even greater spillover benefits to the rest of the state and the nation.

During peak periods, construction employment is expected to reach slightly more than 5,000. Average monthly employment over the four-year stage 1 construction period (trains 1 and 2) is 1,692, and 2,594 over the course of the entire project. (Note that stage 1 includes the relatively low employment phases of design and pre-site work, and that in later years construction of multiple trains as well as the pipeline may be ongoing; therefore the average number employed is significantly higher when measured across the entire period.) The remaining trains are scheduled to come online every 6 to 9 months, with construction completed by the end of 2023. The overall schedule could change depending on demand, which would affect these averages.

Direct spending for construction would likely average about $191.5 million per month during the first stage, with total (direct, indirect, and induced) spending in the US of approximately $556.0 million per month. For the seven-year project as a whole (including the non-operational period), direct construction spending is estimated to be about $276.6 million per month, with total (direct, indirect, and induced) US spending in the sector of approximately $829.1 million per month.

Total US procurement of necessary items is estimated to be approximately $3.6 billion during the first stage of construction (trains 1 and 2), and $9.3 billion for the project as a whole. For Texas, stage 1 construction procurement totals an estimated $2.6 billion, with almost $6.9

billion for the project as a whole. Cameron County procurement is estimated to be $768.2 million during stage 1 and $2.0 billion for the project as a whole.

Cameron County and the surrounding area (within typical construction driving range) have an adequate available construction workforce relative to peak requirements, and many of the workers in key skilled trades should be available in and around the local area. Employment during peak construction employment periods is approximately one tenth of the construction workforce available in the Lower Rio Grande Region and nearby Coastal Bend Region. In addition, there is a large additional supply of skilled construction workers in northern Mexico which could fill a portion of the labor needs for this or other contemporaneous projects. The region is also characterized by relatively high unemployment and low labor force participation, indicating slack in the job market in the area.

While some labor from outside the region is expected, it is not anticipated that any significant temporary housing relative to supply will be required or that construction workers housed in hotels would lead to shortages or other market issues. In 2014, some 5,748 housing were for rent and vacant in Cameron County alone.[14]

Hotel vacancies in the area are also relatively high, with 2014 occupancy of 59.0% in Brownsville and 63.0% in Harlingen, according to data prepared by Source Strategies, Inc., for the Texas Office of the Governor, Economic Development & Tourism Department. The most recent report (second quarter 2015) indicates 7,100 hotel rooms in the Brownsville-Harlingen area with occupancy of 55.8% (down from the same quarter in 2014). Another 6,700 hotel rooms in nearby McAllen-Edinburg-Mission had occupancy of 59.7% (also down from second quarter 2014).

[14] U.S. Census Bureau, 2014 American Community Survey 1-Year Estimates

Facilities to be Built During Stage 1 of Construction (Trains 1 and 2)

Gains in business activity for the United States were found to include about $12.2 billion in gross product and 144,007 person-years of employment during the first stage of project construction. Texas and the Cameron County area would also see substantial economic benefits as noted in the table below.

The Anticipated Cumulative Impact of Construction and Other Non-Operational Activities Associated with the Implementation of Stage 1 of Construction (Trains 1 and 2) of the Proposed Rio Grande LNG Project on Business Activity*

ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)

	United States	Texas	Cameron County
Total Expenditures	$26,879	$17,148	$4,393
Gross Product	$12,242	$8,152	$2,174
Personal Income	$8,205	$5,539	$1,498
Retail Sales	$2,954	$2,104	$620
Employment (Person-Years)	144,007	97,367	27,222
Employment (Average Annual)**	36,002	24,342	6,806

*Assumes all initial costs conform to current projections. Direct purchases are allocated across the state and local areas based on capacity and historical patterns.
**Assumes a four year construction period.
SOURCE: The Perryman Group

Of the 27,222 job total job-years estimated for Cameron County during Stage 1 development, the effects within the local construction sector alone could be expected to include some 6,954 person-years of employment, with the other activity stemming from spinoff effects. Texas and the United States would also experience broad-based increases in business activity; results by industry are included in the Appendices to this report.

Total (Trains 1-6)

Total cumulative construction-related economic benefits for the United States during the build-out period for the full project (trains 1-6) include $31.7 billion in gross product and 373,108 person-years of employment.

The Anticipated Cumulative Impact of Construction and Other Non-Operational Activities Associated with the Implementation of All Phases (Trains 1-6) of the Proposed Rio Grande LNG Project on Business Activity*

ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)

	United States	Texas	Cameron County
Total Expenditures	$69,642	$44,427	$11,383
Gross Product	$31,718	$21,122	$5,634
Personal Income	$21,258	$14,351	$3,881
Retail Sales	$7,653	$5,450	$1,605
Employment (Person-Years)	373,108	252,270	70,530
Employment (Average Annual)**	53,301	36,039	10,076

*Assumes all initial costs conform to current projections. Direct purchases are allocated across the state and local areas based on capacity and historical patterns.
**Assumes a seven year construction period.
SOURCE: The Perryman Group

Rio Bravo Pipeline

As noted, the project also involves construction of the Rio Bravo Pipeline to connect to natural gas supplies. The pipeline spans approximately 137 miles through Kleberg, Kenedy, Willacy, and Cameron Counties and includes compressor stations and other needed infrastructure. Cumulative economic benefits of this investment during the non-operational period for the pipeline include about $3.4 billion in gross product and 40,326 person-years of employment in the United States. Note that these results are for the pipeline project as a whole.

The Anticipated Cumulative Impact of Construction and Other Non-Operational Activities Associated with the Rio Bravo Pipeline Project on Business Activity*						
ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)						
	United Stated	**Texas**	**Kleberg County**	**Kenedy County**	**Willacy County**	**Cameron County**
Total Expenditures	$7,474	$4,348	$526	$560	$402	$625
Gross Product	$3,412	$2,062	$256	$263	$205	$305
Personal Income	$2,308	$1,411	$182	$198	$145	$211
Retail Sales	$830	$531	$79	$75	$63	$87
Employment (Person-Years)	40,326	24,732	3,309	3,631	2,639	3,843
Employment (Average Annual)**	13,455	8,244	1,103	1,210	880	1,281
*Assumes all initial costs conform to current projections. County effects based on planned construction mileage through each county. Direct purchases are allocated across the state and local areas based on capacity and historical patterns. **Assumes a three year construction period.						

Total Non-operational Impact and Tax Effects

Combining the estimated gains in business activity for (1) all six trains of the liquefaction facility (including the terminal and other needed construction on site) and (2) the Rio Bravo Pipeline yields total cumulative economic benefits for the United States during the non-operational period of more than $35.1 billion in gross product and 413,434 person-years of employment. Incremental tax receipts total over $3.0 billion for the federal government, $1.2 billion for Texas, and $116.5 million for local taxing entities in Cameron County. Of these amounts, the portions associated with the first stage of construction of the project (trains 1 and 2) include more than $1.3 billion to the federal government, $546.9 million to Texas, $237.3 million to other states, $61.0 million to local entities within Cameron County, and $318.2 million to local entities in other areas. It should be noted that the tax effects assume that the project will receive tax abatements based on a scenario comparable to those granted for several other LNG and major refining and petrochemical facilities recently implemented in the Texas Gulf Coast region (see Appendix B for a more detailed description). Moreover, much of the estimated

revenue is derived from sources such as sales taxes (direct and indirect), occupancy taxes, and indirect property taxes that are not directly measurable.

The Total Anticipated Cumulative Impact of Construction and Other Non-Operational Activities Associated with the Implementation of All Phases (Trains 1-6) of the Proposed Rio Grande LNG Project and the Rio Bravo Pipeline on Business Activity and Tax Receipts*

ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)			
	United States	**Texas**	**Cameron County**
Total Expenditures	$77,116	$48,774	$12,007
Gross Product	$35,130	$23,184	$5,938
Personal Income	$23,566	$15,762	$4,092
Retail Sales	$8,483	$5,981	$1,692
Employment (Person-Years)	413,434	277,003	74,374
Employment (Average Annual)**	59,062	39,572	10,625
FISCAL BENEFITS (In Millions of constant 2015 Dollars)			
Federal			$3,006
Texas			$1,228
Other States			$533
Cameron County Area			$116
Other Local Areas			$714

*Assumes all initial costs conform to current projections. Direct purchases are allocated across the state and local areas based on capacity and historical patterns. Note that the tax estimates incorporate extensive spinoff effects and assume that incentives are provided which are consistent with current law and in line with those provided to similar projects in recent years.
**Assumes a seven year construction period.
SOURCE: The Perryman Group

Ongoing Operations of the Facilities

The Rio Grande LNG facility will serve as a source of jobs for the local area, both through operations of the liquefaction facility and terminal as well as the pipeline. Total annual payroll

(not including benefits) is estimated to be $19.8 million, or an average of about $64,000 per employee. The first train is scheduled for completion by the end of 2020, with the second train completed by mid-2021. Once the trains and associated facilities are operational, they will begin to generate an ongoing economic stimulus.

Operations will result in an economic stimulus to the local area, state, and nation through purchases and payroll. More than 300 well-paying jobs are planned for the facilities in occupations such as engineering, administration, security, lab specialists, management, maintenance, and more. This economic activity will, in turn, lead to substantial incremental tax receipts. There is unlikely to be any significant change in population given that many of the needed workers will be generally available in or nearby the area.

Operations of Trains 1 and 2

Once Trains 1 and 2 of Rio Grande LNG are fully operational, ongoing economic benefits from operations are estimated to include some $391 million in US gross product each year as well as 3,420 permanent jobs. These effects are concentrated in Texas and the local area, as noted in the table below. Incremental annual tax receipts include $24.0 million in federal taxes, $16.8 million to the state of Texas, and $3.5 million to local entities within Cameron County (including indirect effects and adjusted for typical abatements).

The Anticipated Annual Impact (at Maturity) of Ongoing Operations of Trains 1 and 2 of the Proposed Rio Grande LNG Project and Rio Bravo Pipeline on Business Activity and Tax Receipts*			
ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)			
	United States	**Texas**	**Cameron County**
Total Expenditures	$1,617	$1,476	$999
Gross Product	$391	$358	$227
Personal Income	$221	$202	$131
Retail Sales	$82	$79	$61
Employment (Permanent Jobs)	3,420	3,134	2,272
FISCAL BENEFITS (In Millions of Constant 2015 Dollars)			
		Federal	$24
		Texas	$17
		Other States	$1
		Cameron County Area	$4
		Other Local Areas	$3
* Note that the tax estimates incorporate extensive spinoff effects and assume that incentives are provided which are consistent with current law and in line with those provided to similar projects in recent years. Source: The Perryman Group			

When the facility is operational, it will support jobs across a spectrum of industries. Nondurable manufacturing and mining will benefit, as will consumer-oriented sectors such as retail trade. Industry-level effects are presented in the Appendices.

Total (Trains 1-6)

The total economic benefits of ongoing operations of the Rio Grande LNG facilities (at maturity) are estimated to include more than $560.4 million in US gross product each year as well as 4,901 permanent jobs; these effects are concentrated in Texas and the local Cameron County area, as noted in the table below. Incremental tax receipts for the project as a whole are estimated to include almost $34.5 million in federal taxes, $24.1 million to the state of Texas, and about $5.0 million to local entities in the Cameron County area (adjusted for typical abatements and including all indirect effects).

The Total Anticipated Annual Impact (at Maturity) of Ongoing Operations of the Proposed Rio Grande LNG Project (Trains 1-6) and Rio Bravo Pipeline on Business Activity and Tax Receipts*			
ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)			
	United States	**Texas**	**Cameron County**
Total Expenditures	$2,318	$2,116	$1,432
Gross Product	$560	$513	$326
Personal Income	$316	$290	$188
Retail Sales	$117	$113	$89
Employment (Permanent Jobs)	4,901	4,492	3,256
FISCAL BENEFITS (In Millions of Constant 2015 Dollars)			
		Federal	$34
		Texas	$24
		Other States	$1
		Cameron County Area	$5
		Other Local Areas	$4
*Note that the tax estimates incorporate extensive spinoff effects and assume that incentives are provided which are consistent with current law and in line with those provided to similar projects in recent years. Source: The Perryman Group			

Industry-level effects are presented in the Appendices. Note that many of these jobs occur within various retail and services sectors and represent significant opportunities for local residents. As mentioned, the area currently has a high rate of unemployment, indicating significant slack in the local labor market (see the Appendices for more detail).

Cumulative Operations Effects

For the project as a whole (trains 1-6), Rio Grande LNG and associated facilities lead to cumulative gains in business activity over the first 25 years of an estimated $13.2 billion in output in the United States as well as 115,113 person-years of employment, with benefits concentrated in the Cameron County area. (Note that the 25-year timeframe begins when operations of trains 1 and 2 commence, and thus includes several years of partial operations during the construction of the remaining trains.) Incremental fiscal receipts associated with the project are estimated to be $809.5 million to the federal government, $566.7 million to the

state of Texas, and $151.5 million to local entities in Cameron County (including indirect revenues and assuming a standard abatement scenario).

The Anticipated Cumulative Impact (Over 25 Years) of Ongoing Operations Associated with the Implementation of the Proposed Rio Grande LNG Project (Trains 1-6) and Related Facilities including the Rio Bravo Pipeline on Business Activity and Tax Receipts*

ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)

	United States	Texas	Cameron County
Total Expenditures	$54,440	$49,696	$33,642
Gross Product	$13,161	$12,056	$7,651
Personal Income	$7,433	$6,814	$4,417
Retail Sales	$2,746	$2,650	$2,082
Employment (Person-Years)	115,113	105,497	76,466

FISCAL BENEFITS (In Millions of Constant 2015 Dollars)

Federal	$810
Texas	$567
Other States	$26
Cameron County Area	$152
Other Local Areas	$88

* Note that the tax estimates incorporate extensive spinoff effects and assume that incentives are provided which are consistent with current law and in line with those provided to similar projects in recent years.
Source: The Perryman Group

The economic effects by industry group are indicated in the Appendices.

Total Construction and First 25 Years of Operations of the Facility

Combining construction benefits and the cumulative effects of the first 25 years of operations of the Rio Grande LNG and related facilities (including the Rio Bravo Pipeline) yields a total estimate of economic benefits during the period.

During the first 25 years of operations, the cumulative economic benefits (including construction) of the completed Rio Grande LNG project (trains 1-6) include approximately $25.4

billion in output in the United States as well as 259,120 person-years of employment. Incremental tax receipts associated with this economic activity (further described in the table below) include more than $3.8 billion to the federal government, $1.8 billion to the state of Texas, and $268.0 million to local entities in Cameron County (including indirect revenues and assuming a standard abatement scenario).

The Total Anticipated Cumulative Impact of Construction and the First 25 Years of Ongoing Operations Associated with the Implementation of the Proposed Rio Grande LNG Project (Trains 1-6) and Associated Facilities including the Rio Bravo Pipeline on Business Activity and Tax Receipts*

ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)			
	United States	**Texas**	**Cameron County**
Total Expenditures	$81,319	$66,843	$38,035
Gross Product	$25,403	$20,208	$9,826
Personal Income	$15,638	$12,353	$5,915
Retail Sales	$5,700	$4,753	$2,701
Employment (Person-Years)	259,120	202,865	103,688

FISCAL BENEFITS (In Millions of Constant 2015 Dollars)	
Federal	$3,816
Texas	$1,794
Other States	$559
Cameron County Area	$268
Other Local Areas	$802

* Note that the tax estimates incorporate extensive spinoff effects and assume that incentives are provided which are consistent with current law and in line with those provided to similar projects in recent years.
Source: The Perryman Group

Enhanced Exploration and Production Activity

By increasing the market for natural gas via LNG exports, the Rio Grande LNG facility will likely stimulate additional development of natural gas resources. This development involves sizable investment in exploration and production activity and, thus, further economic stimulus.

The cumulative (over 25 years) economic benefits of enhanced exploration and production of natural gas are presented in the table below. The simulation reflects the need for an initial period of rapid drilling activity to increase supply to meet the additional requirements, followed by a period of more modest investment to maintain adequate levels of gas production. The results are also calibrated to typical capital expenditure and well patterns in the nearby Eagle Ford Shale. For purposes of this analysis, it is assumed that the required natural gas will be acquired from the Eagle Ford Shale due to its abundant reserves and geographic proximity, but not significantly from Cameron County. It should be noted, however, that the customers of Rio Grande LNG will determine where to source the gas to be converted to LNG at the project. As such, the natural gas supply could potentially come from almost anywhere in North America. If it were to be obtained from more distant locations, the national economic benefits reported in this analysis would be understated in that natural gas from other areas would generally involve greater costs (such as potentially paying for expansions of the North American pipeline system or incurring exploration and production costs in more expensive areas). Given the recent slowing in the oil and gas industry and extended period before these resources are needed, there should not be any notable disruptions in terms of housing shortages or similar problems even if most or all of the natural gas is procured in the Eagle Ford Shale. Sourcing the natural gas from farther away would spread labor and equipment requirements over a broader geographic area, which would diffuse any potential disruptions. While such an outcome could result in lower benefits to Texas, it would bring a reallocation of gains to other segments of the United States.

Cumulative Incremental Natural Gas Exploration and Production Effects (Over 25 Years)

The total cumulative incremental business activity during the first 25 years of operation of the proposed Rio Grande LNG Project (Trains 1-6) and the associated enhanced exploration and production activity includes an estimated $249.1 billion in gross product and 2,830,711 person-years of employment in the United States. Additional tax receipts from incremental natural gas exploration total an estimated $19.1 billion to the federal government over the first 25 years, with $12.1 billion to Texas, almost $1 billion to taxing entities in Cameron County, and more than $5 billion to other state and local taxing authorities.

The Potential Cumulative Impact (Over 25 Years) of the Natural Gas Exploration and Production Stimulus Required to Maintain the Level of Incremental Natural Gas Production Associated with the Implementation of the Proposed Rio Grande LNG Project (Trains 1-6) on Business Activity and Tax Receipts			
ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)			
	United States	**Texas**	**Cameron County**
Total Expenditures	$583,688	$518,309	$97,258
Gross Product	$249,137	$228,260	$45,440
Personal Income	$164,175	$152,012	$31,040
Retail Sales	$59,348	$57,298	$12,997
Employment (Person-Years)	2,830,711	2,630,605	546,901
Employment (Average Annual)*	113,228	105,224	22,596
FISCAL BENEFITS (In Millions of Constant 2015 Dollars)			
Federal			$19,101
Texas			$12,112
Other States			$526
Cameron County Area			$999
Other Local Areas			$4,878
*Total effect over first 25 years. SOURCE: The Perryman Group			

Cumulative Incremental Natural Gas Exploration and Production Effects (Initial Drilling Stimulus)

Stage 1

The first few years of operations of the Rio Grande LNG facility are likely to be particularly stimulative to incremental natural gas development as the needed sustainable capacity is developed. The Perryman Group estimates that the gains in business activity from additional development during this period (likely to be the first two years for each train and a subset of the 25-year results previously described) include over $25.8 billion in US gross product and

300,863 person years of employment. Tax receipts from the initial drilling stimulus are estimated to be about $2.0 billion to the federal government, $1.3 billion to Texas, $106.4 million to taxing entities in Cameron County, and over $500 million to other taxing entities.

The Potential Cumulative Impact of the Initial Drilling Stimulus Required to Establish the Level of Incremental Natural Gas Production Associated with the Implementation of Trains 1 and 2 of the Proposed Rio Grande LNG Project on Business Activity and Tax Receipts

ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)			
	United States	**Texas**	**Cameron County**
Total Expenditures	$59,040	$52,159	$10,338
Gross Product	$25,839	$23,639	$4,841
Personal Income	$17,283	$16,000	$3,337
Retail Sales	$6,229	$6,014	$1,364
Employment (Person-Years)	300,863	279,745	60,543
FISCAL BENEFITS (In Millions of Constant 2015 Dollars)			
Federal		$1,995	
Texas		$1,265	
Other States		$55	
Cameron County Area		$106	
Other Local Areas		$514	
SOURCE: The Perryman Group			

The industry composition of these economic benefits is described in the Appendices.

Total

The total initial drilling stimulus associated with the Rio Grande LNG project is estimated to include about $77.5 billion in gross product and 902,590 person-years of employment in the United States. Total tax receipts stemming from the initial drilling stimulus are estimated to be approximately $6.0 billion to the federal government, $3.8 billion to Texas, $319.1 million to taxing entities in Cameron County., and about $1.7 billion to other state and local governments

The Potential Cumulative Impact of the Initial Drilling Stimulus Required to Establish the Level of Incremental Natural Gas Production Associated with the Implementation of the Proposed Rio Grande LNG Project (Trains 1-6) on Business Activity and Tax Receipts			
ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)			
	United States	**Texas**	**Cameron County**
Total Expenditures	$177,119	$156,478	$31,013
Gross Product	$77,516	$70,917	$14,524
Personal Income	$51,848	$48,000	$10,011
Retail Sales	$18,687	$18,042	$4,093
Employment (Person-Years)	902,590	839,234	181,628
FISCAL BENEFITS (In Millions of Constant 2015 Dollars)			
Federal			$5,986
Texas			$3,796
Other States			$166
Cameron County Area			$319
Other Local Areas			$1,541
SOURCE: The Perryman Group			

Incremental Natural Gas Exploration and Production Effects in a "Typical Year"

A "typical" year of natural gas exploration and production to support Rio Grande LNG include economic benefits of an estimated $10.0 billion in US gross product and 113,228 jobs in the United States. The increase in tax receipts in a typical year includes an estimated $764.1 million to the federal government, $484.5 million to Texas, and $40.0 million to local entities in Cameron County.

The Potential Annual Impact in a "Typical" Year of Natural Gas Exploration and Production Stimulus Required to Maintain the Level of Incremental Natural Gas Production Associated with the Implementation of the Proposed Rio Grande LNG Project (Trains 1-6) on Business Activity and Tax Receipts			
ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)			
	United States	**Texas**	**Cameron County**
Total Expenditures	$23,348	$20,732	$3,890
Gross Product	$9,965	$9,130	$1,818
Personal Income	$6,567	$6,080	$1,242
Retail Sales	$2,374	$2,292	$520
Employment (Permanent Jobs)	113,228	105,224	22,596
FISCAL BENEFITS (In Millions of Constant 2015 Dollars)			
Federal			$764
Texas			$484
Other States			$21
Cameron County Area			$40
Other Local Areas			$195
SOURCE: The Perryman Group			

Potential Benefits from Liquid By-Products

Through its operations, the Rio Grande LNG facility will encourage development of industries which utilize various liquid by-products such as ethane. Based on an analysis by the American Chemical Council and the industrial base of the area, The Perryman Group estimated the potential level of new investment and production that could potentially occur in response to the greater availability of petroleum liquids.

This analysis is for illustrative purposes only, and shows the potential effects if the full capacity provided by the by-products were fully implemented in Cameron County over time. It could well be that some of the feedstocks would not be used, or that facilities would locate elsewhere. In fact, it would be somewhat difficult for the local area to absorb an expansion of this magnitude (although similar and even greater increases have occurred at times in other areas). Furthermore, natural gas sourced outside of the Eagle Ford shale could not only lead to the contemplated economic activity occurring elsewhere, but could affect the economic value

of such activity. In particular, the amount of natural gas liquids co-produced with natural gas varies significantly in various producing areas of the country. Some sources of natural gas would stimulate greater activity, while others would be responsible for less.

Construction of New Chemical Manufacturing Facilities

The economic benefits of construction of chemical facilities other firms might implement to utilize incremental ethane from the Rio Grande LNG facility were estimated to include $6.0 billion in US gross product and 70,653 person-years of employment. Incremental tax receipts associated with these economic benefits were estimated to be $581.7 million to the federal government, $224.7 million to Texas, and $62.5 million to local taxing authorities in Cameron County.

The Potential Impact of Constructing New Chemical Manufacturing Facilities to Accommodate the Incremental Ethane Production Associated with the Implementation of the Proposed Rio Grande LNG Project(Trains 1-6) on Business Activity and Tax Receipts

ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)

	United States	Texas	Cameron County*
Total Expenditures	$13,641	$9,029	$4,810
Gross Product	$6,042	$4,147	$2,281
Personal Income	$4,044	$2,809	$1,573
Retail Sales	$1,474	$1,067	$650
Employment (Person-Years)	70,653	49,269	28,595

FISCAL BENEFITS (In Millions of Constant 2015 Dollars)

Federal	$582
Texas	$225
Other States	$88
Cameron County Area	$62
Other Local Areas	$90

* This analysis is for illustrative purposes only, and shows the potential effects if the full capacity provided by the by-products were fully implemented in Cameron County over time. While it would be somewhat difficult for the local area to absorb an expansion of this magnitude, similar and even greater increases have occurred at times in other areas.
SOURCE: The Perryman Group

New Chemical Manufacturing Facilities Operations

Ongoing operations of new chemical manufacturing facilities implemented by various firms to take advantage of ethane associated with the Rio Grande LNG project have the potential to generate annual economic benefits (measured at maturity) of about $9.5 billion in US gross product as well as 83,155 permanent jobs. Tax gains to the federal government include an estimated $562.7 million.

The Potential Annual Impact of Ongoing Operations of New Chemical Manufacturing Facilities to Accommodate the Incremental Ethane Production Associated with the Implementation of the Proposed Rio Grande LNG Project(Trains 1-6) on Business Activity and Tax Receipts

ECONOMIC BENEFITS (Monetary Values in Millions of Constant 2015 Dollars)			
	United States	**Texas**	**Cameron County***
Total Expenditures	$38,076	$35,201	$10,838
Gross Product	$9,460	$8,429	$4,568
Personal Income	$5,346	$4,749	$2,762
Retail Sales	$2,113	$1,848	$1,639
Employment (Permanent Jobs)	83,155	73,277	53,758

FISCAL BENEFITS (In Millions of Constant 2015 Dollars)	
Federal	$563
Texas	$396
Other States	$55
Cameron County Area	$135
Other Local Areas	$71

* This analysis is for illustrative purposes only, and shows the potential effects if the full capacity provided by the by-products were fully implemented in Cameron County over time. While it would be somewhat difficult for the local area to absorb an expansion of this magnitude, similar and even greater increases have occurred at times in other areas.
SOURCE: The Perryman Group

Balance of Trade Benefits

Increasing exports of natural gas in the form of LNG reduces the balance of trade deficit the United States has experienced for many years. The Perryman Group estimates that the improvement in the international balance of payments of the United States from the Rio Grande LNG project could potentially range from $11.5-$18.7 billion per year based on current prices, with the actual amount depending on destination of the liquefied product, transportation distance and costs, and other market factors. These estimates assume that the LNG generated at the facility will be exported, and that residual oil and natural gas liquids will replace current imports (other than ethane, which is assumed to be used for petrochemical expansion).

Based on projections of future gas prices by the Energy Information Administration, this amount is expected to increase over time.

Other Potential Benefits

The economic stimulus associated with the facility also leads to other outcomes such as improvement in the housing market which The Perryman Group examined in a summary fashion.

Given the availability of the necessary workforce in the local area, it is not anticipated that the project will require a significant number of net new residences. However, because of the creation of high paying direct and spinoff jobs, the value of local housing is likely to increase markedly (as there is a demand for higher quality owner-occupied and rental housing). This value increment is estimated to be about $43.2 million.

The only hotel rooms that would be needed are those associated with potential executives or suppliers since it is unlikely that they would be used as housing for construction workers. Even so, based on the results of the impact assessment and a construction period of approximately 84 months, there would likely be 12-16 additional room-nights per month, which is not likely to significantly affect local market conditions.

While the impact assessment system is not designed to provide detailed estimates of economic outcomes such as truck trips, some conclusions can be drawn from trucking revenues and employment, which suggest an average of 20-30 trips per day, with 35-48 during peak periods. The average number of round trips per day by workers during construction is expected to be about 1,622 (note that these numbers are somewhat below the employment levels due to both ride-sharing and the nature of work patterns on large construction projects in the area).

Consumer Price Effects

The potential effect of this facility on consumer prices of natural gas is the subject of a separate study and is, thus, not quantified at present. It should be noted, however, that the range of projected future prices is quite large. Future prices of natural gas will depend on many highly uncertain factors including the pace of technology implementation for broader applications, the magnitude of new supply discoveries, the development of new methods for extraction, the supply and price of alternative fuels, input prices, and many others. As a result, any projected price impact is likely to be below the variation in projected prices among reputable sources and to lie within the 95% confidence interval ("margin of error") of any major forecasting model presently available.

These considerations, coupled with the extreme volatility in prices and substantial increase in known reserves in recent years, suggest that any impact is likely to be relatively insignificant in comparison with market expectations.

Conclusion

The proposed Rio Grande LNG facility would serve as an important source of jobs and economic stimulus to Cameron County and beyond. In addition, the initiative has the potential to enhance natural gas exploration and production as well as the development of industries utilizing by-products.

All of these outcomes generate a sizable economic stimulus. In addition, the economic activity associated with the project would increase tax receipts to all levels of government. In addition, the project is unlikely to result in significant dislocations in the local economy such as large population increases or a shortage of accommodations or housing. The initiative also has a favorable impact on the US Balance of Payments.

The Rio Grande LNG project, Rio Bravo Pipeline, and associated facilities are in the national interest and worthy of implementation and significant support.

APPENDICES

Appendix A: About The Perryman Group

The Perryman Group is an economic research and analysis firm based in Waco, Texas. The firm has more than 30 years of experience in assessing the economic impact of corporate expansions, regulatory changes, real estate developments, public policy initiatives, and myriad other factors affecting business activity. TPG has conducted hundreds of impact analyses for local areas, regions, and states throughout the United States. Impact studies have been performed for hundreds of clients including many of the largest corporations in the world, governmental entities at all levels, educational institutions, major health care systems, utilities, and economic development organizations.

Dr. M. Ray Perryman, founder and President of the firm, developed the US Multi-Regional Impact Assessment System (used in this study) in the early 1980s and has consistently maintained, expanded, and updated it since that time. The model has been used in hundreds of diverse applications and has an excellent reputation for reliability. The firm has been producing forecasts for Cameron County (the Brownsville-Harlingen MSA) for decades and is very familiar with the area economy.

The firm has conducted numerous investigations related to the oil and gas industry. These analyses have included, among others, forecasts, impact assessments, regulatory and environmental issues, and legislative and policy initiatives. Previous work by The Perryman Group includes an assessment of the effects of offshore drilling for the US Department of the Interior, several studies of specific production areas, and projections of natural gas prices and output. Information has been prepared for the Interstate Oil Compact Commission, the US Department of Energy, the Texas Railroad Commission, and numerous legislative committees regarding energy policy.

Additionally, over the past several years, TPG has performed multiple comprehensive assessments of the impact of oil and gas exploration and production on regional economies including assessments of the Barnett Shale's effects on the local northeast Texas area and the state of Texas and a detailed analysis of the labor market in the Permian Basin oil and gas producing area of west Texas. The firm has also completed in-depth analyses of numerous refineries and petrochemical facilities, international pipeline projects, various aspects of natural gas taxation, and numerous studies specifically dealing with changes in the cost of energy resources (including electricity, oil, and natural gas) on both a regional and national basis. The Perryman Group has also analyzed economic and socioeconomic impacts of several other proposed liquefaction export projects.

Appendix B: Methods Used

US Multi-Regional Impact Assessment System

- The basic modeling technique employed in this study is known as dynamic input-output analysis. This methodology essentially uses extensive survey data, industry information, and a variety of corroborative source materials to create a matrix describing the various goods and services (known as resources or inputs) required to produce one unit (a dollar's worth) of output for a given sector. Once the base information is compiled, it can be mathematically simulated to generate evaluations of the magnitude of successive rounds of activity involved in the overall production process.
- There are two essential steps in conducting an input-output analysis once the system is operational. The first major endeavor is to accurately define the levels of direct activity to be evaluated; this process was described within the report. In the case of a prospective evaluation, it is necessary to first calculate reasonable estimates of the direct activity.
- In this instance, data regarding construction costs and schedules, capacity, and likely hiring at the Rio Grande LNG facility and Rio Bravo Pipeline was provided by NextDecade, the parent company of Rio Grande LNG, LLC and Rio Bravo Pipeline Company, LLC, and reviewed by The Perryman Group for reasonableness.
- A variety of sources of data regarding natural gas markets, oil and gas exploration and production patterns in the region, experiences in other areas regarding development of firms utilizing liquid by-products such as ethane, and other information necessary to the analysis were collected and analyzed by The Perryman Group. TPG made use of a major recent analysis by the American Chemical Council regarding the use of natural gas liquids from shale gas activity. In addition, allocations to local and state direct contributions made use of extensive databases from the Bureau of Economic Analysis. Moreover, the fiscal effects estimated within the model were modified to reflect the impact of a typical abatement scenario in accordance with current Texas statues. Information was compiled related to specific agreements awarded in other communities along the Texas Gulf Coast in recent years for LNG facilities and large-scale refining and petrochemical facilities. Using these situations as a basis, a typical scenario was

constructed and implemented within the model. Actual incentives, if any, may well differ from those incorporated in the current analysis.

- The second major phase of the analysis is the simulation of the input-output system to measure overall economic effects as the stimulus ripples through the economy. The Perryman Group developed the US Multi-Regional Impact Assessment System (USMRIAS) for this purpose more than 35 years ago and has consistently maintained and updated it since that time. The specific submodel used in the current application reflects the specific structure of the Cameron County, Texas, and United States economies (as well as the other counties in which the pipeline would be located).

- The USMRIAS is somewhat similar in format to the Input-Output Model of the United States and the Regional Input-Output Modeling System, both of which are maintained by the US Department of Commerce. The model developed by TPG, however, incorporates several important enhancements and refinements. Specifically, the expanded system includes (1) comprehensive 500-sector coverage for any county, multi-county, or urban region; (2) calculation of both total expenditures and value-added by industry and region; (3) direct estimation of expenditures for multiple basic input choices (expenditures, output, income, or employment); (4) extensive parameter localization; (5) price adjustments for real and nominal assessments by sectors and areas; (6) measurement of the induced impacts associated with payrolls and consumer spending; (7) embedded modules to estimate multi-sectoral direct spending effects; (8) estimation of retail spending activity by consumers; and (9) comprehensive linkage and integration capabilities with a wide variety of econometric, real estate, occupational, and fiscal impact models. Moreover, the model uses specific local taxing patterns to estimate the fiscal effects of activity on a detailed sectoral basis. The models used for the present investigation reflect the specific industrial characteristics of the areas studied and have been thoroughly tested for reasonableness and historical reliability.

- The impact assessment (input-output) process essentially estimates the amounts of all types of goods and services required to produce one unit (a dollar's worth) of a specific type of output. For purposes of illustrating the nature of the system, it is useful to think of inputs and outputs in dollar (rather than physical) terms. As an example, the construction of a new building will require specific dollar amounts of lumber, glass, concrete, hand tools, architectural services, interior design services, paint, plumbing, and numerous other elements. Each of these suppliers must, in turn, purchase additional dollar amounts of inputs. This process continues through multiple rounds of production, thus generating subsequent increments to business activity. The initial

process of building the facility is known as the direct effect. The ensuing transactions in the output chain constitute the indirect effect.

- Another pattern that arises in response to any direct economic activity comes from the payroll dollars received by employees at each stage of the production cycle. As workers are compensated, they use some of their income for taxes, savings, and purchases from external markets. A substantial portion, however, is spent locally on food, clothing, health care services, utilities, housing, recreation, and other items. Typical purchasing patterns in the relevant areas are obtained from the ACCRA Cost of Living Index, a privately compiled inter-regional measure which has been widely used for several decades, and the Consumer Expenditure Survey of the US Department of Labor. These initial outlays by area residents generate further secondary activity as local providers acquire inputs to meet this consumer demand. These consumer spending impacts are known as the induced effect. The USMRIAS is designed to provide realistic, yet conservative, estimates of these phenomena.

- Sources for information used in this process include the Bureau of the Census, the Bureau of Labor Statistics, the Regional Economic Information System of the US Department of Commerce, and other public and private sources. The pricing data are compiled from the US Department of Labor and the US Department of Commerce. The verification and testing procedures make use of extensive public and private sources.

- Impacts were measured in constant 2015 dollars to eliminate the effects of inflation.

- The USMRIAS generates estimates of the effect on several measures of business activity. The most comprehensive measure of economic activity used in this study is **Total Expenditures**. This measure incorporates every dollar that changes hands in any transaction. For example, suppose a farmer sells wheat to a miller for $0.50; the miller then sells flour to a baker for $0.75; the baker, in turn, sells bread to a customer for $1.25. The Total Expenditures recorded in this instance would be $2.50, that is, $0.50 + $0.75 + $1.25. This measure is quite broad, but is useful in that (1) it reflects the overall interplay of all industries in the economy, and (2) some key fiscal variables such as sales taxes are linked to aggregate spending.

- A second measure of business activity frequently employed in this analysis is that of **Gross Product**. This indicator represents the regional equivalent of Gross Domestic Product, the most commonly reported statistic regarding national economic performance. In other words, the Gross Product of Arkansas is the amount of US output that is produced in that state; it is defined as the value of all final goods produced in a given region for a specific period of time. Stated differently, it captures the amount of

value-added (gross area product) over intermediate goods and services at each stage of the production process, that is, it eliminates the double counting in the Total Expenditures concept. Using the example above, the Gross Product is $1.25 (the value of the bread) rather than $2.50. Alternatively, it may be viewed as the sum of the value-added by the farmer, $0.50; the miller, $0.25 ($0.75 - $0.50); and the baker, $0.50 ($1.25 - $0.75). The total value-added is, therefore, $1.25, which is equivalent to the final value of the bread. In many industries, the primary component of value-added is the wage and salary payments to employees.

- The third gauge of economic activity used in this evaluation is **Personal Income**. As the name implies, Personal Income is simply the income received by individuals, whether in the form of wages, salaries, interest, dividends, proprietors' profits, or other sources. It may thus be viewed as the segment of overall impacts which flows directly to the citizenry.

- The fourth measure, **Retail Sales**, represents the component of Total Expenditures which occurs in retail outlets (general merchandise stores, automobile dealers and service stations, building materials stores, food stores, drugstores, restaurants, and so forth). Retail Sales is a commonly used measure of consumer activity.

- The final aggregates used are **Permanent Jobs** and **Person-Years of Employment**. The Person-Years of Employment measure reveals the full-time equivalent jobs generated by an activity. It should be noted that, unlike the dollar values described above, Permanent Jobs is a "stock" rather than a "flow." In other words, if an area produces $1 million in output in 2013 and $1 million in 2014, it is appropriate to say that $2 million was achieved in the 2013-2014 period. If the same area has 100 people working in 2013 and 100 in 2014, it only has 100 Permanent Jobs. When a flow of jobs is measured, such as in a construction project or a cumulative assessment over multiple years, it is appropriate to measure employment in Person-Years (a person working for a year). This concept is distinct from Permanent Jobs, which anticipates that the relevant positions will be maintained on a continuing basis.

Appendix C: Detailed Sectoral Results

Construction and Non-Operational Activity

Stage 1 Construction (Trains 1 and 2)

The Anticipated Cumulative Impact of Construction and Other Non-operational Activities Associated with the Implementation of Trains 1 and 2 of the Proposed Rio Grande Liquefied Natural Gas (LNG) Export Facility on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$374,621,277	$110,037,618	$71,611,996	1,157
Mining	$373,261,638	$91,662,737	$52,220,825	346
Construction	$5,842,580,678	$2,737,140,496	$2,255,574,236	32,590
Nondurable Manufacturing	$3,784,945,769	$1,010,658,481	$521,830,052	8,876
Durable Manufacturing	$3,687,353,844	$1,430,198,926	$930,798,515	15,130
Transportation and Utilities	$1,889,942,788	$757,922,306	$443,975,027	5,163
Information	$444,968,384	$274,093,008	$118,243,757	1,145
Wholesale Trade	$890,041,224	$602,297,701	$347,290,213	4,056
Retail Trade	$2,953,808,631	$2,223,410,377	$1,293,870,093	40,602
Finance, Insurance, and Real Estate	$2,841,464,399	$711,460,069	$291,602,662	3,152
Business Services	$1,831,011,253	$1,165,369,291	$950,642,719	11,897
Health Services	$674,282,513	$471,845,967	$398,950,158	6,777
Other Services	$1,291,153,281	$655,886,108	$528,281,316	13,115
TOTAL	**$26,879,435,680**	**$12,241,983,086**	**$8,204,891,570**	**144,007**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact of Construction and Other Non-operational Activities Associated with the Implementation of Trains 1 and 2 of the Proposed Rio Grande Liquefied Natural Gas (LNG) Export Facility on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$239,416,848	$68,989,371	$45,465,783	738
Mining	$274,928,194	$66,555,080	$36,557,143	237
Construction	$4,306,082,986	$2,016,255,476	$1,661,520,109	24,007
Nondurable Manufacturing	$1,456,918,412	$411,625,698	$215,426,449	3,719
Durable Manufacturing	$1,867,857,473	$731,188,623	$473,489,782	7,614
Transportation and Utilities	$1,134,983,527	$473,965,483	$281,242,289	3,346
Information	$313,686,290	$193,222,647	$83,387,690	809
Wholesale Trade	$629,797,093	$426,196,445	$245,748,670	2,870
Retail Trade	$2,103,546,667	$1,584,843,203	$922,522,880	28,907
Finance, Insurance, and Real Estate	$2,058,118,801	$503,348,056	$202,161,036	2,189
Business Services	$1,382,866,558	$879,435,658	$717,394,148	8,977
Health Services	$488,030,756	$341,507,978	$288,748,172	4,905
Other Services	$890,943,816	$455,050,143	$365,384,478	9,051
TOTAL	**$17,147,177,421**	**$8,152,183,862**	**$5,539,048,627**	**97,367**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact of Construction and Other Non-operational Activities Associated with the Implementation of Trains 1 and 2 of the Proposed Rio Grande Liquefied Natural Gas (LNG) Export Facility on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$73,265,260	$21,027,204	$13,865,663	226
Mining	$1,223,851	$406,388	$225,746	2
Construction	$1,249,506,918	$584,097,023	$481,332,337	6,954
Nondurable Manufacturing	$265,197,128	$89,753,803	$47,502,992	922
Durable Manufacturing	$446,039,438	$179,524,158	$113,684,149	1,875
Transportation and Utilities	$255,303,437	$124,889,879	$77,517,211	991
Information	$60,399,984	$37,161,393	$16,135,711	161
Wholesale Trade	$138,757,496	$93,899,665	$54,143,384	632
Retail Trade	$619,520,312	$466,240,355	$271,303,963	8,515
Finance, Insurance, and Real Estate	$512,539,942	$114,416,168	$43,166,996	455
Business Services	$360,463,996	$225,945,654	$184,313,758	2,306
Health Services	$145,847,024	$101,955,553	$86,204,356	1,465
Other Services	$265,193,592	$135,090,165	$108,616,618	2,719
TOTAL	**$4,393,258,379**	**$2,174,407,409**	**$1,498,012,883**	**27,222**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Total Construction (Trains 1-6)

The Anticipated Cumulative Impact of Construction and Other Non-operational Activities Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Export Facility (Trains 1-6) on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$970,609,673	$285,097,464	$185,540,172	2,997
Mining	$967,086,972	$237,489,817	$135,299,411	897
Construction	$15,137,595,393	$7,091,682,194	$5,843,987,794	84,438
Nondurable Manufacturing	$9,806,450,403	$2,618,524,247	$1,352,014,226	22,996
Durable Manufacturing	$9,553,598,595	$3,705,515,400	$2,411,614,333	39,199
Transportation and Utilities	$4,896,669,950	$1,963,707,793	$1,150,298,934	13,378
Information	$1,152,872,631	$710,150,067	$306,358,826	2,967
Wholesale Trade	$2,306,015,900	$1,560,498,588	$899,797,370	10,509
Retail Trade	$7,653,049,634	$5,760,654,159	$3,352,299,786	105,196
Finance, Insurance, and Real Estate	$7,361,975,943	$1,843,328,360	$755,515,988	8,167
Business Services	$4,743,983,701	$3,019,365,891	$2,463,028,863	30,823
Health Services	$1,747,004,693	$1,222,510,006	$1,033,643,592	17,560
Other Services	$3,345,260,774	$1,699,341,279	$1,368,728,864	33,980
TOTAL	**$69,642,174,261**	**$31,717,865,267**	**$21,258,128,158**	**373,108**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact of Construction and Other Non-operational Activities Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Export Facility (Trains 1-6) on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$620,307,288	$178,745,189	$117,797,711	1,911
Mining	$712,313,958	$172,438,161	$94,716,233	615
Construction	$11,156,669,554	$5,223,934,643	$4,304,847,554	62,199
Nondurable Manufacturing	$3,774,743,159	$1,066,484,763	$558,150,344	9,636
Durable Manufacturing	$4,839,448,907	$1,894,443,251	$1,226,768,980	19,727
Transportation and Utilities	$2,940,639,137	$1,228,001,479	$728,673,203	8,670
Information	$812,732,659	$500,622,314	$216,049,923	2,095
Wholesale Trade	$1,631,747,014	$1,104,236,245	$636,712,464	7,435
Retail Trade	$5,450,098,183	$4,106,184,662	$2,390,172,917	74,895
Finance, Insurance, and Real Estate	$5,332,398,712	$1,304,129,055	$523,780,866	5,671
Business Services	$3,582,881,536	$2,278,537,842	$1,858,703,019	23,258
Health Services	$1,264,443,323	$884,816,124	$748,120,263	12,708
Other Services	$2,308,354,433	$1,178,993,551	$946,677,966	23,450
TOTAL	**$44,426,777,864**	**$21,121,567,278**	**$14,351,171,443**	**252,270**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact of Construction and Other Non-operational Activities Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Export Facility (Trains 1-6) on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$189,823,629	$54,479,574	$35,924,672	585
Mining	$3,170,887	$1,052,915	$584,888	5
Construction	$3,237,358,833	$1,513,342,288	$1,247,088,328	18,018
Nondurable Manufacturing	$687,101,649	$232,543,943	$123,075,933	2,388
Durable Manufacturing	$1,155,647,634	$465,130,773	$294,545,294	4,857
Transportation and Utilities	$661,467,997	$323,578,324	$200,840,047	2,568
Information	$156,490,868	$96,281,792	$41,806,160	417
Wholesale Trade	$359,508,057	$243,285,496	$140,280,585	1,637
Retail Trade	$1,605,120,809	$1,207,986,374	$702,923,903	22,062
Finance, Insurance, and Real Estate	$1,327,944,396	$296,441,889	$111,841,763	1,179
Business Services	$933,929,445	$585,404,649	$477,540,192	5,975
Health Services	$377,876,381	$264,157,568	$223,347,649	3,796
Other Services	$687,092,488	$350,006,337	$281,415,782	7,044
TOTAL	**$11,382,533,074**	**$5,633,691,923**	**$3,881,215,198**	**70,530**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Pipeline Construction

The Anticipated Cumulative Impact of Construction Associated with the Implementation of the Proposed Rio Bravo Pipeline on Business Activity in the United States				
Sector	**Total Expenditures**	**Real Gross Product**	**Personal Income**	**Employment**
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$105,088,317	$30,349,973	$19,727,799	319
Mining	$92,380,316	$23,181,558	$13,316,716	91
Construction	$1,855,225,518	$843,847,731	$695,383,090	10,048
Nondurable Manufacturing	$1,047,729,524	$278,742,615	$144,025,946	2,468
Durable Manufacturing	$721,706,442	$274,395,945	$178,922,774	2,864
Transportation and Utilities	$528,525,158	$212,639,063	$124,765,533	1,456
Information	$125,714,424	$77,377,820	$33,386,013	324
Wholesale Trade	$245,146,115	$165,764,265	$95,581,153	1,117
Retail Trade	$830,268,084	$624,151,971	$363,127,822	11,409
Finance, Insurance, and Real Estate	$804,109,125	$201,998,537	$83,026,913	898
Business Services	$556,250,163	$358,920,397	$292,787,076	3,664
Health Services	$191,352,927	$133,786,580	$113,117,792	1,922
Other Services	$370,205,700	$187,214,011	$150,824,583	3,748
TOTAL	**$7,473,701,815**	**$3,412,370,464**	**$2,307,993,212**	**40,326**
Source: US Multi-Regional Impact Assessment System, The Perryman Group				

The Anticipated Cumulative Impact of Construction Associated with the Implementation of the Proposed Rio Bravo Pipeline on Business Activity in Texas				
Sector	**Total Expenditures**	**Real Gross Product**	**Personal Income**	**Employment**
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$60,321,759	$17,057,570	$11,232,231	182
Mining	$58,984,243	$14,640,060	$8,169,717	55
Construction	$1,209,333,609	$549,883,832	$453,138,527	6,548
Nondurable Manufacturing	$360,875,549	$101,539,184	$53,178,916	924
Durable Manufacturing	$371,783,284	$143,108,980	$92,932,427	1,483
Transportation and Utilities	$286,539,039	$120,069,581	$71,365,398	852
Information	$79,440,226	$48,888,991	$21,102,910	205
Wholesale Trade	$157,629,170	$106,586,571	$61,458,769	718
Retail Trade	$530,845,594	$399,440,339	$232,458,162	7,293
Finance, Insurance, and Real Estate	$522,661,078	$128,208,792	$51,705,347	559
Business Services	$355,572,052	$229,432,854	$187,158,416	2,342
Health Services	$124,400,813	$86,976,246	$73,539,222	1,249
Other Services	$229,269,330	$116,632,341	$93,662,538	2,323
TOTAL	**$4,347,655,746**	**$2,062,465,341**	**$1,411,102,580**	**24,732**
Source: US Multi-Regional Impact Assessment System, The Perryman Group				

The Anticipated Cumulative Impact of Construction Associated with the Implementation of the Proposed Rio Bravo Pipeline on Business Activity in Kleberg County				
Sector	**Total Expenditures**	**Real Gross Product**	**Personal Income**	**Employment**
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$9,604,946	$2,707,588	$1,784,402	29
Mining	$8,487,565	$2,080,142	$1,010,162	7
Construction	$210,312,785	$95,440,317	$78,648,769	1,136
Nondurable Manufacturing	$34,107,752	$8,901,677	$4,733,151	77
Durable Manufacturing	$975,233	$359,783	$253,612	4
Transportation and Utilities	$27,321,399	$13,189,104	$8,161,587	104
Information	$12,356,004	$7,604,488	$3,281,467	32
Wholesale Trade	$5,289,211	$3,576,317	$2,062,136	24
Retail Trade	$78,961,159	$59,376,507	$34,548,790	1,085
Finance, Insurance, and Real Estate	$52,007,627	$11,593,802	$4,793,622	49
Business Services	$31,973,657	$20,518,128	$16,737,536	209
Health Services	$19,104,316	$13,329,892	$11,270,549	192
Other Services	$35,162,133	$17,821,994	$14,355,919	361
TOTAL	**$525,663,787**	**$256,499,739**	**$181,641,702**	**3,309**
Source: US Multi-Regional Impact Assessment System, The Perryman Group				

The Anticipated Cumulative Impact of Construction Associated with the Implementation of the Proposed Rio Bravo Pipeline on Business Activity in Kenedy County				
Sector	**Total Expenditures**	**Real Gross Product**	**Personal Income**	**Employment**
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$14,664,234	$4,117,333	$2,716,363	44
Mining	$11,801,265	$2,600,586	$1,199,389	6
Construction	$354,992,679	$160,698,061	$132,425,208	1,913
Nondurable Manufacturing	$0	$0	$0	0
Durable Manufacturing	$0	$0	$0	0
Transportation and Utilities	$9,107,046	$2,566,519	$1,289,200	11
Information	$3,413,265	$2,081,310	$941,346	11
Wholesale Trade	$0	$0	$0	0
Retail Trade	$74,710,391	$54,241,243	$31,221,388	1,035
Finance, Insurance, and Real Estate	$36,729,984	$8,191,550	$4,582,465	43
Business Services	$3,349,924	$1,757,203	$1,433,429	18
Health Services	$6,943,655	$4,956,948	$4,191,142	71
Other Services	$44,060,739	$21,530,691	$17,516,501	479
TOTAL	**$559,773,182**	**$262,741,444**	**$197,516,430**	**3,631**
Source: US Multi-Regional Impact Assessment System, The Perryman Group				

The Anticipated Cumulative Impact of Construction Associated with the Implementation of the Proposed Rio Bravo Pipeline on Business Activity in Willacy County				
Sector	**Total Expenditures**	**Real Gross Product**	**Personal Income**	**Employment**
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$7,755,662	$2,186,276	$1,440,837	23
Mining	$3,008,401	$662,386	$305,490	1
Construction	$163,904,419	$73,926,235	$60,919,824	880
Nondurable Manufacturing	$10,573,855	$4,049,740	$2,058,813	47
Durable Manufacturing	$0	$0	$0	0
Transportation and Utilities	$23,105,225	$12,533,032	$7,977,548	106
Information	$9,887,280	$6,093,519	$2,618,992	25
Wholesale Trade	$9,345,658	$6,319,099	$3,643,647	43
Retail Trade	$63,482,273	$47,781,752	$27,810,106	872
Finance, Insurance, and Real Estate	$41,297,477	$9,216,916	$3,844,524	39
Business Services	$31,248,428	$20,116,311	$16,409,755	205
Health Services	$13,485,226	$9,423,546	$7,967,697	135
Other Services	$24,799,661	$12,372,209	$10,129,617	262
TOTAL	**$401,893,565**	**$204,681,021**	**$145,126,850**	**2,639**
Source: US Multi-Regional Impact Assessment System, The Perryman Group				

The Anticipated Cumulative Impact of Construction Associated with the Implementation of the Proposed Rio Bravo Pipeline on Business Activity in Cameron County				
Sector	**Total Expenditures**	**Real Gross Product**	**Personal Income**	**Employment**
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$10,327,934	$2,914,712	$1,920,319	31
Mining	$181,229	$62,066	$34,559	0
Construction	$217,640,099	$98,716,762	$81,348,760	1,175
Nondurable Manufacturing	$37,242,907	$12,564,232	$6,641,788	130
Durable Manufacturing	$42,429,954	$16,746,341	$10,537,762	172
Transportation and Utilities	$36,328,209	$17,850,018	$11,095,934	142
Information	$8,454,078	$5,198,151	$2,258,096	23
Wholesale Trade	$19,876,690	$13,439,912	$7,749,575	91
Retail Trade	$87,084,532	$65,501,253	$38,115,024	1,196
Finance, Insurance, and Real Estate	$72,683,755	$16,308,919	$6,203,603	66
Business Services	$33,421,591	$21,404,804	$17,460,836	218
Health Services	$20,818,060	$14,536,652	$12,290,873	209
Other Services	$38,189,395	$19,362,101	$15,574,973	391
TOTAL	**$624,678,433**	**$304,605,923**	**$211,232,102**	**3,843**
Source: US Multi-Regional Impact Assessment System, The Perryman Group				

Total Construction (Trains1-6) and Pipeline

The Anticipated Cumulative Impact of Construction and Other Non-operational Activities Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Export Facility and the Rio Bravo Pipeline on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$1,075,697,990	$315,447,437	$205,267,971	3,316
Mining	$1,059,467,289	$260,671,376	$148,616,128	988
Construction	$16,992,820,911	$7,935,529,924	$6,539,370,884	94,486
Nondurable Manufacturing	$10,854,179,927	$2,897,266,863	$1,496,040,173	25,464
Durable Manufacturing	$10,275,305,037	$3,979,911,345	$2,590,537,108	42,064
Transportation and Utilities	$5,425,195,108	$2,176,346,856	$1,275,064,467	14,833
Information	$1,278,587,055	$787,527,887	$339,744,839	3,291
Wholesale Trade	$2,551,162,015	$1,726,262,853	$995,378,522	11,626
Retail Trade	$8,483,317,719	$6,384,806,130	$3,715,427,608	116,605
Finance, Insurance, and Real Estate	$8,166,085,068	$2,045,326,896	$838,542,901	9,065
Business Services	$5,300,233,864	$3,378,286,288	$2,755,815,939	34,487
Health Services	$1,938,357,620	$1,356,296,587	$1,146,761,384	19,482
Other Services	$3,715,466,474	$1,886,555,290	$1,519,553,447	37,728
TOTAL	**$77,115,876,076**	**$35,130,235,732**	**$23,566,121,370**	**413,434**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact of Construction and Other Non-operational Activities Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Export Facility and the Rio Bravo Pipeline on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$680,629,047	$195,802,759	$129,029,942	2,093
Mining	$771,298,201	$187,078,221	$102,885,950	670
Construction	$12,366,003,163	$5,773,818,475	$4,757,986,081	68,746
Nondurable Manufacturing	$4,135,618,708	$1,168,023,947	$611,329,260	10,560
Durable Manufacturing	$5,211,232,191	$2,037,552,231	$1,319,701,407	21,209
Transportation and Utilities	$3,227,178,176	$1,348,071,060	$800,038,601	9,521
Information	$892,172,885	$549,511,305	$237,152,834	2,300
Wholesale Trade	$1,789,376,184	$1,210,822,816	$698,171,233	8,153
Retail Trade	$5,980,943,777	$4,505,625,001	$2,622,631,079	82,188
Finance, Insurance, and Real Estate	$5,855,059,790	$1,432,337,847	$575,486,213	6,230
Business Services	$3,938,453,588	$2,507,970,696	$2,045,861,435	25,600
Health Services	$1,388,844,136	$971,792,370	$821,659,485	13,958
Other Services	$2,537,623,763	$1,295,625,892	$1,040,340,504	25,772
TOTAL	**$48,774,433,610**	**$23,184,032,619**	**$15,762,274,023**	**277,003**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact of Construction and Other Non-operational Activities Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Export Facility and the Rio Bravo Pipeline on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$200,151,563	$57,394,286	$37,844,991	616
Mining	$3,352,116	$1,114,981	$619,447	5
Construction	$3,454,998,932	$1,612,059,050	$1,328,437,088	19,193
Nondurable Manufacturing	$724,344,556	$245,108,175	$129,717,721	2,518
Durable Manufacturing	$1,198,077,588	$481,877,114	$305,083,056	5,029
Transportation and Utilities	$697,796,206	$341,428,342	$211,935,981	2,711
Information	$164,944,946	$101,479,943	$44,064,256	439
Wholesale Trade	$379,384,747	$256,725,408	$148,030,160	1,728
Retail Trade	$1,692,205,341	$1,273,487,627	$741,038,927	23,258
Finance, Insurance, and Real Estate	$1,400,628,151	$312,750,808	$118,045,366	1,244
Business Services	$967,351,036	$606,809,453	$495,001,028	6,193
Health Services	$398,694,441	$278,694,220	$235,638,522	4,005
Other Services	$725,281,883	$369,368,438	$296,990,756	7,434
TOTAL	**$12,007,211,507**	**$5,938,297,846**	**$4,092,447,300**	**74,374**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Ongoing Operations of the Facility

Operation of Facilities Completed During Stage 1 of Construction

The Anticipated Annual Impact (at Maturity) of Ongoing Operations Associated with the Implementation of Trains 1 and 2 of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project on Business Activity in the United States				
Sector	**Total Expenditures**	**Real Gross Product**	**Personal Income**	**Employment**
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Permanent Jobs)*
Agriculture	$10,829,382	$3,316,040	$2,131,800	34
Mining	$240,581,487	$52,976,575	$24,773,830	132
Construction	$33,273,060	$18,133,470	$14,943,107	216
Nondurable Manufacturing	$852,322,336	$90,298,172	$44,083,882	496
Durable Manufacturing	$35,670,372	$13,482,162	$8,893,407	127
Transportation and Utilities	$125,174,246	$39,984,964	$23,017,093	259
Information	$14,763,281	$9,119,375	$3,925,947	38
Wholesale Trade	$30,722,567	$20,766,870	$11,974,360	140
Retail Trade	$81,569,010	$60,531,209	$35,093,617	1,122
Finance, Insurance, and Real Estate	$107,677,878	$33,557,162	$11,951,528	125
Business Services	$30,030,074	$17,626,604	$14,378,790	180
Health Services	$18,108,373	$12,688,016	$10,727,836	182
Other Services	$36,488,944	$18,473,591	$14,915,183	368
TOTAL	**$1,617,211,008**	**$390,954,210**	**$220,810,380**	**3,420**
Source: US Multi-Regional Impact Assessment System, The Perryman Group				

The Anticipated Annual Impact (at Maturity) of Ongoing Operations Associated with the Implementation of Trains 1 and 2 of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Permanent Jobs)*
Agriculture	$9,384,012	$2,794,640	$1,825,201	30
Mining	$240,096,151	$52,841,693	$24,646,898	131
Construction	$31,608,316	$17,226,202	$14,195,462	205
Nondurable Manufacturing	$754,503,195	$73,623,037	$35,682,224	366
Durable Manufacturing	$28,059,425	$10,869,137	$7,136,785	102
Transportation and Utilities	$103,460,293	$34,197,180	$19,992,668	232
Information	$14,084,771	$8,699,104	$3,746,272	36
Wholesale Trade	$29,830,366	$20,163,789	$11,626,617	136
Retail Trade	$78,713,608	$58,472,072	$33,910,278	1,083
Finance, Insurance, and Real Estate	$105,693,430	$32,411,777	$11,278,128	117
Business Services	$28,987,006	$17,014,360	$13,879,356	174
Health Services	$17,776,941	$12,455,792	$10,531,488	179
Other Services	$34,102,860	$17,361,037	$13,973,094	344
TOTAL	**$1,476,300,377**	**$358,129,819**	**$202,424,471**	**3,134**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Annual Impact (at Maturity) of Ongoing Operations Associated with the Implementation of Trains 1 and 2 of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project on Business Activity in Cameron County				
Sector	**Total Expenditures**	**Real Gross Product**	**Personal Income**	**Employment**
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Permanent Jobs)*
Agriculture	$8,111,106	$2,425,899	$1,583,665	26
Mining	$2,654,987	$593,367	$278,631	2
Construction	$22,781,431	$12,458,704	$10,266,749	148
Nondurable Manufacturing	$667,737,321	$63,245,221	$30,456,637	303
Durable Manufacturing	$15,219,253	$5,972,347	$3,761,051	55
Transportation and Utilities	$62,570,312	$23,761,040	$14,741,402	188
Information	$7,209,554	$4,447,062	$1,925,060	19
Wholesale Trade	$19,822,072	$13,397,546	$7,725,146	90
Retail Trade	$61,836,636	$45,777,279	$26,524,101	851
Finance, Insurance, and Real Estate	$75,311,168	$22,983,398	$7,479,193	76
Business Services	$14,031,691	$8,134,034	$6,635,288	83
Health Services	$14,428,858	$10,085,266	$8,527,186	145
Other Services	$27,678,606	$14,010,305	$11,320,197	285
TOTAL	**$999,392,995**	**$227,291,468**	**$131,224,308**	**2,272**
Source: US Multi-Regional Impact Assessment System, The Perryman Group				

Total Operations

The Anticipated Annual Impact (at Maturity) of Ongoing Operations Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) and the Rio Bravo Pipeline on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Permanent Jobs)*
Agriculture	$15,521,729	$4,752,872	$3,055,504	49
Mining	$344,824,906	$75,931,207	$35,508,274	190
Construction	$47,690,202	$25,990,662	$21,417,922	309
Nondurable Manufacturing	$1,221,631,694	$129,424,167	$63,185,329	711
Durable Manufacturing	$51,126,264	$19,323,952	$12,746,900	182
Transportation and Utilities	$179,411,966	$57,310,360	$32,990,348	372
Information	$21,160,178	$13,070,779	$5,627,051	54
Wholesale Trade	$44,034,586	$29,765,109	$17,162,823	201
Retail Trade	$116,912,679	$86,759,246	$50,299,602	1,609
Finance, Insurance, and Real Estate	$154,334,461	$48,097,406	$17,130,098	179
Business Services	$43,042,037	$25,264,172	$20,609,088	258
Health Services	$25,954,690	$18,185,705	$15,376,184	261
Other Services	$52,299,522	$26,478,156	$21,377,899	528
TOTAL	**$2,317,944,913**	**$560,353,793**	**$316,487,022**	**4,901**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Annual Impact (at Maturity) of Ongoing Operations Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) and the Rio Bravo Pipeline on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Permanent Jobs)*
Agriculture	$13,450,084	$4,005,551	$2,616,057	42
Mining	$344,129,276	$75,737,880	$35,326,344	188
Construction	$45,304,129	$24,690,277	$20,346,324	294
Nondurable Manufacturing	$1,081,427,739	$105,523,734	$51,143,251	524
Durable Manufacturing	$40,217,511	$15,578,709	$10,229,138	146
Transportation and Utilities	$148,289,407	$49,014,742	$28,655,446	332
Information	$20,187,670	$12,468,406	$5,369,523	52
Wholesale Trade	$42,755,796	$28,900,713	$16,664,405	195
Retail Trade	$112,820,038	$83,807,890	$48,603,525	1,552
Finance, Insurance, and Real Estate	$151,490,157	$46,455,727	$16,164,915	168
Business Services	$41,547,011	$24,386,644	$19,893,250	249
Health Services	$25,479,650	$17,852,859	$15,094,759	257
Other Services	$48,879,553	$24,883,536	$20,027,604	493
TOTAL	**$2,115,978,021**	**$513,306,667**	**$290,134,540**	**4,492**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Annual Impact (at Maturity) of Ongoing Operations Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) and the Rio Bravo Pipeline on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Permanent Jobs)*
Agriculture	$11,625,630	$3,477,036	$2,269,864	37
Mining	$3,805,387	$850,471	$399,362	2
Construction	$32,652,574	$17,857,032	$14,715,309	213
Nondurable Manufacturing	$957,066,406	$90,649,233	$43,653,429	435
Durable Manufacturing	$21,813,722	$8,560,152	$5,390,706	79
Transportation and Utilities	$89,681,887	$34,056,646	$21,128,818	270
Information	$10,333,438	$6,373,963	$2,759,185	27
Wholesale Trade	$28,410,931	$19,202,672	$11,072,435	129
Retail Trade	$88,630,312	$65,612,472	$38,016,935	1,220
Finance, Insurance, and Real Estate	$107,943,328	$32,942,053	$10,719,911	109
Business Services	$20,111,591	$11,658,493	$9,510,343	119
Health Services	$20,680,850	$14,455,190	$12,221,997	208
Other Services	$39,671,684	$20,080,939	$16,225,212	409
TOTAL	**$1,432,427,740**	**$325,776,351**	**$188,083,506**	**3,256**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Cumulative Operations Effects

The Anticipated Cumulative Impact (Over 25 Years) of Ongoing Operations Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) and the Rio Bravo Pipeline on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$364,545,041	$111,626,486	$71,761,901	1,157
Mining	$8,098,596,059	$1,783,328,762	$833,951,278	4,452
Construction	$1,120,057,374	$610,419,572	$503,023,704	7,264
Nondurable Manufacturing	$28,691,377,692	$3,039,670,372	$1,483,977,658	16,696
Durable Manufacturing	$1,200,757,123	$453,844,481	$299,375,104	4,280
Transportation and Utilities	$4,213,689,367	$1,345,997,472	$774,814,983	8,726
Information	$496,970,289	$306,981,770	$132,157,553	1,267
Wholesale Trade	$1,034,201,173	$699,066,652	$403,087,967	4,712
Retail Trade	$2,745,824,175	$2,037,637,283	$1,181,342,046	37,779
Finance, Insurance, and Real Estate	$3,624,716,303	$1,129,621,015	$402,319,385	4,192
Business Services	$1,010,890,068	$593,357,149	$484,027,330	6,054
Health Services	$609,574,737	$427,111,499	$361,126,758	6,141
Other Services	$1,228,312,373	$621,868,920	$502,083,700	12,394
TOTAL	**$54,439,511,775**	**$13,160,531,433**	**$7,433,049,369**	**115,113**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact (Over 25 Years) of Ongoing Operations Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) and the Rio Bravo Pipeline on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$315,890,167	$94,074,816	$61,440,996	996
Mining	$8,082,258,408	$1,778,788,255	$829,678,432	4,420
Construction	$1,064,017,798	$579,878,588	$477,856,034	6,900
Nondurable Manufacturing	$25,398,532,034	$2,478,342,142	$1,201,156,080	12,314
Durable Manufacturing	$944,552,937	$365,883,298	$240,242,667	3,420
Transportation and Utilities	$3,482,741,480	$1,151,165,673	$673,004,999	7,800
Information	$474,129,869	$292,834,370	$126,109,207	1,210
Wholesale Trade	$1,004,167,376	$678,765,354	$391,382,061	4,575
Retail Trade	$2,649,703,949	$1,968,321,411	$1,141,507,793	36,448
Finance, Insurance, and Real Estate	$3,557,914,660	$1,091,064,371	$379,650,998	3,955
Business Services	$975,777,726	$572,747,431	$467,215,083	5,843
Health Services	$598,417,899	$419,294,223	$354,517,179	6,029
Other Services	$1,147,990,606	$584,417,495	$470,370,524	11,587
TOTAL	**$49,696,094,909**	**$12,055,577,426**	**$6,814,132,052**	**105,497**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact (Over 25 Years) of Ongoing Operations Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) and the Rio Bravo Pipeline on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$273,040,831	$81,662,047	$53,310,273	860
Mining	$89,373,747	$19,974,257	$9,379,455	52
Construction	$766,881,984	$419,392,237	$345,605,378	4,993
Nondurable Manufacturing	$22,477,767,958	$2,128,997,967	$1,025,249,286	10,216
Durable Manufacturing	$512,319,497	$201,044,679	$126,606,725	1,860
Transportation and Utilities	$2,106,278,770	$799,858,163	$496,233,774	6,341
Information	$242,692,263	$149,699,612	$64,802,522	628
Wholesale Trade	$667,262,282	$450,996,091	$260,048,430	3,034
Retail Trade	$2,081,581,344	$1,540,981,805	$892,869,962	28,641
Finance, Insurance, and Real Estate	$2,535,168,997	$773,680,715	$251,769,021	2,558
Business Services	$472,343,063	$273,812,651	$223,360,982	2,797
Health Services	$485,712,741	$339,496,195	$287,047,177	4,878
Other Services	$931,733,585	$471,623,169	$381,067,142	9,607
TOTAL	**$33,642,157,062**	**$7,651,219,588**	**$4,417,350,127**	**76,466**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Total Construction and First 25 Years of Operations of the Facility

The Anticipated Cumulative Impact of Construction and the First 25 Years of Operations Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$739,166,318	$221,664,104	$143,373,898	2,313
Mining	$8,471,857,698	$1,874,991,498	$886,172,104	4,798
Construction	$6,962,638,052	$3,347,560,068	$2,758,597,941	39,854
Nondurable Manufacturing	$32,476,323,462	$4,050,328,854	$2,005,807,710	25,572
Durable Manufacturing	$4,888,110,967	$1,884,043,408	$1,230,173,619	19,410
Transportation and Utilities	$6,103,632,155	$2,103,919,777	$1,218,790,011	13,890
Information	$941,938,673	$581,074,779	$250,401,311	2,412
Wholesale Trade	$1,924,242,398	$1,301,364,353	$750,378,180	8,768
Retail Trade	$5,699,632,805	$4,261,047,661	$2,475,212,139	78,381
Finance, Insurance, and Real Estate	$6,466,180,702	$1,841,081,084	$693,922,047	7,345
Business Services	$2,841,901,321	$1,758,726,440	$1,434,670,048	17,950
Health Services	$1,283,857,250	$898,957,466	$760,076,917	12,919
Other Services	$2,519,465,655	$1,277,755,028	$1,030,365,016	25,509
TOTAL	**$81,318,947,455**	**$25,402,514,518**	**$15,637,940,939**	**259,120**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact of Construction and the First 25 Years of Operations Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$555,307,015	$163,064,187	$106,906,779	1,734
Mining	$8,357,186,602	$1,845,343,335	$866,235,574	4,658
Construction	$5,370,100,784	$2,596,134,065	$2,139,376,142	30,907
Nondurable Manufacturing	$26,855,450,446	$2,889,967,840	$1,416,582,529	16,033
Durable Manufacturing	$2,812,410,410	$1,097,071,921	$713,732,449	11,033
Transportation and Utilities	$4,617,725,007	$1,625,131,156	$954,247,288	11,146
Information	$787,816,159	$486,057,017	$209,496,896	2,019
Wholesale Trade	$1,633,964,469	$1,104,961,799	$637,130,731	7,445
Retail Trade	$4,753,250,617	$3,553,164,614	$2,064,030,674	65,355
Finance, Insurance, and Real Estate	$5,616,033,461	$1,594,412,427	$581,812,034	6,144
Business Services	$2,358,644,284	$1,452,183,089	$1,184,609,231	14,820
Health Services	$1,086,448,655	$760,802,201	$643,265,350	10,934
Other Services	$2,038,934,422	$1,039,467,637	$835,755,002	20,638
TOTAL	**$66,843,272,330**	**$20,207,761,287**	**$12,353,180,679**	**202,865**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Anticipated Cumulative Impact of Construction and the First 25 Years of Operations Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$346,306,091	$102,689,251	$67,175,936	1,085
Mining	$90,597,598	$20,380,646	$9,605,202	54
Construction	$2,016,388,902	$1,003,489,261	$826,937,715	11,947
Nondurable Manufacturing	$22,742,965,086	$2,218,751,769	$1,072,752,278	11,138
Durable Manufacturing	$958,358,934	$380,568,837	$240,290,874	3,735
Transportation and Utilities	$2,361,582,207	$924,748,042	$573,750,985	7,332
Information	$303,092,247	$186,861,005	$80,938,233	789
Wholesale Trade	$806,019,778	$544,895,756	$314,191,813	3,666
Retail Trade	$2,701,101,657	$2,007,222,160	$1,164,173,924	37,156
Finance, Insurance, and Real Estate	$3,047,708,940	$888,096,883	$294,936,018	3,013
Business Services	$832,807,059	$499,758,305	$407,674,740	5,103
Health Services	$631,559,766	$441,451,748	$373,251,533	6,343
Other Services	$1,196,927,176	$606,713,334	$489,683,760	12,326
TOTAL	**$38,035,415,441**	**$9,825,626,997**	**$5,915,363,010**	**103,688**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Enhanced Exploration and Production Activity

The Potential Cumulative Impact (Over 25 Years) of the Natural Gas Exploration and Production Stimulus Required to Maintain the Level of Incremental Natural Gas Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$7,541,384,069	$2,145,156,880	$1,405,052,686	22,749
Mining	$171,732,101,371	$62,776,708,317	$48,947,117,888	671,115
Construction	$9,533,947,471	$5,096,031,079	$4,199,446,490	60,682
Nondurable Manufacturing	$81,423,431,729	$21,363,546,195	$10,979,391,620	181,915
Durable Manufacturing	$46,650,508,772	$17,158,013,570	$11,458,110,867	169,597
Transportation and Utilities	$46,075,685,305	$20,040,053,921	$12,048,446,879	146,592
Information	$9,190,450,188	$5,640,866,034	$2,431,705,206	23,476
Wholesale Trade	$19,407,474,204	$13,134,469,189	$7,573,451,829	88,459
Retail Trade	$59,348,215,278	$44,619,092,029	$25,955,193,350	816,097
Finance, Insurance, and Real Estate	$68,163,452,607	$20,205,389,022	$8,838,983,759	99,019
Business Services	$23,568,573,345	$13,840,779,923	$11,290,529,600	141,272
Health Services	$13,690,429,953	$9,576,041,676	$8,096,632,084	137,575
Other Services	$27,362,143,606	$13,540,815,087	$10,950,724,886	272,163
TOTAL	**$583,687,797,898**	**$249,136,962,922**	**$164,174,787,145**	**2,830,711**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Cumulative Impact (Over 25 Years) of the Natural Gas Exploration and Production Stimulus Required to Maintain the Level of Incremental Natural Gas Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$6,537,473,372	$1,829,438,636	$1,211,453,778	19,677
Mining	$171,419,795,172	$62,679,439,408	$48,854,817,936	670,412
Construction	$9,056,937,645	$4,841,062,515	$3,989,336,539	57,646
Nondurable Manufacturing	$43,026,885,183	$11,865,247,766	$6,171,781,418	103,323
Durable Manufacturing	$36,803,950,673	$13,721,357,575	$9,106,581,665	134,513
Transportation and Utilities	$38,177,749,860	$17,255,391,502	$10,489,297,829	129,964
Information	$8,768,962,900	$5,381,463,048	$2,320,779,026	22,446
Wholesale Trade	$18,843,869,986	$12,753,036,646	$7,353,514,430	85,890
Retail Trade	$57,297,804,355	$43,118,529,641	$25,089,479,810	787,721
Finance, Insurance, and Real Estate	$66,655,141,155	$19,337,051,142	$8,325,379,135	93,275
Business Services	$22,749,940,516	$13,360,033,098	$10,898,363,385	136,365
Health Services	$13,439,858,689	$9,400,774,656	$7,948,442,192	135,057
Other Services	$25,530,952,753	$12,717,452,194	$10,252,859,651	254,316
TOTAL	**$518,309,322,258**	**$228,260,277,825**	**$152,012,086,794**	**2,630,605**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Cumulative Impact (Over 25 Years) of the Natural Gas Exploration and Production Stimulus Required to Maintain the Level of Incremental Natural Gas Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$1,541,024,409	$430,194,141	$285,110,099	4,631
Mining	$34,544,369,244	$13,806,395,385	$11,304,948,763	162,499
Construction	$1,636,803,619	$876,898,074	$722,618,633	10,441
Nondurable Manufacturing	$5,655,844,891	$1,887,691,823	$997,453,264	19,368
Durable Manufacturing	$4,846,734,678	$1,880,875,218	$1,178,672,989	18,162
Transportation and Utilities	$7,036,463,729	$3,684,371,283	$2,326,096,695	30,557
Information	$1,283,090,688	$787,073,497	$341,398,400	3,387
Wholesale Trade	$3,273,470,596	$2,215,406,670	$1,277,423,332	14,920
Retail Trade	$12,996,553,508	$9,776,924,341	$5,688,293,457	178,697
Finance, Insurance, and Real Estate	$12,509,021,769	$3,300,367,564	$1,334,742,456	14,615
Business Services	$2,948,248,992	$1,708,983,087	$1,394,092,247	17,446
Health Services	$3,103,404,434	$2,168,349,350	$1,833,359,464	31,152
Other Services	$5,883,394,911	$2,916,199,180	$2,355,398,675	59,026
TOTAL	**$97,258,425,468**	**$45,439,729,612**	**$31,039,608,476**	**564,901**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Cumulative Incremental Natural Gas Exploration and Production Effects (Initial Drilling Stimulus): Completed Stage 1 Facilities

The Potential Cumulative Impact of the Initial Drilling Stimulus Required to Establish the Level of Incremental Natural Gas Production Associated with the Implementation of the Trains 1 and 2 of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$790,870,100	$223,609,043	$146,674,757	2,376
Mining	$15,998,036,732	$6,344,779,218	$5,183,238,541	73,985
Construction	$809,030,365	$430,993,044	$355,165,055	5,132
Nondurable Manufacturing	$8,536,769,536	$2,238,571,069	$1,150,426,571	19,080
Durable Manufacturing	$5,042,685,545	$1,849,655,610	$1,235,560,541	18,331
Transportation and Utilities	$4,845,970,169	$2,135,535,181	$1,288,667,052	15,775
Information	$966,375,067	$593,004,347	$255,632,758	2,468
Wholesale Trade	$2,063,822,149	$1,396,868,901	$805,447,046	9,408
Retail Trade	$6,229,097,222	$4,685,597,517	$2,726,134,405	85,637
Finance, Insurance, and Real Estate	$6,913,528,462	$2,028,573,859	$924,859,358	10,430
Business Services	$2,514,295,164	$1,476,665,628	$1,204,580,738	15,072
Health Services	$1,441,365,552	$1,008,267,953	$852,499,913	14,486
Other Services	$2,887,662,066	$1,426,591,232	$1,153,946,026	28,685
TOTAL	**$59,039,508,128**	**$25,838,712,600**	**$17,282,832,761**	**300,863**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Cumulative Impact of the Initial Drilling Stimulus Required to Establish the Level of Incremental Natural Gas Production Associated with the Implementation of the Trains 1 and 2 of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$685,603,824	$190,876,134	$126,533,141	2,056
Mining	$15,964,825,548	$6,334,429,753	$5,173,430,296	73,910
Construction	$768,552,333	$409,429,267	$337,395,163	4,875
Nondurable Manufacturing	$4,509,431,552	$1,242,520,674	$646,252,959	10,831
Durable Manufacturing	$3,978,803,728	$1,478,903,794	$981,732,898	14,537
Transportation and Utilities	$4,023,403,851	$1,841,539,117	$1,123,223,556	13,993
Information	$922,054,412	$565,733,573	$243,971,231	2,360
Wholesale Trade	$2,003,887,566	$1,356,303,024	$782,056,401	9,135
Retail Trade	$6,014,040,260	$4,528,116,923	$2,635,260,311	82,661
Finance, Insurance, and Real Estate	$6,752,892,914	$1,936,074,858	$870,131,951	9,816
Business Services	$2,426,963,422	$1,425,374,998	$1,162,740,728	14,549
Health Services	$1,414,984,731	$989,813,969	$836,896,899	14,221
Other Services	$2,694,051,693	$1,339,729,896	$1,080,317,888	26,802
TOTAL	**$52,159,495,834**	**$23,638,845,980**	**$15,999,943,421**	**279,745**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Cumulative Impact of the Initial Drilling Stimulus Required to Establish the Level of Incremental Natural Gas Production Associated with the Implementation of the Trains 1 and 2 of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$161,623,257	$44,873,472	$29,773,640	484
Mining	$3,801,482,076	$1,537,531,523	$1,266,865,875	18,303
Construction	$137,088,945	$73,223,941	$60,341,086	872
Nondurable Manufacturing	$593,685,032	$198,049,275	$104,625,221	2,033
Durable Manufacturing	$523,262,997	$202,643,571	$126,938,749	1,961
Transportation and Utilities	$750,148,568	$395,981,503	$250,445,621	3,299
Information	$134,983,509	$82,785,862	$35,907,842	356
Wholesale Trade	$348,277,004	$235,727,880	$135,922,807	1,587
Retail Trade	$1,364,413,897	$1,026,996,395	$597,633,549	18,756
Finance, Insurance, and Real Estate	$1,260,184,392	$325,339,254	$138,221,638	1,525
Business Services	$314,522,411	$182,362,512	$148,761,076	1,862
Health Services	$326,871,710	$228,405,451	$193,118,927	3,282
Other Services	$621,192,987	$307,358,099	$248,304,534	6,223
TOTAL	**$10,337,736,786**	**$4,841,278,739**	**$3,336,860,565**	**60,543**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Cumulative Incremental Natural Gas Exploration and Production Effects (Initial Drilling Stimulus): Total

The Potential Cumulative Impact of the Initial Drilling Stimulus Required to Establish the Level of Incremental Natural Gas Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$2,372,610,299	$670,827,130	$440,024,271	7,127
Mining	$47,994,110,196	$19,034,337,654	$15,549,715,623	221,955
Construction	$2,427,091,094	$1,292,979,131	$1,065,495,166	15,396
Nondurable Manufacturing	$25,610,308,609	$6,715,713,208	$3,451,279,713	57,239
Durable Manufacturing	$15,128,056,634	$5,548,966,829	$3,706,681,624	54,992
Transportation and Utilities	$14,537,910,507	$6,406,605,542	$3,866,001,155	47,325
Information	$2,899,125,201	$1,779,013,040	$766,898,273	7,404
Wholesale Trade	$6,191,466,447	$4,190,606,703	$2,416,341,139	28,223
Retail Trade	$18,687,291,666	$14,056,792,550	$8,178,403,216	256,910
Finance, Insurance, and Real Estate	$20,740,585,386	$6,085,721,576	$2,774,578,073	31,290
Business Services	$7,542,885,491	$4,429,996,883	$3,613,742,213	45,216
Health Services	$4,324,096,657	$3,024,803,859	$2,557,499,740	43,457
Other Services	$8,662,986,197	$4,279,773,696	$3,461,838,077	86,055
TOTAL	**$177,118,524,384**	**$77,516,137,800**	**$51,848,498,284**	**902,590**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Cumulative Impact of the Initial Drilling Stimulus Required to Establish the Level of Incremental Natural Gas Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$2,056,811,472	$572,628,403	$379,599,424	6,167
Mining	$47,894,476,645	$19,003,289,258	$15,520,290,887	221,731
Construction	$2,305,656,998	$1,228,287,800	$1,012,185,488	14,626
Nondurable Manufacturing	$13,528,294,656	$3,727,562,023	$1,938,758,877	32,494
Durable Manufacturing	$11,936,411,185	$4,436,711,381	$2,945,198,694	43,612
Transportation and Utilities	$12,070,211,553	$5,524,617,350	$3,369,670,667	41,978
Information	$2,766,163,236	$1,697,200,720	$731,913,692	7,079
Wholesale Trade	$6,011,662,699	$4,068,909,073	$2,346,169,202	27,404
Retail Trade	$18,042,120,781	$13,584,350,768	$7,905,780,932	247,983
Finance, Insurance, and Real Estate	$20,258,678,743	$5,808,224,575	$2,610,395,854	29,448
Business Services	$7,280,890,265	$4,276,124,995	$3,488,222,184	43,646
Health Services	$4,244,954,192	$2,969,441,907	$2,510,690,696	42,662
Other Services	$8,082,155,079	$4,019,189,687	$3,240,953,664	80,406
TOTAL	**$156,478,487,503**	**$70,916,537,939**	**$47,999,830,262**	**839,234**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Cumulative Impact of the Initial Drilling Stimulus Required to Establish the Level of Incremental Natural Gas Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$484,869,770	$134,620,417	$89,320,921	1,451
Mining	$11,404,446,229	$4,612,594,570	$3,800,597,624	54,909
Construction	$411,266,835	$219,671,823	$181,023,257	2,616
Nondurable Manufacturing	$1,781,055,096	$594,147,826	$313,875,664	6,099
Durable Manufacturing	$1,569,788,991	$607,930,712	$380,816,247	5,884
Transportation and Utilities	$2,250,445,705	$1,187,944,509	$751,336,863	9,896
Information	$404,950,528	$248,357,587	$107,723,526	1,069
Wholesale Trade	$1,044,831,011	$707,183,640	$407,768,421	4,762
Retail Trade	$4,093,241,690	$3,080,989,186	$1,792,900,647	56,267
Finance, Insurance, and Real Estate	$3,780,553,177	$976,017,761	$414,664,913	4,576
Business Services	$943,567,234	$547,087,535	$446,283,228	5,585
Health Services	$980,615,131	$685,216,353	$579,356,780	9,845
Other Services	$1,863,578,961	$922,074,297	$744,913,602	18,670
TOTAL	**$31,013,210,358**	**$14,523,836,217**	**$10,010,581,694**	**181,628**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Incremental Natural Gas Exploration and Production Effects in a "Typical Year"

The Potential Annual Impact in a "Typical" Year of Natural Gas Exploration and Production Stimulus Required to Maintain the Level of Incremental Natural Gas Production Associated with the Implementation of the Rio Grande Liquefied Natural Gas (LNG) Export Facility (Trains 1-6) on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$301,655,363	$85,806,275	$56,202,107	910
Mining	$6,869,284,055	$2,511,068,333	$1,957,884,716	26,845
Construction	$381,357,899	$203,841,243	$167,977,860	2,427
Nondurable Manufacturing	$3,256,937,269	$854,541,848	$439,175,665	7,277
Durable Manufacturing	$1,866,020,351	$686,320,543	$458,324,435	6,784
Transportation and Utilities	$1,843,027,412	$801,602,157	$481,937,875	5,864
Information	$367,618,008	$225,634,641	$97,268,208	939
Wholesale Trade	$776,298,968	$525,378,768	$302,938,073	3,538
Retail Trade	$2,373,928,611	$1,784,763,681	$1,038,207,734	32,644
Finance, Insurance, and Real Estate	$2,726,538,104	$808,215,561	$353,559,350	3,961
Business Services	$942,742,934	$553,631,197	$451,621,184	5,651
Health Services	$547,617,198	$383,041,667	$323,865,283	5,503
Other Services	$1,094,485,744	$541,632,603	$438,028,995	10,887
TOTAL	**$23,347,511,916**	**$9,965,478,517**	**$6,566,991,486**	**113,228**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Annual Impact in a "Typical" Year of Natural Gas Exploration and Production Stimulus Required to Maintain the Level of Incremental Natural Gas Production Associated with the Implementation of the Rio Grande Liquefied Natural Gas (LNG) Export Facility (Trains 1-6) on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$261,498,935	$73,177,545	$48,458,151	787
Mining	$6,856,791,807	$2,507,177,576	$1,954,192,717	26,816
Construction	$362,277,506	$193,642,501	$159,573,462	2,306
Nondurable Manufacturing	$1,721,075,407	$474,609,911	$246,871,257	4,133
Durable Manufacturing	$1,472,158,027	$548,854,303	$364,263,267	5,381
Transportation and Utilities	$1,527,109,994	$690,215,660	$419,571,913	5,199
Information	$350,758,516	$215,258,522	$92,831,161	898
Wholesale Trade	$753,754,799	$510,121,466	$294,140,577	3,436
Retail Trade	$2,291,912,174	$1,724,741,186	$1,003,579,192	31,509
Finance, Insurance, and Real Estate	$2,666,205,646	$773,482,046	$333,015,165	3,731
Business Services	$909,997,621	$534,401,324	$435,934,535	5,455
Health Services	$537,594,348	$376,030,986	$317,937,688	5,402
Other Services	$1,021,238,110	$508,698,088	$410,114,386	10,173
TOTAL	**$20,732,372,890**	**$9,130,411,113**	**$6,080,483,472**	**105,224**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Annual Impact in a "Typical" Year of Natural Gas Exploration and Production Stimulus Required to Maintain the Level of Incremental Natural Gas Production Associated with the Implementation of the Rio Grande Liquefied Natural Gas (LNG) Export Facility (Trains 1-6) on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$61,640,976	$17,207,766	$11,404,404	185
Mining	$1,381,774,770	$552,255,815	$452,197,951	6,500
Construction	$65,472,145	$35,075,923	$28,904,745	418
Nondurable Manufacturing	$226,233,796	$75,507,673	$39,898,131	775
Durable Manufacturing	$193,869,387	$75,235,009	$47,146,920	726
Transportation and Utilities	$281,458,549	$147,374,851	$93,043,868	1,222
Information	$51,323,628	$31,482,940	$13,655,936	135
Wholesale Trade	$130,938,824	$88,616,267	$51,096,933	597
Retail Trade	$519,862,140	$391,076,974	$227,531,738	7,148
Finance, Insurance, and Real Estate	$500,360,871	$132,014,703	$53,389,698	585
Business Services	$117,929,960	$68,359,323	$55,763,690	698
Health Services	$124,136,177	$86,733,974	$73,334,379	1,246
Other Services	$235,335,796	$116,647,967	$94,215,947	2,361
TOTAL	**$3,890,337,019**	**$1,817,589,184**	**$1,241,584,339**	**22,596**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Benefits from Liquid By-Products

The Potential Impact of Constructing New Chemical Manufacturing Facilities to Accommodate the Incremental Ethane Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$185,260,907	$52,889,490	$34,602,579	561
Mining	$180,854,280	$44,804,993	$26,390,912	178
Construction	$3,645,666,651	$1,564,599,745	$1,289,327,635	18,629
Nondurable Manufacturing	$1,967,431,346	$518,461,801	$266,682,154	4,454
Durable Manufacturing	$1,269,397,628	$473,344,099	$312,152,973	4,709
Transportation and Utilities	$1,080,906,865	$466,315,880	$279,579,384	3,385
Information	$224,321,970	$137,876,358	$59,442,809	574
Wholesale Trade	$479,221,049	$324,311,886	$187,001,122	2,185
Retail Trade	$1,473,916,774	$1,110,258,128	$646,218,021	20,258
Finance, Insurance, and Real Estate	$1,560,662,370	$441,015,106	$196,964,726	2,204
Business Services	$573,149,172	$342,533,282	$279,419,383	3,497
Health Services	$337,011,879	$235,772,143	$199,347,530	3,387
Other Services	$662,722,782	$330,134,411	$266,763,252	6,631
TOTAL	**$13,640,523,674**	**$6,042,317,323**	**$4,043,892,480**	**70,653**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Impact of Constructing New Chemical Manufacturing Facilities to Accommodate the Incremental Ethane Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$120,413,982	$33,804,468	$22,366,608	363
Mining	$130,216,386	$31,899,192	$18,194,313	121
Construction	$2,727,221,652	$1,169,711,381	$963,915,029	13,928
Nondurable Manufacturing	$778,301,249	$216,012,767	$112,464,774	1,900
Durable Manufacturing	$753,094,392	$284,842,865	$186,635,132	2,808
Transportation and Utilities	$670,721,769	$300,801,324	$182,387,741	2,250
Information	$160,527,441	$98,652,721	$42,548,927	412
Wholesale Trade	$348,978,146	$236,170,262	$136,177,877	1,591
Retail Trade	$1,067,333,471	$804,745,568	$468,528,533	14,667
Finance, Insurance, and Real Estate	$1,144,690,613	$315,954,125	$138,969,252	1,555
Business Services	$414,931,020	$247,976,777	$202,285,505	2,531
Health Services	$248,132,750	$173,592,665	$146,774,205	2,494
Other Services	$464,067,863	$232,646,888	$187,402,866	4,649
TOTAL	**$9,028,630,731**	**$4,146,810,999**	**$2,808,650,759**	**49,269**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Impact of Constructing New Chemical Manufacturing Facilities to Accommodate the Incremental Ethane Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Person-Years)*
Agriculture	$75,945,888	$21,280,986	$14,087,582	228
Mining	$1,164,083	$397,602	$219,934	2
Construction	$1,792,856,812	$766,445,193	$631,598,575	9,126
Nondurable Manufacturing	$279,366,495	$93,658,786	$49,541,071	962
Durable Manufacturing	$285,629,887	$112,071,210	$69,781,514	1,088
Transportation and Utilities	$328,918,187	$170,540,374	$107,355,662	1,404
Information	$63,082,750	$38,731,535	$16,802,637	167
Wholesale Trade	$162,012,843	$109,642,118	$63,220,619	739
Retail Trade	$649,896,426	$489,923,967	$285,221,065	8,931
Finance, Insurance, and Real Estate	$588,825,760	$143,158,899	$59,472,422	651
Business Services	$142,629,562	$84,859,791	$69,223,846	866
Health Services	$153,560,627	$107,310,121	$90,731,701	1,542
Other Services	$286,224,034	$142,893,610	$115,297,379	2,888
TOTAL	**$4,810,113,355**	**$2,280,914,192**	**$1,572,554,009**	**28,595**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

New Chemical Manufacturing Facilities Operations

The Potential Annual Impact of New Chemical Manufacturing Operations (at Maturity) to Accommodate the Incremental Ethane Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in the United States

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Permanent Jobs)*
Agriculture	$252,225,651	$75,208,887	$49,108,644	795
Mining	$6,628,490,145	$1,458,702,666	$680,162,790	3,628
Construction	$857,715,837	$467,935,168	$385,607,742	5,572
Nondurable Manufacturing	$18,633,033,984	$1,843,296,873	$895,551,000	9,357
Durable Manufacturing	$759,495,409	$293,988,141	$193,136,765	2,761
Transportation and Utilities	$2,612,297,597	$832,992,046	$480,177,060	5,421
Information	$379,785,540	$234,596,462	$101,024,281	970
Wholesale Trade	$806,598,633	$545,208,432	$314,372,040	3,672
Retail Trade	$2,113,379,921	$1,569,378,834	$910,062,883	29,074
Finance, Insurance, and Real Estate	$2,856,413,300	$878,492,941	$304,371,772	3,169
Business Services	$785,601,176	$460,492,671	$375,644,014	4,701
Health Services	$476,840,078	$334,119,241	$282,500,918	4,799
Other Services	$913,683,695	$465,364,335	$374,528,448	9,238
TOTAL	**$38,075,560,965**	**$9,459,776,696**	**$5,346,248,355**	**83,155**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Annual Impact of New Chemical Manufacturing Operations (at Maturity) to Accommodate the Incremental Ethane Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Texas

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Permanent Jobs)*
Agriculture	$220,563,674	$65,767,888	$42,944,018	695
Mining	$5,796,413,401	$1,275,591,198	$594,781,711	3,172
Construction	$750,046,460	$409,195,099	$337,202,264	4,873
Nondurable Manufacturing	$18,199,232,737	$1,768,307,806	$856,571,347	8,743
Durable Manufacturing	$664,155,678	$257,083,704	$168,892,238	2,414
Transportation and Utilities	$2,284,374,943	$728,426,255	$419,900,261	4,740
Information	$332,110,925	$205,147,484	$88,342,667	848
Wholesale Trade	$705,346,017	$476,768,222	$274,908,806	3,211
Retail Trade	$1,848,086,582	$1,372,374,147	$795,822,363	25,424
Finance, Insurance, and Real Estate	$2,497,846,714	$768,215,407	$266,163,874	2,771
Business Services	$686,984,379	$402,686,861	$328,489,287	4,111
Health Services	$416,982,172	$292,177,133	$247,038,476	4,196
Other Services	$798,988,653	$406,946,983	$327,513,757	8,079
TOTAL	**$35,201,132,336**	**$8,428,688,186**	**$4,748,571,069**	**73,277**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

The Potential Annual Impact of New Chemical Manufacturing Operations (at Maturity) to Accommodate the Incremental Ethane Production Associated with the Implementation of the Proposed Rio Grande Liquefied Natural Gas (LNG) Project (Trains 1-6) on Business Activity in Cameron County

Sector	Total Expenditures	Real Gross Product	Personal Income	Employment
	(2015 Dollars)	*(2015 Dollars)*	*(2015 Dollars)*	*(Permanent Jobs)*
Agriculture	$205,471,282	$61,443,999	$40,095,455	649
Mining	$46,256,993	$10,402,245	$4,898,269	29
Construction	$560,325,007	$306,205,179	$252,332,139	3,646
Nondurable Manufacturing	$2,368,282,024	$414,195,456	$213,827,420	3,439
Durable Manufacturing	$377,676,646	$147,473,112	$92,919,776	1,349
Transportation and Utilities	$1,577,362,739	$568,614,962	$346,067,255	4,297
Information	$188,413,197	$116,219,415	$50,303,313	495
Wholesale Trade	$488,636,748	$330,272,164	$190,437,878	2,225
Retail Trade	$1,638,723,137	$1,214,699,887	$704,054,126	22,547
Finance, Insurance, and Real Estate	$1,942,954,987	$566,947,584	$184,826,044	1,880
Business Services	$349,068,461	$203,588,960	$166,076,418	2,079
Health Services	$376,019,099	$263,118,224	$222,468,875	3,780
Other Services	$718,452,019	$364,736,788	$294,182,925	7,344
TOTAL	**$10,837,642,341**	**$4,567,917,977**	**$2,762,489,895**	**53,758**

Source: US Multi-Regional Impact Assessment System, The Perryman Group

Appendix D: Detailed Forecast Results

Definition of Terms

Compound Annual Growth Rates (CAGR): A *CAGR* differs from a simple growth rate in that it reflects changes in the size of the base used to calculate growth. The idea of compounding is routine in calculating interest; interest for the current period is calculated on the principle plus previously accrued interest.

Nominal and Real Values: *Real* variables are adjusted for the effects of inflation; *nominal* values are not. Real variables are expressed in terms of dollars (or rates such as interest rates) at a particular point in time (2009 at present); therefore, the pattern in real variables over time removes distortions caused by changes in the value of the dollar (inflation).

Gross Area Product, Real Gross Area Product (RGP): *Gross area product*, often referred to as output, is the final value of all goods and services produced in an economy during a given period of time. RGP is gross area product adjusted for inflation.

Personal Income (by place of residence): *Personal income* is the total income accruing to households. "By place of residence" denotes where the income-earner resides rather than works. *Real personal income* is expressed on an inflation-adjusted basis.

Personal Income (by place of work): *Personal income* is total earnings expressed at the location where the earnings occur.

Wage and Salary Employment: *Wage and salary employment* is a measure of the number of persons in the workforce excluding proprietors, but including agricultural workers and military personnel.

Population: *Population* is the total number of persons residing in a specific area.

Real Retail Sales: *Retail sales* is the total volume of retail goods sold. It is expressed on an inflation-adjusted basis.

Definition of Sectors

Mining: This sector is composed of companies primarily involved in the extraction of minerals occurring naturally. Mining includes quarrying, oil and gas well operations, milling, and other activities which are a part of mining activity. In Texas, this sector is largely oil and gas related.

Construction: Companies in this sector are primarily engaged in construction activities including new work, additions, alterations, and repairs. Construction includes buildings, water systems, highways, utility plants, and other related projects.

Trade: Trade establishments are involved in wholesale and retail trade—selling items and rendering services incidental to the sale of goods. Examples include wholesale distributors, food stores, and clothing stores.

FIRE (Finance, Insurance, and Real Estate): This sector includes companies in the fields of finance, insurance, and real estate such as depository institutions, credit institutions, holding companies, insurance carriers, insurance agents, real estate buyers, real estate sellers, real estate agents, and real estate developers.

Nondurable Manufacturing: These companies are engaged in the mechanical or chemical transformation of materials or substances into items consumed in a short time period such as paper, bread, chemicals, and clothing.

Durable Manufacturing: Companies in this sector are primarily engaged in the mechanical or chemical transformation of materials or substances into goods typically consumed over a period of several years such as automobiles, washing machines, industrial machinery, and computers.

Services: This sector includes companies providing services to individuals, businesses, or government entities. Examples include medical services, business services (excluding finance, insurance, and real estate), hotels, and amusements.

Government: All government establishments involved in public administration including the executive, legislative, judicial, administrative, and regulatory activities of Federal, state, local, and international governments are included in this sector. Military activity is also included.

Transportation, Warehousing, and Utilities: Companies in this sector are engaged in transportation, warehousing, electric, water, and sanitary services (including all establishments of the US Postal Service).

Agriculture: These establishments are engaged in farming, ranching, commercial fishing, forestry, hunting and trapping, and related services.

Information: This sector includes those establishments that create, disseminate, or provide the means to distribute information. It also includes establishments that provide data processing services. Industries included in this new sector are newspaper, book, and periodical publishers, previously included in the manufacturing sector in the SIC; software publishers, previously included in services; broadcasting and telecommunications producers and distributors, previously included with utilities and transportation; and motion picture and sound recording industries, information services, and data processing services, previously included in services.

Historical and Projected Values of Key Economic Indicators for the Brownsville-Harlingen MSA

Year	Gross Area Product	Real Gross Area Product	Personal Income (residence)	Real Personal Income (residence)	Personal Income (work)	Real Personal Income (work)	Total Employment	Wage and Salary Employment	Population	Gross Product Deflator	Texas Consumer Price Index	Industrial Production Index	Labor Productivity	Retail Sales	Real Retail Sales	Housing Permits
2001	$5,199.882	$6,390.614	$5,553.017	$6,536.871	$3,747.441	$4,411.392	143.311	119.527	342.368	81.37	84.95	105.29	$53,466	$2,914.285	$3,430.622	3,094
2002	$5,462.160	$6,604.086	$5,976.432	$6,936.022	$4,040.089	$4,688.775	148.385	123.418	350.194	82.71	86.17	100.96	$53,510	$2,658.273	$3,085.092	3,917
2003	$5,715.057	$6,769.195	$6,330.146	$7,200.109	$4,233.484	$4,815.299	149.493	123.493	358.492	84.43	87.92	90.85	$54,814	$2,682.826	$3,051.532	3,452
2004	$5,965.652	$6,865.581	$6,557.394	$7,352.722	$4,411.434	$4,946.485	153.074	125.087	366.299	86.89	89.18	90.87	$54,886	$2,824.557	$3,167.139	3,592
2005	$6,278.269	$7,022.264	$6,948.404	$7,543.777	$4,528.570	$4,916.600	155.546	125.582	373.429	89.41	92.11	94.64	$55,918	$3,050.428	$3,311.803	3,694
2006	$6,736.889	$7,310.506	$7,472.934	$7,884.784	$4,894.035	$5,163.756	162.580	130.769	380.169	92.15	94.78	104.17	$55,904	$3,294.733	$3,476.313	3,402
2007	$7,125.735	$7,458.375	$7,981.926	$8,276.077	$5,088.294	$5,275.809	167.522	133.334	386.306	95.54	96.45	107.96	$55,938	$3,517.406	$3,647.030	2,091
2008	$7,442.963	$7,624.893	$8,576.794	$8,528.283	$5,264.499	$5,234.723	170.768	135.105	393.000	97.61	100.57	115.16	$56,437	$3,519.189	$3,499.284	1,306
2009	$7,603.130	$7,603.130	$8,795.285	$8,795.285	$5,339.379	$5,339.379	171.161	133.575	400.303	100.00	100.00	100.00	$56,920	$3,314.858	$3,314.858	1,105
2010	$7,901.115	$7,783.449	$9,302.916	$9,250.516	$5,579.276	$5,547.850	172.221	134.671	407.656	101.51	100.57	108.33	$57,796	$3,477.054	$3,457.469	1,258
2011	$8,045.940	$7,783.414	$9,656.499	$9,305.374	$5,764.753	$5,555.138	178.773	136.598	412.577	103.37	103.77	115.09	$56,980	$3,822.888	$3,683.882	1,136
2012	$8,427.695	$7,979.467	$9,935.722	$9,387.183	$6,023.771	$5,691.206	182.851	139.700	415.557	105.62	105.84	124.73	$57,119	$3,971.504	$3,752.242	1,154
2013	$8,877.428	$8,193.633	$10,399.491	$9,682.827	$6,311.599	$5,876.645	187.319	142.632	422.411	108.35	107.40	122.04	$57,446	$4,019.316	$3,742.331	1,263
2014	$9,493.371	$8,523.622	$10,979.715	$10,035.939	$6,679.110	$6,104.998	192.037	146.195	429.694	111.38	109.40	123.73	$58,303	$4,303.579	$3,933.659	1,217
2015	$10,073.259	$8,798.653	$11,622.732	$10,467.893	$6,967.940	$6,275.603	194.379	148.493	432.602	114.49	111.03	127.35	$59,253	$4,554.098	$4,101.601	1,002
2016	$10,749.462	$9,137.470	$12,399.021	$10,981.180	$7,386.735	$6,542.054	197.931	151.771	438.759	117.64	112.91	132.56	$60,206	$4,856.663	$4,301.298	1,166
2017	$11,460.945	$9,483.006	$13,244.022	$11,515.612	$7,854.990	$6,829.875	201.412	155.034	445.330	120.86	115.01	137.86	$61,167	$5,185.943	$4,509.152	1,209
2018	$12,211.880	$9,836.999	$14,156.393	$12,041.623	$8,369.075	$7,118.851	204.877	158.315	452.088	124.14	117.56	143.14	$62,136	$5,541.391	$4,713.584	1,249
2019	$13,000.556	$10,196.939	$15,124.612	$12,573.951	$8,913.443	$7,410.252	208.286	161.575	458.926	127.49	120.29	148.53	$63,110	$5,918.474	$4,920.364	1,290
2020	$13,828.279	$10,562.835	$16,131.547	$13,109.178	$9,466.122	$7,692.571	211.619	164.789	465.510	130.91	123.06	154.13	$64,099	$6,310.470	$5,128.155	1,308
2021	$14,698.587	$10,936.312	$17,196.138	$13,660.964	$10,047.620	$7,982.035	214.938	168.005	472.162	134.40	125.88	159.86	$65,095	$6,724.776	$5,342.299	1,295
2022	$15,612.760	$11,317.162	$18,320.994	$14,229.496	$10,659.065	$8,278.651	218.239	171.220	478.883	137.96	128.75	165.73	$66,097	$7,162.391	$5,562.865	1,289
2023	$16,572.027	$11,705.149	$19,508.792	$14,814.943	$11,301.596	$8,582.413	221.517	174.429	485.672	141.58	131.68	171.74	$67,105	$7,624.342	$5,789.912	1,283
2024	$17,577.608	$12,100.035	$20,762.277	$15,417.459	$11,976.371	$8,893.303	224.767	177.631	492.529	145.27	134.67	177.88	$68,119	$8,111.681	$6,023.497	1,278
2025	$18,630.637	$12,501.536	$22,084.261	$16,037.178	$12,684.567	$9,211.295	227.984	180.820	499.455	149.03	137.71	184.16	$69,138	$8,625.486	$6,263.667	1,273
2026	$19,732.230	$12,909.375	$23,477.622	$16,674.219	$13,427.371	$9,536.355	231.163	183.993	506.450	152.85	140.80	190.57	$70,162	$9,166.858	$6,510.463	1,269
2027	$20,883.414	$13,323.232	$24,945.295	$17,328.678	$14,205.983	$9,868.430	234.301	187.146	513.514	156.74	143.95	197.12	$71,192	$9,736.920	$6,763.919	1,264
2028	$22,085.197	$13,742.802	$26,490.280	$18,000.634	$15,021.615	$10,207.464	237.391	190.277	520.647	160.70	147.16	203.79	$72,225	$10,336.820	$7,024.060	1,259
2029	$23,338.418	$14,167.701	$28,115.630	$18,690.142	$15,875.485	$10,553.385	240.431	193.379	527.848	164.73	150.43	210.59	$73,264	$10,967.724	$7,290.902	1,254
2030	$24,643.906	$14,597.572	$29,824.451	$19,397.234	$16,768.816	$10,906.107	243.414	196.451	535.118	168.82	153.76	217.52	$74,306	$11,630.819	$7,564.455	1,249
2031	$26,002.282	$15,031.969	$31,619.898	$20,121.923	$17,702.838	$11,265.537	246.336	199.488	542.457	172.98	157.14	224.57	$75,353	$12,327.309	$7,844.717	1,243
2032	$27,414.030	$15,470.418	$33,505.168	$20,864.191	$18,678.773	$11,631.563	249.193	202.485	549.866	177.20	160.59	231.75	$76,403	$13,058.414	$8,131.678	1,238
2033	$28,879.627	$15,912.485	$35,483.504	$21,624.000	$19,697.850	$12,004.065	251.981	205.439	557.342	181.49	164.09	239.04	$77,456	$13,825.371	$8,425.318	1,232
2034	$30,399.438	$16,357.722	$37,558.186	$22,401.288	$20,761.293	$12,382.912	254.696	208.347	564.888	185.84	167.66	246.46	$78,512	$14,629.428	$8,725.609	1,226
2035	$31,973.697	$16,805.660	$39,732.513	$23,195.959	$21,870.311	$12,767.953	257.332	211.203	572.503	190.26	171.29	253.99	$79,571	$15,471.843	$9,032.508	1,219
2036	$33,602.517	$17,255.818	$42,009.813	$24,007.893	$23,026.102	$13,159.025	259.886	214.004	580.186	194.73	174.98	261.64	$80,633	$16,353.881	$9,345.964	1,213
2037	$35,285.888	$17,707.707	$44,393.440	$24,836.943	$24,229.857	$13,555.957	262.354	216.745	587.938	199.27	178.74	269.40	$81,698	$17,276.818	$9,665.918	1,206
2038	$37,023.650	$18,160.820	$46,886.745	$25,682.929	$25,482.736	$13,958.557	264.732	219.424	595.758	203.87	182.56	277.28	$82,766	$18,241.926	$9,992.293	1,199
2039	$38,815.513	$18,614.649	$49,493.093	$26,545.643	$26,785.886	$14,366.622	267.016	222.036	603.647	208.52	186.45	285.27	$83,836	$19,250.482	$10,325.005	1,192
2040	$40,661.038	$19,068.675	$52,215.839	$27,424.843	$28,140.422	$14,779.934	269.202	224.577	611.605	213.23	190.40	293.37	$84,909	$20,303.760	$10,663.957	1,185

Historical and Projected Values of Per Capita Key Economic Indicators for Brownsville-Harlingen MSA

Year	Per Capita Gross Area Product	Per Capita Real Gross Area Product	Per Capita Personal Income (by residence)	Per Capita Real Personal Income (by residence)	Per Capita Retail Sales	Per Capita Real Retail Sales
2001	$15.188	$18.666	$16.219	$19.093	$8.512	$10.020
2002	$15.598	$18.858	$17.066	$19.806	$7.591	$8.810
2003	$15.942	$18.882	$17.658	$20.084	$7.484	$8.512
2004	$16.286	$18.743	$17.902	$20.073	$7.711	$8.646
2005	$16.812	$18.805	$18.607	$20.201	$8.169	$8.869
2006	$17.721	$19.230	$19.657	$20.740	$8.666	$9.144
2007	$18.446	$19.307	$20.662	$21.424	$9.105	$9.441
2008	$18.939	$19.402	$21.824	$21.700	$8.955	$8.904
2009	$18.993	$18.993	$21.972	$21.972	$8.281	$8.281
2010	$19.382	$19.093	$22.821	$22.692	$8.529	$8.481
2011	$19.502	$18.865	$23.405	$22.554	$9.266	$8.929
2012	$20.280	$19.202	$23.909	$22.589	$9.557	$9.029
2013	$21.016	$19.397	$24.619	$22.923	$9.515	$8.859
2014	$22.093	$19.837	$25.552	$23.356	$10.015	$9.155
2015	$23.285	$20.339	$26.867	$24.198	$10.527	$9.481
2016	$24.500	$20.826	$28.259	$25.028	$11.069	$9.803
2017	$25.736	$21.294	$29.740	$25.859	$11.645	$10.125
2018	$27.012	$21.759	$31.313	$26.636	$12.257	$10.426
2019	$28.328	$22.219	$32.957	$27.399	$12.896	$10.721
2020	$29.706	$22.691	$34.654	$28.161	$13.556	$11.016
2021	$31.130	$23.162	$36.420	$28.933	$14.243	$11.315
2022	$32.602	$23.632	$38.258	$29.714	$14.956	$11.616
2023	$34.122	$24.101	$40.169	$30.504	$15.699	$11.921
2024	$35.688	$24.567	$42.154	$31.303	$16.469	$12.230
2025	$37.302	$25.030	$44.217	$32.109	$17.270	$12.541
2026	$38.962	$25.490	$46.357	$32.924	$18.100	$12.855
2027	$40.668	$25.945	$48.578	$33.745	$18.961	$13.172
2028	$42.419	$26.396	$50.880	$34.574	$19.854	$13.491
2029	$44.214	$26.840	$53.265	$35.408	$20.778	$13.813
2030	$46.053	$27.279	$55.734	$36.249	$21.735	$14.136
2031	$47.934	$27.711	$58.290	$37.094	$22.725	$14.461
2032	$49.856	$28.135	$60.933	$37.944	$23.748	$14.788
2033	$51.817	$28.551	$63.666	$38.798	$24.806	$15.117
2034	$53.815	$28.957	$66.488	$39.656	$25.898	$15.447
2035	$55.849	$29.355	$69.401	$40.517	$27.025	$15.777
2036	$57.917	$29.742	$72.408	$41.380	$28.187	$16.109
2037	$60.016	$30.118	$75.507	$42.244	$29.385	$16.440
2038	$62.145	$30.484	$78.701	$43.110	$30.620	$16.772
2039	$64.302	$30.837	$81.990	$43.975	$31.890	$17.104
2040	$66.483	$31.178	$85.375	$44.841	$33.197	$17.436

Historical and Projected Values of Nominal Gross Product
by Major Industrial Classification for Brownsville-Harlingen MSA

Year	Agriculture	Mining	Construction	Total Manufacturing	Durable Manufacturing	Nondurable Manufacturing	Trade	Transportation, Warehousing & Utilities	Information	Finance, Insurance & Real Estate	Services	Government	Total All Industries
2001	$122.745	$1.911	$177.750	$636.333	$342.350	$293.983	$730.543	$284.742	$128.351	$540.978	$1,341.821	$1,234.709	$5,199.882
2002	$118.693	$1.387	$214.654	$626.400	$375.296	$251.104	$769.107	$259.229	$133.838	$422.649	$1,596.782	$1,319.422	$5,462.160
2003	$170.001	$2.319	$238.568	$523.832	$332.633	$191.199	$817.890	$260.068	$143.090	$465.775	$1,701.039	$1,392.474	$5,715.057
2004	$173.341	$4.930	$281.991	$491.381	$322.469	$168.911	$848.377	$276.810	$155.413	$473.092	$1,813.736	$1,446.582	$5,965.652
2005	$156.778	$8.171	$298.284	$500.670	$340.951	$159.719	$883.899	$308.804	$149.164	$589.136	$1,856.407	$1,526.956	$6,278.269
2006	$172.485	$10.726	$358.831	$557.667	$381.567	$176.099	$933.697	$340.843	$161.728	$625.614	$1,977.821	$1,597.475	$6,736.889
2007	$171.694	$10.868	$334.933	$601.495	$425.315	$176.180	$978.551	$344.622	$172.682	$739.636	$2,058.931	$1,712.323	$7,125.735
2008	$146.904	$13.221	$280.230	$646.597	$429.233	$217.365	$1,012.077	$392.011	$205.304	$777.762	$2,151.919	$1,816.938	$7,442.963
2009	$151.752	$8.921	$257.046	$583.600	$351.266	$232.334	$1,017.775	$374.374	$234.011	$808.053	$2,230.422	$1,937.177	$7,603.130
2010	$165.465	$9.848	$242.141	$592.327	$345.421	$246.906	$1,080.535	$434.448	$232.525	$790.469	$2,291.960	$2,061.397	$7,901.115
2011	$168.043	$14.068	$244.973	$650.294	$366.185	$284.109	$1,133.228	$464.532	$225.499	$696.538	$2,356.917	$2,091.848	$8,045.940
2012	$186.688	$17.367	$284.065	$738.044	$441.971	$296.073	$1,206.880	$509.778	$213.402	$670.845	$2,493.536	$2,107.089	$8,427.695
2013	$172.839	$22.625	$309.906	$732.289	$438.552	$293.736	$1,300.189	$507.177	$169.870	$701.764	$2,734.105	$2,226.666	$8,877.428
2014	$181.995	$26.679	$342.121	$752.787	$449.808	$302.979	$1,351.658	$523.230	$175.895	$775.076	$2,998.246	$2,365.684	$9,493.371
2015	$190.635	$27.676	$355.379	$787.386	$465.839	$321.547	$1,428.402	$549.756	$184.956	$819.679	$3,232.100	$2,497.291	$10,073.259
2016	$199.756	$29.976	$374.035	$834.856	$493.136	$341.720	$1,520.723	$579.924	$195.247	$866.708	$3,505.859	$2,642.377	$10,749.462
2017	$208.382	$33.504	$394.879	$884.281	$522.811	$361.470	$1,615.428	$609.944	$205.876	$916.070	$3,798.166	$2,794.415	$11,460.945
2018	$217.538	$38.206	$420.375	$934.309	$552.143	$382.166	$1,712.978	$640.328	$216.836	$967.844	$4,109.828	$2,953.640	$12,211.880
2019	$227.001	$43.437	$446.346	$986.595	$582.585	$404.010	$1,813.299	$671.714	$228.119	$1,022.112	$4,441.644	$3,120.288	$13,000.556
2020	$236.903	$47.771	$471.482	$1,041.133	$613.166	$427.967	$1,912.823	$706.439	$239.376	$1,083.360	$4,793.663	$3,295.329	$13,828.279
2021	$247.134	$52.398	$497.820	$1,098.377	$645.057	$453.320	$2,016.166	$742.385	$250.903	$1,147.769	$5,167.284	$3,478.351	$14,698.587
2022	$257.700	$57.325	$525.386	$1,158.442	$678.295	$480.147	$2,123.362	$779.550	$262.688	$1,215.461	$5,563.248	$3,669.599	$15,612.760
2023	$268.604	$62.553	$554.198	$1,221.443	$712.918	$508.525	$2,234.437	$817.931	$274.714	$1,286.556	$5,982.273	$3,869.319	$16,572.027
2024	$279.854	$68.082	$584.304	$1,287.497	$748.963	$538.534	$2,349.408	$857.520	$286.966	$1,361.179	$6,425.044	$4,077.754	$17,577.608
2025	$291.453	$73.909	$615.723	$1,356.728	$786.470	$570.258	$2,468.283	$898.304	$299.426	$1,439.455	$6,892.206	$4,295.149	$18,630.637
2026	$303.406	$80.029	$648.504	$1,429.263	$825.476	$603.787	$2,591.062	$940.266	$312.076	$1,521.513	$7,384.365	$4,521.746	$19,732.230
2027	$315.718	$86.432	$682.680	$1,505.229	$866.021	$639.208	$2,717.734	$983.385	$324.895	$1,607.480	$7,902.075	$4,757.785	$20,883.414
2028	$328.393	$93.108	$718.330	$1,584.764	$908.145	$676.619	$2,848.277	$1,027.633	$337.862	$1,697.491	$8,445.836	$5,003.503	$22,085.197
2029	$341.434	$100.041	$755.446	$1,668.005	$951.887	$716.118	$2,982.661	$1,072.979	$350.954	$1,791.679	$9,016.084	$5,259.134	$23,338.418
2030	$354.845	$107.214	$794.099	$1,755.096	$997.290	$757.806	$3,120.842	$1,119.383	$364.147	$1,890.179	$9,613.191	$5,524.909	$24,643.906
2031	$368.629	$114.615	$834.228	$1,846.190	$1,044.394	$801.796	$3,262.767	$1,166.803	$377.417	$1,993.130	$10,237.453	$5,801.051	$26,002.282
2032	$382.789	$122.216	$875.761	$1,941.433	$1,093.242	$848.191	$3,408.368	$1,215.187	$390.738	$2,100.672	$10,889.084	$6,087.782	$27,414.030
2033	$397.328	$129.989	$918.718	$2,040.986	$1,143.877	$897.109	$3,557.568	$1,264.481	$404.083	$2,212.945	$11,568.214	$6,385.315	$28,879.627
2034	$412.248	$137.903	$963.111	$2,145.020	$1,196.345	$948.676	$3,710.277	$1,314.623	$417.425	$2,330.096	$12,274.880	$6,693.855	$30,399.438
2035	$427.550	$145.926	$1,008.952	$2,253.701	$1,250.691	$1,003.011	$3,866.390	$1,365.544	$430.736	$2,452.272	$13,009.023	$7,013.602	$31,973.697
2036	$443.237	$154.022	$1,056.250	$2,367.202	$1,306.963	$1,060.239	$4,025.792	$1,417.177	$443.986	$2,579.627	$13,770.477	$7,344.746	$33,602.517
2037	$459.311	$162.154	$1,105.009	$2,485.709	$1,365.211	$1,120.498	$4,188.354	$1,469.447	$457.148	$2,712.316	$14,558.973	$7,687.468	$35,285.888
2038	$475.773	$170.281	$1,155.232	$2,609.401	$1,425.485	$1,183.916	$4,353.934	$1,522.274	$470.191	$2,850.502	$15,374.125	$8,041.937	$37,023.650
2039	$492.624	$178.361	$1,206.917	$2,738.475	$1,487.839	$1,250.636	$4,522.377	$1,575.576	$483.087	$2,994.352	$16,215.431	$8,408.314	$38,815.513
2040	$509.864	$186.350	$1,260.059	$2,873.129	$1,552.330	$1,320.799	$4,693.515	$1,629.264	$495.805	$3,144.038	$17,082.269	$8,786.746	$40,661.038

Historical and Projected Values of Real Gross Product
by Major Industrial Classification for Brownsville-Harlingen MSA

Year	Agriculture	Mining	Construction	Total Manufacturing	Durable Manufacturing	Nondurable Manufacturing	Trade	Transportation, Warehousing & Utilities	Information	Finance, Insurance & Real Estate	Services	Government	Total All Industries
2001	$125.102	$4.414	$274.614	$664.604	$343.758	$320.846	$845.779	$349.040	$113.079	$623.246	$1,715.545	$1,675.191	$6,390.614
2002	$130.261	$3.174	$316.657	$648.189	$376.704	$271.484	$893.318	$324.822	$120.891	$459.822	$1,979.465	$1,727.487	$6,604.086
2003	$169.190	$4.577	$336.279	$557.309	$334.959	$222.350	$956.201	$316.581	$128.713	$492.927	$2,055.320	$1,752.098	$6,769.195
2004	$152.150	$8.794	$369.042	$539.967	$335.541	$204.426	$970.228	$329.861	$141.781	$493.813	$2,127.939	$1,732.005	$6,865.581
2005	$157.157	$10.924	$351.948	$548.621	$358.302	$190.319	$985.038	$355.567	$140.944	$607.756	$2,107.265	$1,757.043	$7,022.264
2006	$178.954	$12.227	$386.799	$618.559	$407.655	$210.904	$1,008.927	$376.407	$156.358	$627.412	$2,178.096	$1,766.768	$7,310.506
2007	$143.052	$11.123	$339.507	$663.395	$457.073	$206.323	$1,030.168	$369.328	$169.779	$735.663	$2,179.005	$1,817.356	$7,458.375
2008	$120.974	$11.424	$284.359	$694.936	$467.351	$227.585	$1,041.228	$407.086	$204.693	$766.675	$2,227.950	$1,865.568	$7,624.893
2009	$151.752	$8.921	$257.046	$583.600	$351.266	$232.334	$1,017.775	$374.374	$234.011	$808.053	$2,230.422	$1,937.177	$7,603.130
2010	$146.939	$8.576	$246.624	$603.331	$357.926	$245.405	$1,066.733	$435.504	$233.821	$784.731	$2,253.137	$2,004.054	$7,783.449
2011	$122.167	$11.218	$246.327	$646.221	$387.756	$258.465	$1,096.142	$455.341	$226.287	$684.773	$2,295.093	$1,999.846	$7,783.414
2012	$133.323	$14.524	$279.268	$702.704	$448.746	$253.957	$1,137.991	$488.802	$212.332	$639.617	$2,379.506	$1,991.401	$7,979.467
2013	$136.943	$16.857	$296.657	$684.770	$440.795	$243.975	$1,198.545	$478.330	$168.038	$653.573	$2,525.016	$2,034.904	$8,193.633
2014	$141.096	$19.137	$318.137	$692.029	$448.605	$243.424	$1,218.425	$485.148	$173.037	$705.147	$2,680.537	$2,090.928	$8,523.622
2015	$144.625	$19.123	$320.417	$711.110	$461.043	$250.067	$1,259.351	$501.099	$180.987	$728.532	$2,798.230	$2,135.180	$8,798.653
2016	$148.305	$19.960	$327.057	$741.705	$484.416	$257.289	$1,311.574	$520.039	$190.091	$752.633	$2,940.197	$2,185.908	$9,137.470
2017	$151.412	$21.507	$334.936	$773.283	$509.786	$263.497	$1,363.193	$538.210	$199.473	$777.287	$3,086.586	$2,237.118	$9,483.006
2018	$154.707	$23.653	$345.955	$804.333	$534.480	$269.852	$1,414.587	$556.014	$209.128	$802.484	$3,237.348	$2,288.789	$9,836.999
2019	$158.019	$25.946	$356.484	$836.227	$559.915	$276.311	$1,465.671	$574.002	$219.053	$828.219	$3,392.423	$2,340.897	$10,196.939
2020	$161.431	$27.542	$365.525	$868.598	$585.152	$283.446	$1,513.602	$594.120	$228.916	$857.968	$3,551.184	$2,393.949	$10,562.835
2021	$164.859	$29.172	$374.720	$902.011	$611.308	$290.702	$1,562.120	$614.503	$239.008	$888.469	$3,714.039	$2,447.412	$10,936.312
2022	$168.301	$30.830	$384.055	$936.489	$638.406	$298.083	$1,611.181	$635.127	$249.319	$919.718	$3,880.880	$2,501.262	$11,317.162
2023	$171.754	$32.513	$393.515	$972.053	$666.466	$305.588	$1,660.739	$655.967	$259.842	$951.712	$4,051.582	$2,555.472	$11,705.149
2024	$175.217	$34.214	$403.101	$1,008.727	$695.508	$313.218	$1,710.747	$676.996	$270.565	$984.448	$4,226.006	$2,610.014	$12,100.035
2025	$178.688	$35.926	$412.799	$1,046.532	$725.556	$320.976	$1,761.154	$698.184	$281.478	$1,017.919	$4,403.997	$2,664.860	$12,501.536
2026	$182.163	$37.643	$422.613	$1,085.493	$756.629	$328.864	$1,811.908	$719.501	$292.569	$1,052.120	$4,585.382	$2,719.982	$12,909.375
2027	$185.641	$39.358	$432.537	$1,125.633	$788.751	$336.882	$1,862.955	$740.915	$303.826	$1,087.045	$4,769.975	$2,775.348	$13,323.232
2028	$189.118	$41.063	$442.593	$1,166.977	$821.942	$345.035	$1,914.238	$762.393	$315.234	$1,122.687	$4,957.572	$2,830.928	$13,742.802
2029	$192.593	$42.750	$452.750	$1,209.550	$856.227	$353.323	$1,965.697	$783.899	$326.780	$1,159.038	$5,147.954	$2,886.690	$14,167.701
2030	$196.063	$44.412	$463.023	$1,253.379	$891.627	$361.752	$2,017.273	$805.396	$338.449	$1,196.091	$5,340.885	$2,942.601	$14,597.572
2031	$199.525	$46.043	$473.352	$1,298.493	$928.168	$370.325	$2,068.902	$826.847	$350.225	$1,233.838	$5,536.115	$2,998.629	$15,031.969
2032	$202.977	$47.635	$483.677	$1,344.919	$965.873	$379.046	$2,120.521	$848.212	$362.091	$1,272.270	$5,733.379	$3,054.739	$15,470.418
2033	$206.415	$49.177	$493.993	$1,392.686	$1,004.768	$387.918	$2,172.064	$869.450	$374.029	$1,311.378	$5,932.397	$3,110.896	$15,912.485
2034	$209.838	$50.663	$504.294	$1,441.830	$1,044.879	$396.951	$2,223.463	$890.519	$386.024	$1,351.154	$6,132.873	$3,167.065	$16,357.722
2035	$213.243	$52.083	$514.571	$1,492.382	$1,086.234	$406.148	$2,274.649	$911.377	$398.055	$1,391.590	$6,334.501	$3,223.209	$16,805.660
2036	$216.626	$53.431	$524.816	$1,544.377	$1,128.862	$415.515	$2,325.554	$931.981	$410.104	$1,432.677	$6,536.959	$3,279.292	$17,255.818
2037	$219.986	$54.698	$535.022	$1,597.856	$1,172.793	$425.063	$2,376.105	$952.288	$422.153	$1,474.409	$6,739.914	$3,335.277	$17,707.707
2038	$223.318	$55.879	$545.179	$1,652.858	$1,218.061	$434.798	$2,426.231	$972.252	$434.180	$1,516.777	$6,943.021	$3,391.126	$18,160.820
2039	$226.621	$56.966	$555.277	$1,709.428	$1,264.698	$444.730	$2,475.859	$991.830	$446.166	$1,559.777	$7,145.925	$3,446.799	$18,614.649
2040	$229.892	$57.953	$565.308	$1,767.611	$1,312.743	$454.868	$2,524.917	$1,010.978	$458.090	$1,603.404	$7,348.261	$3,502.259	$19,068.675

Historical and Projected Values of Employment
by Major Industrial Classification for Brownsville-Harlingen MSA

Year	Agriculture	Mining	Construction	Total Manufacturing	Durable Manufacturing	Nondurable Manufacturing	Trade	Transportation, Warehousing & Utilities	Information	Finance, Insurance & Real Estate	Services	Government	Total All Industries
2001	1.880	.021	4.444	11.514	5.795	5.719	18.637	4.551	1.524	4.204	45.489	27.263	119.527
2002	1.706	.017	4.318	10.427	5.571	4.856	18.934	4.316	1.490	4.297	50.839	27.074	123.418
2003	1.687	.012	4.220	9.147	5.277	3.870	18.923	4.219	1.434	4.482	52.185	27.184	123.493
2004	1.666	.028	4.867	7.722	5.014	2.708	19.235	4.343	1.384	4.605	53.723	27.514	125.087
2005	1.717	.041	4.570	7.297	4.792	2.505	19.453	4.337	1.265	4.676	54.350	27.876	125.582
2006	1.692	.047	4.848	7.914	5.552	2.362	20.179	4.739	1.366	4.828	56.405	28.751	130.769
2007	1.724	.056	4.596	7.581	5.315	2.266	20.369	5.108	1.427	4.967	58.441	29.065	133.334
2008	1.667	.054	4.458	7.355	5.331	2.024	20.612	4.844	1.857	5.214	59.254	29.790	135.105
2009	1.822	.044	3.864	6.353	4.509	1.844	19.744	4.492	2.113	5.197	59.187	30.759	133.575
2010	1.778	.041	3.324	5.626	3.856	1.770	19.473	4.882	2.019	5.304	60.267	31.957	134.671
2011	1.788	.063	2.993	5.474	3.680	1.794	20.270	5.058	1.919	5.606	61.647	31.780	136.598
2012	1.771	.074	3.525	5.866	4.115	1.751	21.042	4.960	1.499	5.650	63.894	31.419	139.700
2013	1.792	.082	3.693	5.568	3.911	1.657	21.661	4.744	1.178	5.650	66.535	31.730	142.632
2014	1.811	.089	3.911	5.450	3.827	1.623	21.537	4.710	1.197	5.973	69.317	32.200	146.195
2015	1.823	.085	3.889	5.395	3.762	1.633	21.786	4.751	1.214	6.043	71.036	32.470	148.493
2016	1.836	.085	3.917	5.432	3.787	1.645	22.214	4.812	1.237	6.114	73.292	32.831	151.771
2017	1.841	.089	3.959	5.470	3.824	1.647	22.611	4.861	1.261	6.183	75.569	33.190	155.034
2018	1.848	.095	4.036	5.499	3.853	1.646	22.985	4.905	1.283	6.251	77.865	33.548	158.315
2019	1.854	.101	4.104	5.526	3.882	1.644	23.338	4.948	1.306	6.318	80.177	33.904	161.575
2020	1.861	.104	4.153	5.548	3.902	1.646	23.625	5.006	1.327	6.409	82.490	34.266	164.789
2021	1.868	.107	4.203	5.569	3.922	1.647	23.907	5.064	1.348	6.500	84.814	34.625	168.005
2022	1.874	.110	4.252	5.590	3.941	1.649	24.186	5.122	1.368	6.590	87.145	34.983	171.220
2023	1.880	.114	4.301	5.609	3.960	1.650	24.460	5.179	1.388	6.679	89.481	35.338	174.429
2024	1.886	.117	4.351	5.629	3.978	1.650	24.729	5.236	1.408	6.767	91.818	35.691	177.631
2025	1.891	.120	4.400	5.647	3.996	1.651	24.993	5.292	1.427	6.854	94.154	36.042	180.820
2026	1.895	.123	4.449	5.665	4.014	1.651	25.252	5.348	1.446	6.940	96.485	36.390	183.993
2027	1.899	.127	4.498	5.682	4.031	1.651	25.505	5.403	1.465	7.025	98.808	36.735	187.146
2028	1.903	.130	4.546	5.698	4.047	1.651	25.753	5.457	1.483	7.109	101.119	37.078	190.277
2029	1.906	.133	4.595	5.714	4.064	1.650	25.995	5.511	1.501	7.191	103.416	37.417	193.379
2030	1.909	.137	4.643	5.729	4.079	1.650	26.231	5.564	1.518	7.272	105.695	37.753	196.451
2031	1.912	.140	4.691	5.743	4.095	1.649	26.460	5.616	1.535	7.352	107.952	38.086	199.488
2032	1.914	.144	4.739	5.757	4.109	1.648	26.683	5.668	1.551	7.430	110.184	38.416	202.485
2033	1.915	.147	4.787	5.770	4.123	1.646	26.900	5.718	1.567	7.507	112.387	38.741	205.439
2034	1.916	.150	4.835	5.782	4.137	1.644	27.109	5.768	1.583	7.582	114.558	39.063	208.347
2035	1.917	.153	4.882	5.793	4.150	1.643	27.311	5.817	1.598	7.656	116.694	39.382	211.203
2036	1.917	.157	4.929	5.803	4.163	1.640	27.506	5.865	1.612	7.727	118.790	39.696	214.004
2037	1.917	.160	4.975	5.813	4.175	1.638	27.694	5.913	1.626	7.797	120.844	40.006	216.745
2038	1.916	.163	5.022	5.822	4.187	1.635	27.874	5.959	1.639	7.866	122.851	40.312	219.424
2039	1.915	.166	5.068	5.830	4.198	1.632	28.046	6.005	1.652	7.932	124.809	40.613	222.036
2040	1.914	.169	5.113	5.838	4.209	1.629	28.210	6.049	1.664	7.996	126.713	40.910	224.577

APPENDIX F

DELOITTE RIO GRANDE LNG EXPORT REPORT

World Gas Model

Global Natural Gas and LNG Market Analysis

December 2015

Report Provided to NextDecade, LLC

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Executive Summary

Deloitte MarketPoint LLC (DMP) was retained by NextDecade, LLC to perform a long-term (up to year 2045) fundamentals-based market study on the potential impact of LNG exports from Rio Grande LNG, LLC's (a NextDecade subsidiary) proposed Rio Grande LNG (RGLNG) export facility in Brownsville, TX on the US natural gas market. DMP modelled three scenarios to test the impact this facility could have on regional gas prices in the US. Analysis indicates that the start-up of the RGLNG export facility will likely have minimal long term impacts on regional prices. Overall, the large amount of shale gas resources available to be produced in the US at relatively low costs keeps prices from rising significantly even with incremental volumes being exported by pipelines and LNG tankers.

In this study, we utilized DMP's World Gas Model (WGM). The WGM carefully simulates supply and demand behavior by building an economic model of the full supply chain for the global gas market using proprietary MarketBuilder software.

DMP utilized its WGM, along with EIA's domestic demand forecasts for the US, to develop its WGM Fall 2015 Reference Case which shows Henry Hub forward prices rising from $4.32/MMBtu in 2020 to $5.23/MMBtu in 2025, and $8.83/MMBtu in 2045 (in 2015$/MMBtu), assuming 74 metric tons per annum (mtpa) of liquefaction capacity is added at Sabine Pass, Cameron LNG, Freeport, Corpus Christi, and Cove Point. A Base Case was then created that included the addition of the 27-mtpa RGLNG terminal and another 13 mtpa terminal in the Houston/Beaumont region of the Gulf of Mexico. Natural gas markets are not negatively impacted by the additional volumes of LNG exports assumed in the Base Case. In this case, Henry Hub prices increased only slightly to $4.37/MMBtu in 2020 and $5.34/MMBtu in 2025 but decreased slightly to $8.80/MMBtu in 2045 compared to the Reference Case prices.

When analyzing the price impact of LNG exports, it is crucial to test the impact on regional prices as well. The closest regional hub to the RGLNG facility is the Agua Dulce Hub. In the Base Case, the spread between price at Agua Dulce and Henry Hub is expected to widen from about $0.10/MMBtu today to $0.28/MMBtu in 2020 and $0.29/MMBtu in 2025 as LNG exports begin, but then narrow back to just $0.16/MMBtu in 2045. Compared to the Reference Case, the spread between the HH and Agua Dulce stays at about $0.03/MMBtu in 2025 and reaches the same basis as in the base case to $0.15/MMBtu in 2045. Competing demand for gas exports to Mexico and LNG exports at Brownsville raises the spread in the Base case in 2025 when the planned LNG terminals are in full operation. Over time the spread at Agua Dulce is not impacted further by the RGLNG facility.

Two scenarios were also analyzed to illustrate the impact of LNG exports under different market environments. While these scenarios show larger impacts on the price of natural gas relative to the Base Case, they still do not show substantial impacts on the price of gas at Henry Hub. In the High Mexico Exports Case, we assumed higher natural gas demand from Mexico leading to higher demand for natural gas exports into Mexico from South Texas. In this case, the Henry Hub price rises $0.09/MMBtu and $0.13/MMBtu above the Base Case by 2025 and 2045, respectively. Regionally, the Agua Dulce Hub, near the RGLNG export terminal is also connected to several pipelines that deliver gas into Mexico. Consequently, Agua Dulce Hub prices rise higher than other neighboring market hubs in the GOM analyzed in our High Mexico Exports Case, reaching $0.33/MMBtu above the Base Case in 2021 as the terminal begins to come online but falling to just $0.15/MMBtu by 2026 and remains at this level until 2045. The impact on basis prices near other LNG export facilities was much smaller, with prices at Katy

and Corpus Christi Hubs peaking $0.16/MMBtu above the Base Case in 2036 and dropping off to about $0.13/MMBtu and $0.11/MMBtu in 2045, respectively.

In the High Renewables Case, we assumed more moderate growth in both the power and industrial sectors in North America post-2020. In addition, we assumed that total LNG export capacity from the Gulf of Mexico (GOM) is not fully utilized. The RGLNG terminal is assumed to be built as in the Base Case. In this case, Henry Hub prices fall below Base Case prices, reaching a discount of $0.18/MMBtu in 2020, $0.35/MMBtu in 2025, and $1.05/MMBtu in 2045. Regionally, prices at Agua Dulce Hub fall further below the Base Case overtime with relatively lower domestic demand. Prices fall $0.13/MMBtu below the Base Case in 2020, $0.12/MMBtu in 2025, and $1.01/MMBtu in 2045.

This study also examined the impact that the RGLNG export terminal could have on prices in the Northeast US. Natural gas production from the Marcellus and Utica shale plays in Pennsylvania, Ohio, and West Virginia has increased more than four-fold in the past five years. As a result, many pipelines are being constructed, expanded, and reversed in order to transport natural gas from the Marcellus and Utica to demand markets. At the same time, demand along the Gulf of Mexico is expected to rise due in part to LNG exports. Consequently, prices in the Northeast are expected to fall relative to prices near the Gulf of Mexico. In the three cases, basis prices at Tetco M3 are at a premium to Henry Hub through 2020. However, by 2025, when the assumed LNG export facilities are in service, prices at Tetco M3 become discounted to Henry Hub in the three cases. This discount averages about $0.05/MMBtu in the Base Case, but grows to average about $0.10/MMBtu in both of the scenario cases.

Methodology

The World Gas Model

DMP applied its World Gas Model (WGM) to analyze the impact of LNG exports on US regional natural gas prices and volumes given alternative market scenarios. The WGM is an economic model of long-term global natural gas markets, which projects gas prices, production volumes, and flows through 2040. The WGM includes disaggregated representations of supply and demand in global markets, including North America, Europe, and Asia, and their linkages through global LNG shipments or pipeline exports. Figure 1 illustrates the regional structure of the model.

Each region (e.g., Africa) includes a detailed representation of the major countries within the region as well as inbound and outbound flows to other regions. Within each country are representations of its gas supply basins, pipeline and LNG infrastructure, storage facilities, and demand regions. Sources of supply compete against each other to serve demand in each market. The WGM not only models competition between regions but also models competition between fuels within each region. The model takes into consideration competing fuel prices (e.g., fuel oil, coal, and natural gas) in both the industrial and power sectors, as well as policies related to the US power sector. Market clearing prices and quantities are computed by solving for supply and demand equilibrium simultaneously across markets and over all time points. Figure 2 represents the iterative algorithm adopted in DMP's analysis.

Figure 1: Regional Structure of the World Gas Model

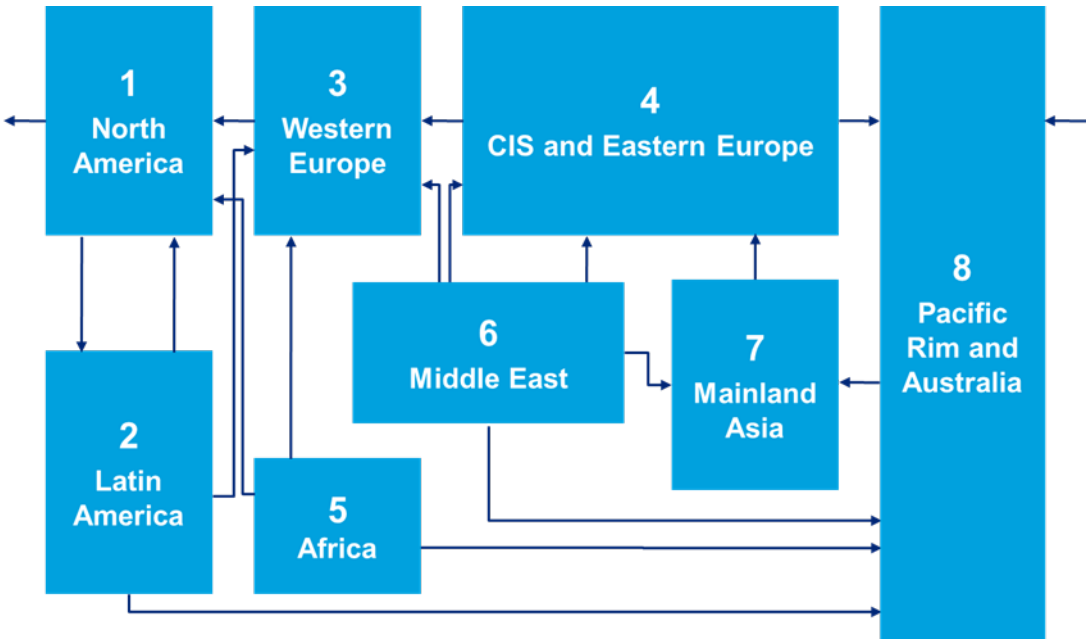
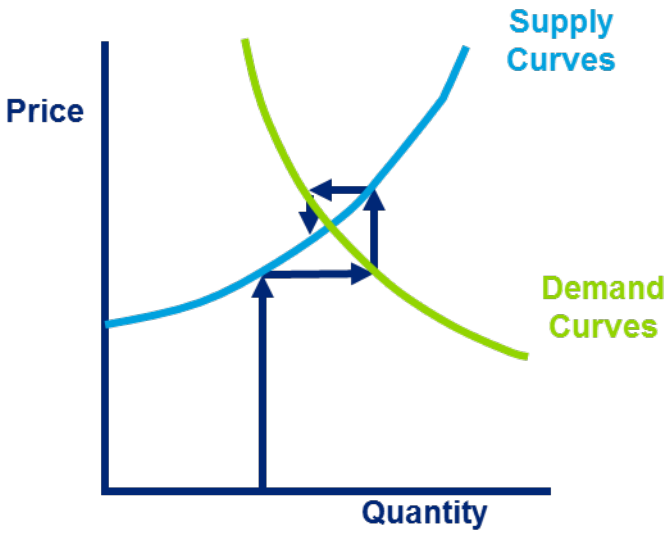


Figure 2: Representation of WGM's Iterative, Nonlinear Solution Algorithm



Exactly how much prices will change depends on market dynamics, including how the LNG export volumes affect the marginal source in each market. That is, price impact will depend on the elasticity of supply and, to a lesser degree, elasticity of demand. Rather than estimate supply response through a statistical function and estimated supply elasticity terms, the WGM represents gas supplier decisions given the various supplies competing in each market, including estimates of delivered costs for each supply into a market. With entry of new supply or demand (e.g., US LNG exports) into a market, the model computes what sources will be displaced and how that affects the price. The displaced supplies,

in turn, seek other markets leading to an iterative recalculation of supply-demand balance throughout the regions.

Since natural gas is a depletable resource, what is produced in one period is not available for production in future periods. Unlike many models, which require assumptions on productive capacity over time, the WGM computes productive capacity over time by representing producer decisions given their resource endowments, costs and anticipated forward prices. The resources are characterized by supply curves estimating the capital and operating costs to find and develop gas volumes. The model uses discounted cash flow to compute the value of reserve additions and production given the supply curves and projected wellhead prices. Through an iterative algorithm, the WGM computes the economic timing of reserve additions and production that maximize net present value to producers.

Vital to this analysis, WGM represents capital decisions regarding capacity additions for infrastructure such as LNG terminals and gas pipelines. These decisions require up-front capital expenditures plus finance charges, ongoing variable costs, and required rate of return. The model computes when and how much to build based on future margins that could be captured if capacity were added. Since we are analyzing long-term markets, we need to consider potential future market developments, not just against what currently exists. The WGM enables us to analyze how US LNG exports might impact possible future projects.

Assumptions

To determine the impact of LNG exports from the US on the domestic market, we used the latest historical data and demand forecasts from the Energy Information Administration (EIA), National Energy Board (NEB), and United States Geological Society (USGS), as detailed in Figure 3. Demand assumptions in the model are based on actual consumption data in 2014 with an assumed growth rate as observed in the EIA's annual Energy Outlook for demand projections in the Residential, Commercial and Industrial sectors. Gas demand for power generation is independently calculated by our North American integrated gas and power model, with gas prices and electricity generation being dynamically inked and integrated. The residential, commercial and industrial sector gas demand also depends on its price elasticity to assess the final consumption of natural gas consumption. The time horizon in the model goes out to 2046 with a monthly granularity. This results in an assumption that in the Base Case, total US natural gas demand grows by about 8.6 Bcf/d (or 13%) over the next 20 years. About 85% of this growth is expected to occur in the electrical power sector.

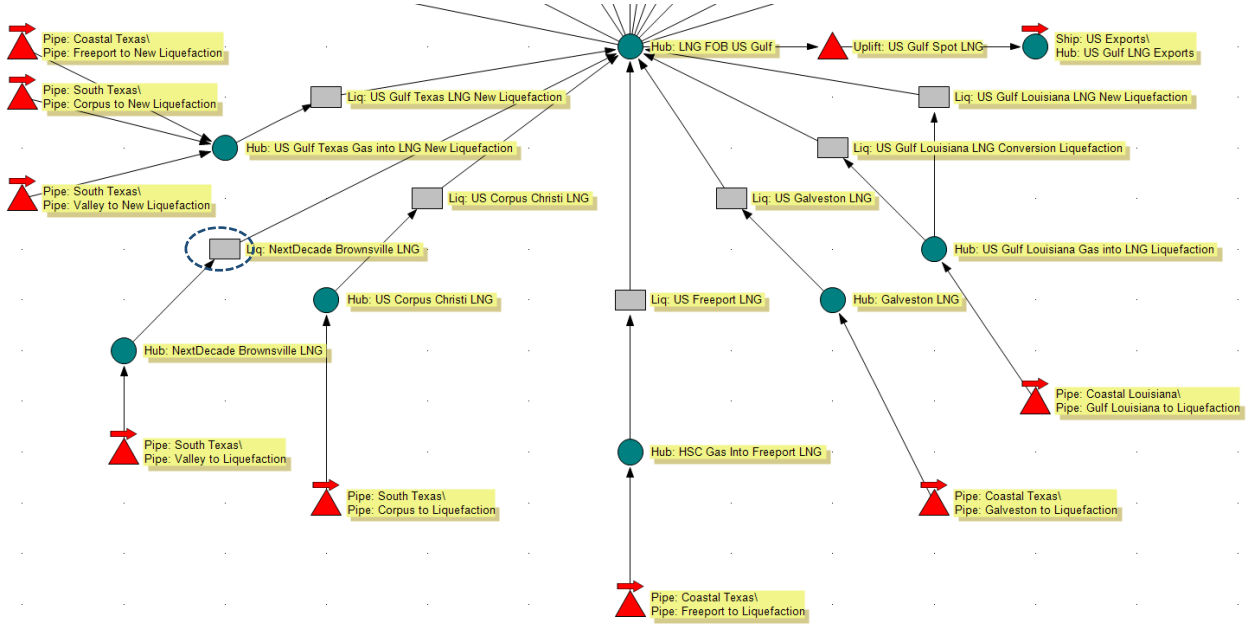
Figure 3: Major Assumptions in WGM

World Gas Model Inputs	Sources
US demand (by state and sector)	EIA Annual Energy Outlook
Canada's demand for natural gas	NEB's Canada's Energy Future
Mexico's demand for natural gas	EIA
Rest of world's demand for natural gas	EIA's International Energy Outlook
US storage capacity	EIA
Proved reserves and potential resources	EIA, USGS

To set up the cases, we added the RGLNG facility at Brownsville to our infrastructure representation of US Gulf LNG export facilities. In Figure 4 below, the triangles represent pipelines, the circles represent

market hubs, and the rectangles represent liquefaction facilities. We assumed that pipelines may likely be built from South Texas production basins and the Agua Dulce hub to the RGLNG terminal. The natural gas feedstock for these liquefaction facilities is assumed to compete with other markets in the area. In addition, LNG terminals in the Gulf will compete in the global LNG market.

Figure 4: Gulf Coast LNG Terminal Representation in WGM



The RGLNG project with planned capacity of 27 mtpa (6 trains) is assumed to be fully online by 2024, with the first train starting in 2021. Due to the location of the RGLNG terminal, market dynamics between the US and Mexico could influence how LNG exports impact regional prices. Total capacity from Agua Dulce to the five border crossing points south of Penitas was about 1.6 Bcf/d prior to 2010. Since then, several pipelines and laterals have been planned, approved, and constructed. The 2.1-Bcf/d NET Mexico Pipeline began service in late 2014 from Agua Dulce to the Mexican border and other pipelines are planned through 2017. Figure 5 shows the various US-Mexico Border crossing points.

Figure 5: US-Mexico Border Crossing Points

Source: Energy Information Administration, Office of Oil and Gas, Natural Gas Division, Imports/Export Points Database; http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/impex_map.html

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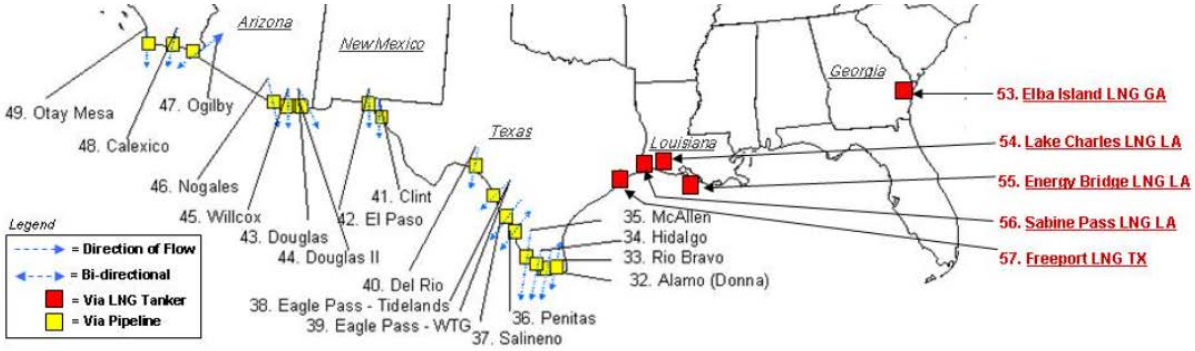


The World Gas Model represents five distinct natural gas pipeline crossings between the US and Mexico: Otay Mesa, Ogilby/Mexicali, Nogales/Wilcox, El Paso/Juarez/Clint and Reynosa. Mexico border crossings at Reynosa in the model is an aggregate of the nine crossing points and capacities in the Southern Texas region. In this study, border crossing points in South Texas compete in the same market for natural gas as the RGLNG liquefaction plant. Figure 6 summarizes the assumption for the Base Case and the two scenarios.

Figure 6: Summary of Assumptions for Each Scenario

Case Name	Assumptions
Base	The Base Case is based on DMP's WGM Fall 2015 Reference Case. US demand growth rates are based on EIA's AEO Reference Case. Seven LNG export facilities are expected to begin service, including Sabine Pass LNG, Cameron LNG, Freeport LNG, Corpus Christi LNG, Cove Point LNG, RGLNG, and another 13-mtpa facility in the Houston/Beaumont region of the Gulf of Mexico. Together these facilities represent about 112 mtpa (about 14.9 Bcf/d) of LNG export capacity.
High Mexico Exports	The High Mexico Exports Case is a variant of the Base Case. Mexico's demand for natural gas rises 3.7 Bcf/d above the Base Case by 2020 and 4.5 Bcf/d above the Base Case by 2040. As a consequence, higher imports into Mexico from the US are demanded.
High Renewables	The High Renewables Case is also a variant of the Base Case. In this case, North American demand in the power and industrial sectors grows at a slower pace after 2020. Additionally, we assume that LNG export capacity utilization at the GOM drops by 14 mtpa (about 1.8 Bcf/d) relative to the Base Case.

Results

Summary of Results

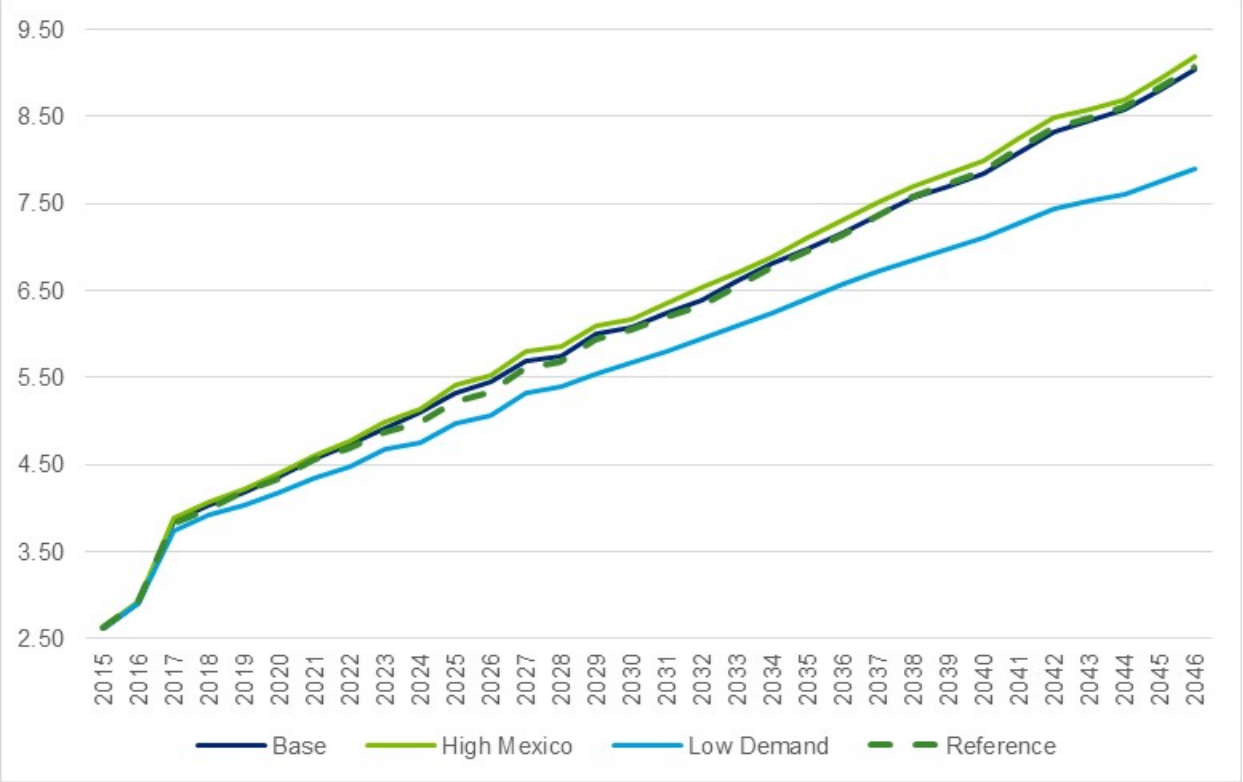
Based upon the methodology and assumptions detailed above, our analysis provides an overview of the effect that NextDecade's Rio Grande LNG export terminal could have on US natural gas prices. This study is being conducted to analyze the impact on prices due to incremental LNG exports from the RGLNG facility. The results summarized in Figure 7 indicate that in the Base Case, a small rise in prices may occur (above the WGM Fall 2015 Reference Case projections) by 2025. However, US prices are projected to return to levels consistent with our WGM Fall 2015 Reference Case by 2035-2045 Overall, the large amount of shale gas resources available in the US at relatively low costs provide the robustness in US gas production to result in only a marginal increase in gas prices, even including the large amount of gas that is exported by pipelines and LNG tankers.

Figure 7: Summary of Results in Three Cases (Henry Hub in 2015$/MMBtu and US Gas Consumption in Bcf/d)

	2020		2025		2030		2045	
	Price	Demand	Price	Demand	Price	Demand	Price	Demand
WGM Fall 2015 Ref Case	4.34	69.5	5.23	72.6	6.06	74.8	8.83	81.9
Base Case	4.37	69.2	5.34	72.2	6.08	74.7	8.80	81.9
High Mexico Exports Case	4.41	69.2	5.41	72.1	6.17	74.6	8.93	81.8
High Renewables Case	4.19	69.5	4.99	69.6	5.67	69.4	7.76	67.3

While our other scenario cases show larger impacts on the price of natural gas, even these scenarios do not show substantial impacts on Henry Hub prices. In the High Mexico Exports Case, increased demand for natural gas in Mexico leads to increased demand for US exports into Mexico. With higher exports into Mexico, more gas-on-gas competition is expected to push prices higher than in the Base Case. Conversely, in the High Renewables Case prices remain lower throughout the time period. Figure 8 shows the Henry Hub prices, in 2015$/MMBtu, for the Base Case and the two scenario cases.

Figure 8: Henry Hub Price Forecasts by Case

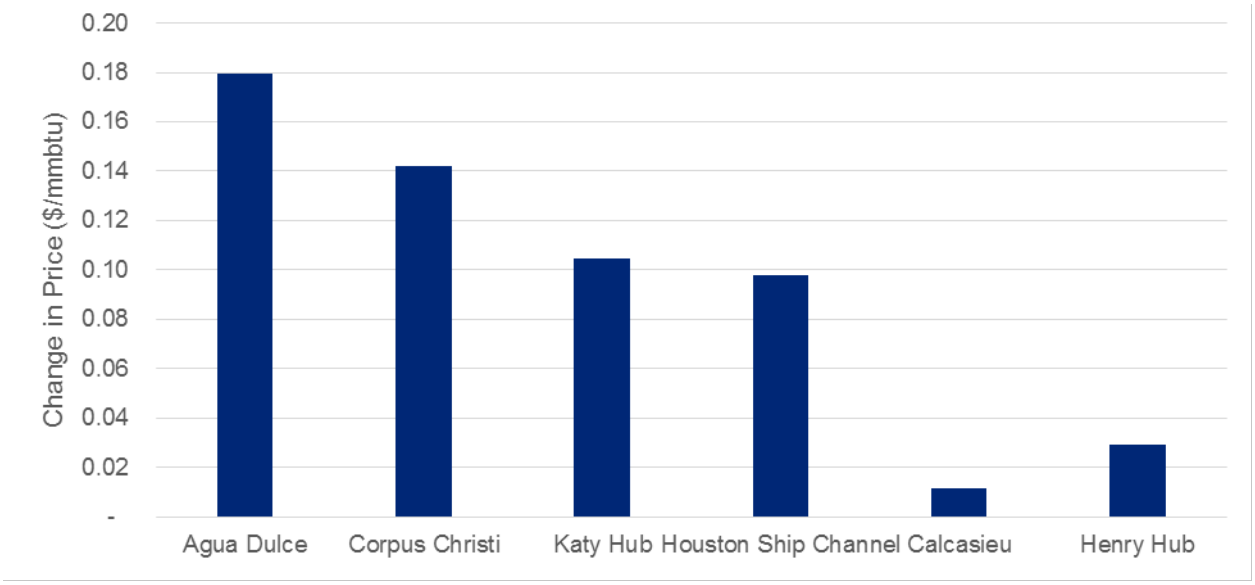


Base Case Results

In the Base Case, Henry Hub prices rise $0.03/MMBtu on average during the 2015-2045 timeframe above the WGM Fall 2015 Reference Case. There is a small $0.14/MMBtu price spike in 2024 after both terminals come online, but this spike is short-lived. Henry Hub prices with and without the new terminals return to within $0.05/MMBtu of each other by 2027.

Regional prices in proximity to each terminal, as shown in Figure 9, will also be affected. Prices at Katy Hub and Houston Ship Channel rise after the facilities come online, averaging just $0.10/MMBtu higher than the Reference Case over the 2020-2045 timeframe. Near the RGLNG terminal, prices at Agua Dulce rise more, reaching $0.38/MMBtu in 2024 and average $0.18/MMBtu over the 2020-2045 time period.

Figure 9: Projected Average Price in Base Case vs. Reference Case (2020-2045)



In the Northeast US, prices are much less affected by the start-up of LNG. Prices at Transco Z6 NNY, Tetco M3, and Dominion South Point are pushed up to peak at $0.11/MMBtu above the Reference Case and average about $0.05/MMBtu higher than the Reference Case during the 2020-2045 period.

High Mexico Exports Case

In the High Mexico Exports Case, we assume that demand for natural gas in Mexico rises about 4.0 Bcf/d on average over the Base Case during the 2015-2045 period. As a result, exports from the US to Mexico are projected to rise by 3.6 Bcf/d on average to fill the gap between Mexico's increased production and growing demand as shown in Figure 10. US natural gas exports to Mexico peak in the 2019-2023 period at about 7.0 Bcf/d, just as LNG begins to be exported from the RGLNG terminal in South Texas. This leads to higher prices in South Texas, since, as Figure 11 shows, rising demand in Mexico is mostly met by natural gas from South Texas.

Figure 10: Mexico Imports from the US by Case

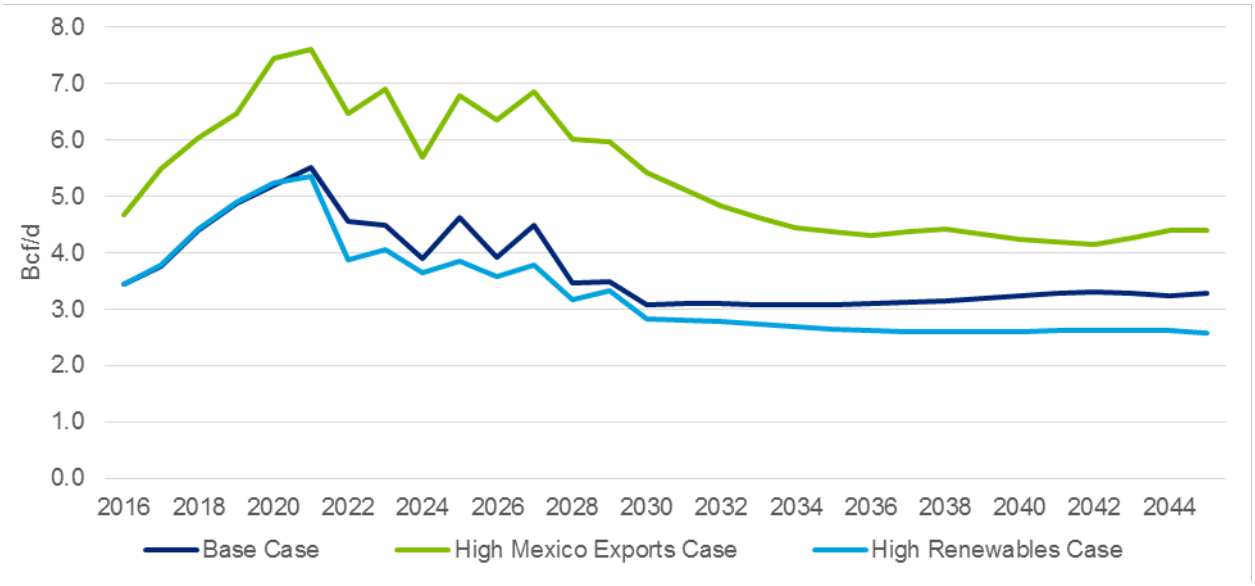
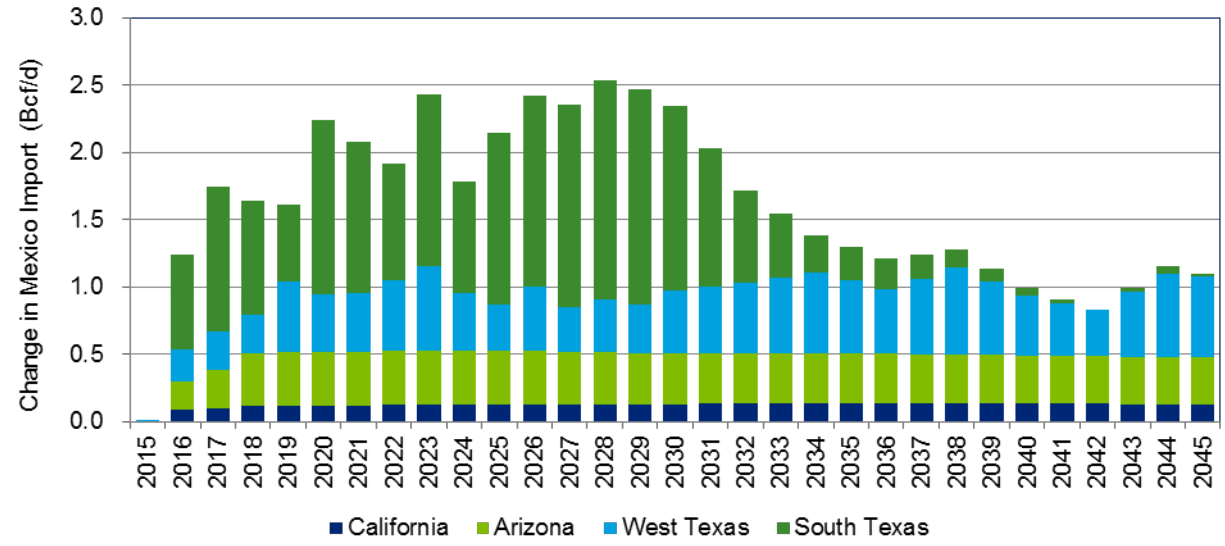
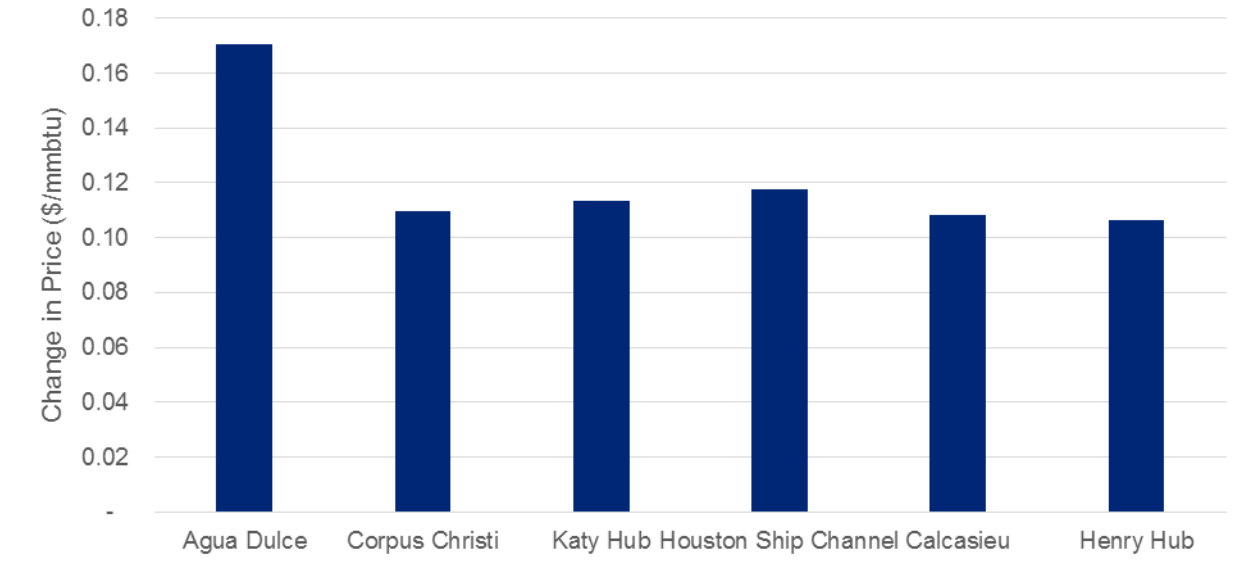


Figure 11: Change in Mexico Imports (High Mexico Case vs. Base Case)



Higher demand for natural gas from the US causes Henry Hub prices to rise by an average $0.11/MMBtu over the Base Case. Regional prices rise higher, with prices at Agua Dulce increasing $0.17/MMBtu on average over the Base Case during the 2020-2045 timeframe as shown in Figure 12.

Figure 12: Projected Average Prices in High Mexico Exports Case vs. Base Case (2020-2045)



With higher prices, LNG exports from the US fall by an average 740 MMcf/d between 2020 and 2045. Figure 13 shows the change in LNG export volumes over time. In addition to decreased LNG exports, exports to Canada also decrease and production rises relative to the Base Case.

Figure 13: LNG Exports from the US by Facility (High Mexico Case vs. Base Case)

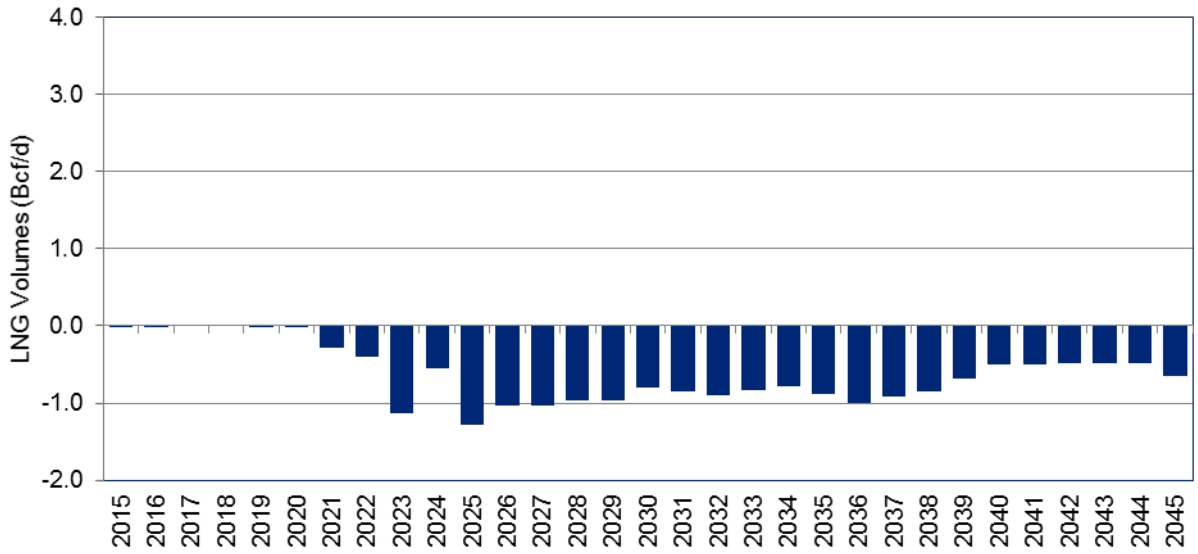
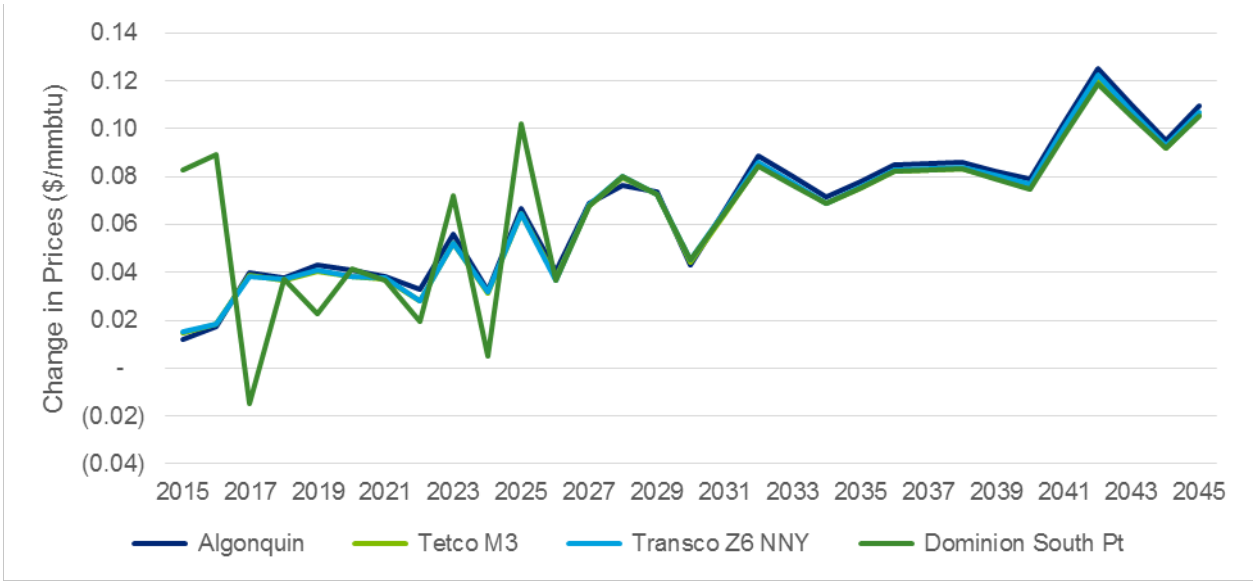


Figure 14 shows the change in prices in the Northeast US also rising but to a lesser degree. Prices at Algonquin, Transco Z6 NY, Tetco M3, and Dominion South Point rise about $0.07/MMBtu on average over the Base Case during 2020-2045.

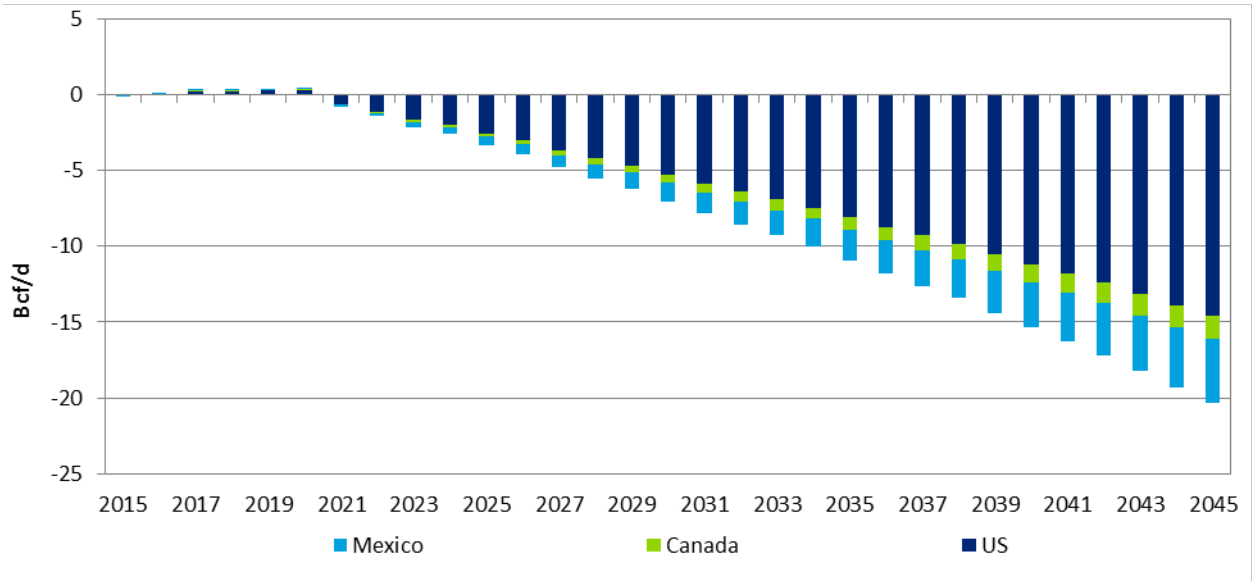
Figure 14: Change in Northeast Prices in the High Mexico Exports Case vs. Base Case



High Renewables Case

In the High Renewables Case, we assume (1) lower power sector and industrial sector demand in North America after 2020 relative to the base case and (2) LNG export capacity from the GOM drops by 1.8 Bcf/d compared to the Base Case. Core (residential and commercial) demand in North America does not change compared to the Base Case. As shown in Figure 15, power sector and industrial demand decrease starting in 2020, reaching 8.0 Bcf/d and 6.5 Bcf/d lower than Base Case by 2045. The reduction in demand is assumed to occur evenly across the US.

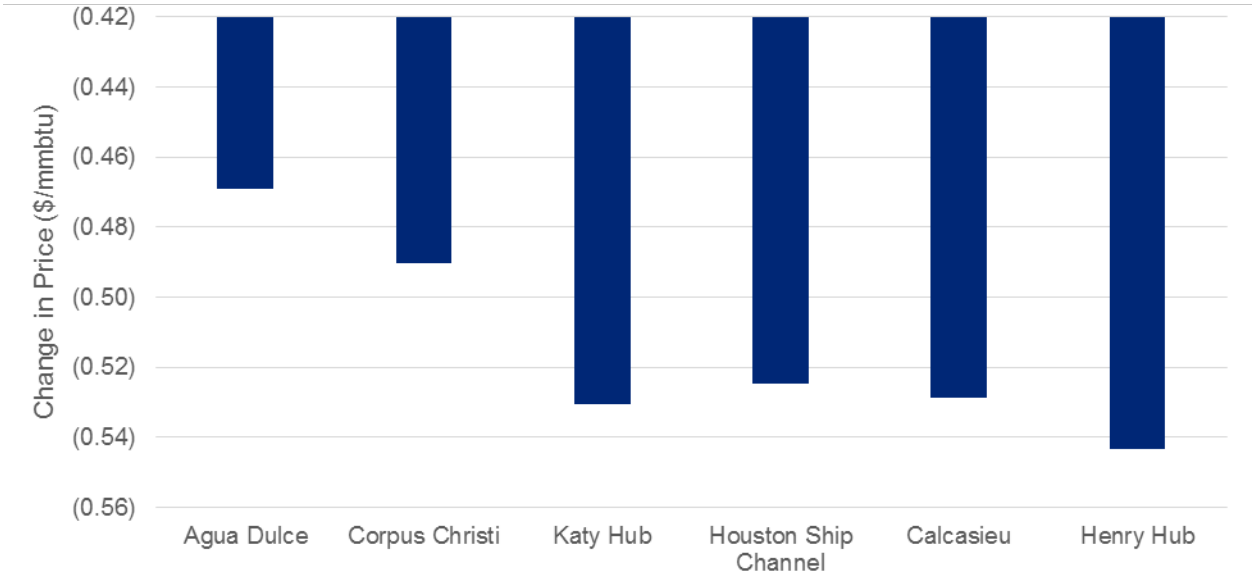
Figure 15: Change in North American Gas Demand in High Renewables Case vs. Base Case



With lower demand, Henry Hub prices fall increasingly below the Base Case. In 2020, Henry Hub prices are projected to be $0.18/MMBtu below the Base Case and this increases to $1.00/MMBtu in 2045. On average over the 2020-2045 time period, Henry Hub averages $0.54/MMBtu below the Base Case.

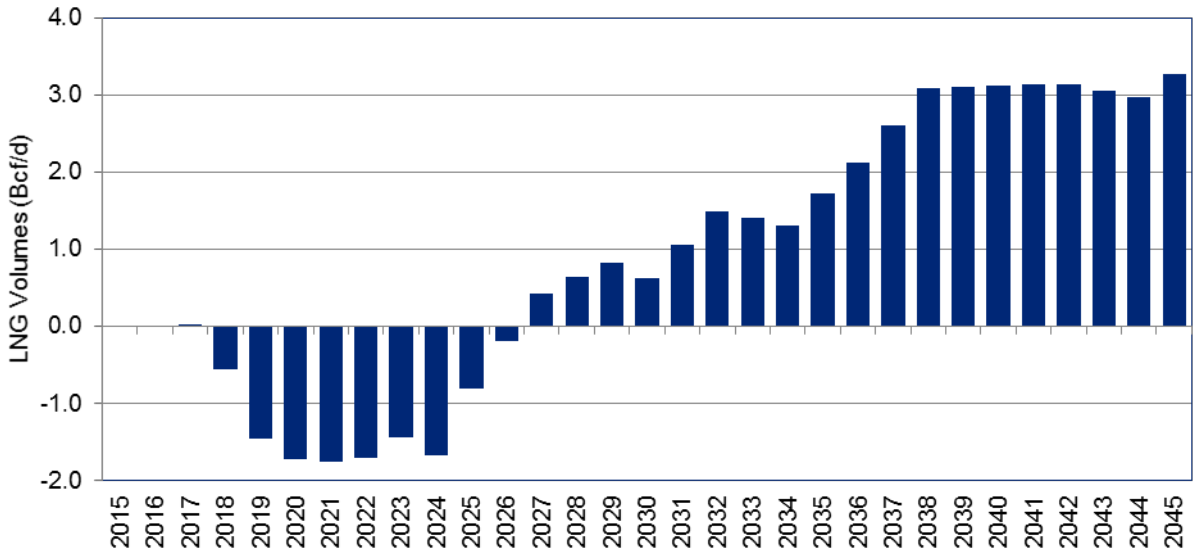
Regional prices as shown in Figure 16, at Agua Dulce and Corpus Christi don't fall as far below as the Base Case. However, prices at Calcasieu and Katy Hub fall nearly $0.53/MMBtu below the Base Case due to lower assumed LNG export capacity and lower domestic demand impacting the relatively more populated areas of East Texas relative to South Texas.

Figure 16: Projected Average Prices for High Renewables Case vs. Base Case (2020-2045)



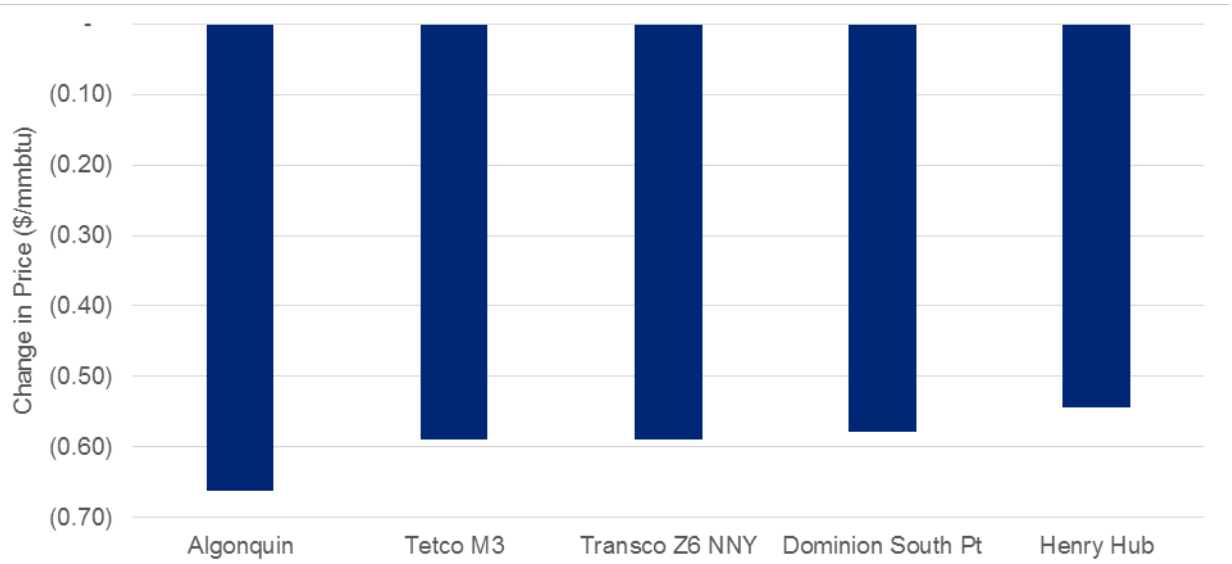
With lower prices, LNG exports remain robust at each terminal in the US Gulf. Figure 17 shows the change in LNG export volumes in the High Renewables Case compared to the Base Case. The one exception is Sabine Pass & Cameron where LNG capacity in Louisiana was reduced slightly in this case. The largest increases in LNG exports occur at Freeport and Galveston.

Figure 17: LNG Exports from the US by Facility (High Renewables Case vs. Base Case)



Prices in the Northeast as shown in Figure 18, fall even further below the Base Case than prices near the LNG terminals, with Algonquin dropping $0.66/MMBtu and prices around New Jersey falling $0.59/MMBtu.

Figure 18: Projected Average Northeast Prices for High Renewables Case vs. Base Case (2020-2045)



Conclusions

This study compared the impact of LNG exports from a number of LNG facilities built along the Gulf of Mexico coast over the period of 2015 to 2045. The first LNG plant, Sabine Pass Train #1, which is currently in the commissioning stage is assumed to begin full operation in 2016 with other plants coming online through 2024. NextDecade's RGLNG 6-train project at Brownsville with a capacity of 27 mtpa (about 3.6 Bcf/d) is assumed to be online by 2024, with the first train starting in 2021.

Base Case analysis indicates that the plants will reach full operational capacity over the next ten years, but spot cargoes could begin to decrease in the late 2030s due to increased competition in the global market, including LNG supplies from other potential export regions as well as pipeline gas reaching Europe and Asia (e.g., China, Pakistan and India).

US natural gas markets are not negatively impacted by the significant amounts of LNG exports assumed in the Base Case, including the RGLNG facility. As shown above, Henry Hub prices in the US rise only by an average of $0.03/MMBtu over the forecast horizon, peaking at about $0.14/MMBtu around the 2024-2025 time period when terminals are in full service.

Two scenarios were conducted to assess the impacts of increased exports to Mexico in one case and low demand for natural gas in the second case. The High Renewables Case shows that prices drop at the Henry Hub and other hubs across the US over time due to ample supplies in North America. The High Mexico Exports Case, on the other hand, shows that prices do rise with increased exports, stressing the South Texas market which experiences a significant impact. While the increase in the South Texas market prices is significant, it is still minor. Henry Hub prices under this case show an average increase of less than $0.10/MMBtu or 4.10% over the 2015 to 2045 period. South Texas prices increase by an average of $0.18/MMBtu or 4.22% over the same period under the High Mexico Exports Case.