Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports

Prepared by: NERA Economic Consulting

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The opinions expressed herein are those of the authors and do not necessarily represent the views of NERA Economic Consulting, any other NERA consultants, KeyLogic Systems, Inc., or the peer reviewers.

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List of Acronyms

AEO 2017	Annual Energy Outlook 2017
Bcf/d	Billion cubic feet per day
CES	Constant elasticity of substitution
CPP	Clean Power Plan
DOE	U.S. Department of Energy
DOE/FE	U.S. Department of Energy, Office of Fossil Energy
EIA	Energy Information Administration
EIS	Energy-intensive sector
ELE	Electricity sector
FID	Final investment decision
GDP	Gross domestic product
GNGM	Global Natural Gas Model
HOGR	High Oil and Gas Resource and Technology
IEA WEO	International Energy Agency World Energy Outlook
IEO	International Energy Outlook
LNG	Liquefied natural gas
LOGR	Low Oil and Gas Resource and Technology
Mcf	Thousand cubic feet
MMBtu	Million British thermal units
NAICS	North American Industry Classification System
Non-FTA	Non-Free Trade Agreement
ROW	Rest of the World
Tcf	Trillion cubic feet
TRK	Commercial trucking sector
TRN	Other commercial transportation sector

BACKGROUND ON LNG EXPORT STUDIES COMMISSIONED BY THE DEPARTMENT OF ENERGY

Since 2012, the Department of Energy's Office of Fossil Energy (DOE/FE) has commissioned five studies to examine effects of U.S. liquefied natural gas (LNG) exports on the U.S. economy and energy markets. The first study, *Effect of Increased Natural Gas Exports on Domestic Energy Markets*[1], was performed by U.S. Energy Information Administration (EIA) and published in January 2012 (EIA Study). The second study, *Macroeconomic Impacts of LNG Exports from the United States*[2], was performed by NERA Economic Consulting (NERA) and published in December 2012 (2012 Study). The third study, *Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets*[3], was performed by EIA and published in October 2014 (2014 Study). The fourth study, *The Macroeconomic Impact of Increasing U.S. LNG Exports*[4], was performed jointly by the Center for Energy Studies at Rice University's Baker Institute and Oxford Economics and published in October 2015 (2015 Study). This current study (2018 Study) is the fifth.

The EIA Study assesses how four different DOE/FE prescribed levels of natural gas exports under EIA's different Annual Energy Outlook (AEO 2011) projections could affect domestic energy markets. AEO 2011 presented a number of different projections, based on varying assumptions about future domestic natural gas supply and the U.S. economic growth rate. DOE/FE chose four of these projections as alternative baselines, and prescribed U.S. LNG export limits of 6 billion cubic feet per day (Bcf/d) and 12 Bcf/d starting in 2015 combined with either an expansion rate of 1 Bcf/d per year (slow) or 3 Bcf/d per year (rapid) for the study. Therefore, this study analyzed sixteen scenarios (four baselines under four LNG export limits). The EIA Study is confined to effects of specified levels of exports on U.S. natural gas prices and not on the broader economy.

The 2012 Study estimated macroeconomic impacts of natural gas exports as well as their impacts on U.S. natural gas prices. The study examined the same levels of LNG exports that were in the 16 scenarios for LNG exports analyzed in the EIA Study. These scenarios incorporated different assumptions about U.S. natural gas supply and demand as well as different export levels. In addition, upon DOE/FE's request, the 2012 study examined a 6 Bcf/d export limit with capacity rising at a slower rate and cases with no export constraints. The 2012 Study estimated the world prices at which various quantities of U.S. LNG exports could be sold on the world market. To evaluate the feasibility of exporting the specified quantities of natural gas, the 2012 Study developed additional scenarios for global natural gas supply and demand to estimate the market-

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1 https://energy.gov/sites/prod/files/2013/04/f0/fe_eia_lng.pdf

2 https://energy.gov/sites/prod/files/2013/04/f0/nera_lng_report.pdf

3 https://www.eia.gov/analysis/requests/fe/pdf/lng.pdf

4 https://energy.gov/sites/prod/files/2015/12/f27/20151113_macro_impact_of_lng_exports_0.pdf

determined export price that would be received by exporters of natural gas from the United States in each of the combined scenarios. The 2012 Study analyzed impacts on the U.S. economy of the prescribed levels of exports by comparing results for each of the alternative export limits to the corresponding EIA baseline cases for exports. Although the four EIA baselines made different assumptions about the U.S. natural gas resource, they all had zero LNG exports. Therefore, comparison to the EIA baselines provided estimates of the impacts of allowing the specified levels of exports.

The 2014 Study is an update of EIA's January 2012 study of LNG export scenarios. The 2014 study assesses energy market and economic impacts of scenarios that limited LNG exports to 12 Bcf/d, 16 Bcf/d, and 20 Bcf/d in 2015, with these export limits ramping at a rate of 2 Bcf/d each year, as prescribed by DOE/FE. The study uses five different baseline cases from EIA's 2014 *Annual Energy Outlook* (AEO 2014) that assume different natural resource outlook, natural gas demand, and economic growth. The 2014 Study analyzes impacts on the U.S. economy of the prescribed LNG exports by again comparing results to the corresponding baseline cases.

The 2015 Study is a scenario-based economic assessment of U.S. LNG exports of 12 Bcf/d and 20 Bcf/d under different U.S. natural gas supply conditions and international natural gas market conditions. The main goal of the study is to evaluate the effects of LNG export levels above 12 Bcf/d under a situation in which the international natural gas market conditions create *significantly higher* (exceeding 20 Bcf/d) levels of international demand for U.S.-sourced LNG. The 2015 Study analyzes impacts on the U.S. economy by comparing scenarios that constrain the U.S. LNG exports to 12 Bcf/d and 20 Bcf/d under alternative domestic natural gas supply and demand conditions while holding constant international conditions that support demand pull of significantly higher-level exports.

This current study, the 2018 Study, develops and examines a wide range of scenarios for future U.S. LNG exports; assesses the likelihood of different levels of unconstrained LNG exports; [5] and analyzes the outcomes of different LNG export levels on the U.S. natural gas markets and the U.S. economy as a whole over the 2020 to 2040 time period. The 2018 Study develops 54 scenarios by identifying various assumptions for domestic and international natural gas supply and demand conditions to capture a wide range of uncertainty in the natural gas markets. The scenarios include three baseline cases based on EIA's AEO 2017 projections with varying assumptions about U.S. natural gas supply. Alternative scenarios in the 2018 study add different assumptions about future U.S. natural gas demand and about the international outlook. International assumptions are based on the EIA International Energy Outlook 2017 (IEO 2017) and the IEA World Energy Outlook 2016 (WEO 2016). The scenarios produce a range of unconstrained LNG export volumes. At the high end of the scenario range, LNG exports are beyond those previously studied. At the low end of the scenario range, the LNG exports were lower than the corresponding AEO 2017 baseline case levels. The 2018 Study analyzes the

[5] Unconstrained LNG exports are defined as market determined levels of LNG exports.

likelihood of different export levels by assigning probabilities to each of the 54 export scenarios. The ranges for U.S. and global supply and demand along with probability assignments are developed by the authors of the study with feedback from external peer reviewers. The 2018 Study also analyzes the macroeconomic performance of the U.S. economy for several of these scenarios within the more likely range.

To summarize, the 2018 Study differs from other studies in several ways:

(i) Includes a large number of scenarios (54 scenarios) to capture a wider range of uncertainty in four specific natural gas market conditions, domestic and international supply and demand, than examined in previous studies commissioned by DOE/FE.

(ii) Includes LNG exports in all 54 scenarios that are market determined levels, including the three alternative baseline scenarios that are based on the AEO 2017 projections.

(iii) Examines unconstrained LNG export volumes beyond the levels examined in previous studies commissioned by DOE/FE.

(iv) Imposes no constraints or DOE/FE prescribed limits on LNG export volumes.

(v) Examines the likelihood of those market determined LNG export volumes.

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

As a result, the 2018 Study analyzes the robustness of unlimited market level determined LNG exports by examining different scenarios that reflect a wide range of natural gas market conditions, where robustness is measured using key macroeconomic metrics such as GDP, aggregate household income, and consumer welfare.

EXECUTIVE SUMMARY

NERA was retained by the U.S. Department of Energy's Office of Fossil Energy (DOE/FE) to examine a wide range of scenarios for future liquefied natural gas (LNG) exports, to assess the likelihood of different levels of exports, and to analyze the outcomes of different export levels on natural gas markets and the U.S. economy.

NERA's Global Natural Gas Model (GNGM) was used to estimate market-determined levels of U.S. LNG exports under different domestic and international natural gas market conditions. NERA's N_{ew}ERA macroeconomic model of the U.S. economy was used to provide macroeconomic projections over the 2020 to 2040 time period based on those different market conditions and levels of LNG exports.

Possible future export levels in the scenarios evaluated include very unlikely extremes, from zero in cases in which the U.S. "shale revolution" ends abruptly and global demand is limited to levels that exceed the total export capacity for which LNG export authorization applications have currently been filed at DOE/FE. Throughout the entire range of scenarios, we find that overall U.S. economic output is higher whenever global markets call for higher levels of LNG exports, assuming that exports are allowed to be determined by market demand.

The more likely range of LNG exports in 2040 was judged to range from 8.7 to 30.7 billion cubic feet per day (Bcf/d), which translates into 3.2 to 11.2 trillion cubic feet (Tcf) per year.[6] This assessment was based on a probabilistic analysis of 54 different scenarios that were constructed for the study. The study identified four major sources of uncertainty that affect LNG exports from the United States: natural gas supply conditions in the U.S., natural gas demand in the U.S., natural gas supply availability in the rest of the world, and natural gas demand in the rest of the world. All scenarios impose no constraints on LNG export volumes.

As shown in Table 1 below, three different cases for U.S. natural gas supply, based on the Energy Information Administration's (EIA) Annual Energy Outlook for 2017 (AEO 2017), were examined. These were the AEO 2017 High Oil and Gas Resource and Technology (HOGR) Case, the Reference Case, and the Low Oil and Gas Resource and Technology (LOGR) Case. The AEO 2017 Reference Case was also used as the basis for the central U.S. natural gas demand case. For the high U.S. demand case, gross domestic product (GDP) growth was assumed to achieve a compound annual rate of 3.7% between 2020 and 2040,[7] and for the low

[6] A trillion cubic feet (Tcf) of natural gas per year is equivalent to 2.74 billion cubic feet per day (Bcf/d).

[7] In order to obtain a broad range of U.S. natural gas demand cases, we assume in this high demand case that the economy grows at a much healthier rate than the economic growth rate of 2.1% projected in the AEO 2017 Reference case, and even higher than projections made by the current Administration of the effects of its economic, regulatory and tax policies.

U.S. demand case an aggressive national Renewables Mandate that is in line with California's stringent RPS target was assumed. Table 1 shows the probabilities assigned to each of these domestic supply and demand cases.

On the international side, the study defined three natural gas demand cases for the rest of the world. One was the reference case from the EIA's International Energy Outlook for 2017 (IEO 2017), and the other two were based on the International Energy Agency's World Energy Outlook (WEO 2016). The low international demand case takes natural gas demand for all other countries from a WEO 2016 case that assumed all countries adopt policies to reduce fossil energy use sufficiently to achieve the aggressive greenhouse gas reduction of holding concentrations below 450 ppm CO_{2e} (The low U.S. natural gas demand case was defined by assumptions about future renewable energy policies in the U.S., not by U.S. adherence to a 450 ppm goal.).

The high demand case was based on the WEO current policy case, which assumed no tighter restrictions on fossil fuel use than now exist in the rest of the world.

Table 1: Uncertainties around U.S. and Rest of the World (ROW) Natural Gas Supply and Demand Alternatives

	US Supply	**US Demand**	**ROW Supply**	**ROW Demand**
Case	AEO 2017, HOGR	Robust Economic Growth		High Demand
Probability	30%	17%		50%
Case	AEO 2017, Reference	AEO 2017, Reference	IEO 2017, Reference	IEO 2017, Reference
Probability	55%	66%	80%	45%
Case	AEO 2017, LOGR	Renewables Mandate	Low Supply	WEO 2016, 450 ppm
Probability	15%	17%	20%	5%

Two alternative global natural gas supply cases were defined. The IEO 2017 Reference Case projects rapid growth in conventional and unconventional natural gas production worldwide. This case formed the reference case. The low case assumed that ROW supply grows no faster than does U.S. supply in the AEO 2017 LOGR Case. This low world supply case could come about if, for institutional or resource related reasons, the rest of the world gains little benefit from

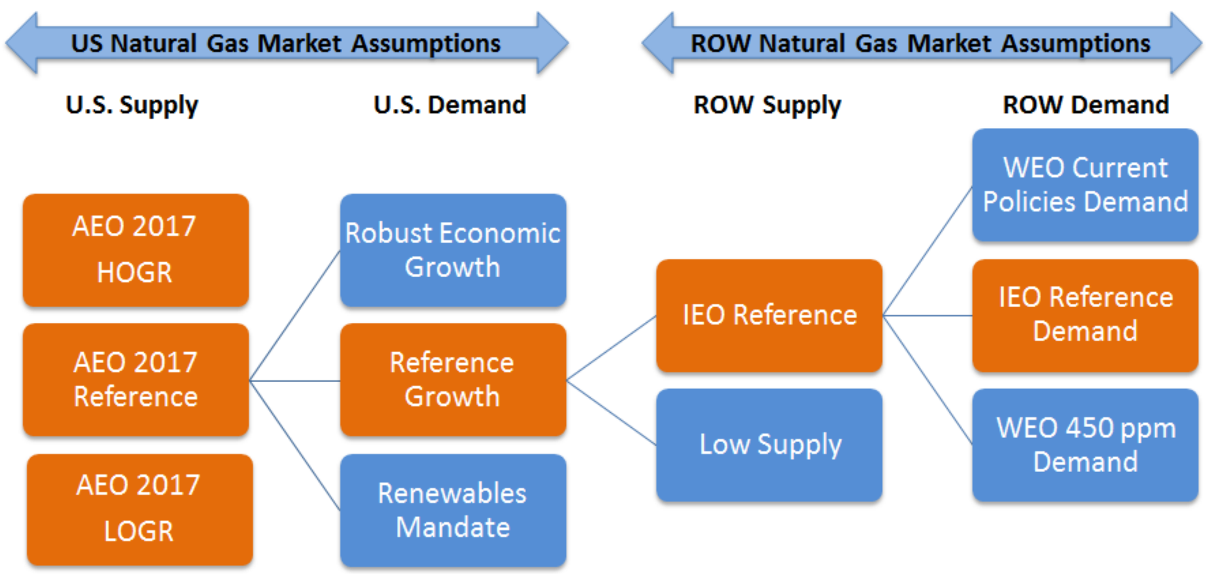
The White House Office of the Press Secretary Briefing by Secretary of the Treasury Steven Mnuchin and Director of the National Economic Council Gary Cohn April 26, 2017.
https://www.whitehouse.gov/briefings-statements/briefing-secretary-treasury-steven-mnuchin-director-national-economic-council-gary-cohn/

the shale revolution. Table 1 shows the probabilities assigned to each of these international supply and demand cases.

Probabilities of the different possible cases under each of the four sources of uncertainty were assigned by the project team, and subsequently some of those initial probability assignments were modified based on comments from an external peer review process conducted by DOE/FE and KeyLogic Systems, Inc.

Each path through this chain of four assumptions, which combines a U.S. supply case, a U.S. demand case, a ROW supply case and a ROW demand case, represents a scenario. Combining three U.S. supply cases, three U.S. demand cases, three international demand cases, and two international supply cases in all possible combinations yielded a total of 54 different scenarios for LNG exports. The probabilities of each of these 54 scenarios were calculated from the probabilities assigned to the four cases making up each scenario. The construction of the LNG export scenarios is illustrated in Figure 1.

Figure 1: Construction of LNG Export Scenarios



A cumulative probability distribution over export levels was constructed, and the analysis concentrated on scenarios that lay within a one-standard deviation interval around the mean export level in 2040. Statistically, there is a 68% probability that U.S. LNG exports would fall within a one-standard deviation interval. The Global Natural Gas Model (GNGM) developed by NERA was used to project U.S. and rest of world natural gas supply, demand, and prices for the years 2020 to 2040 for each scenario.

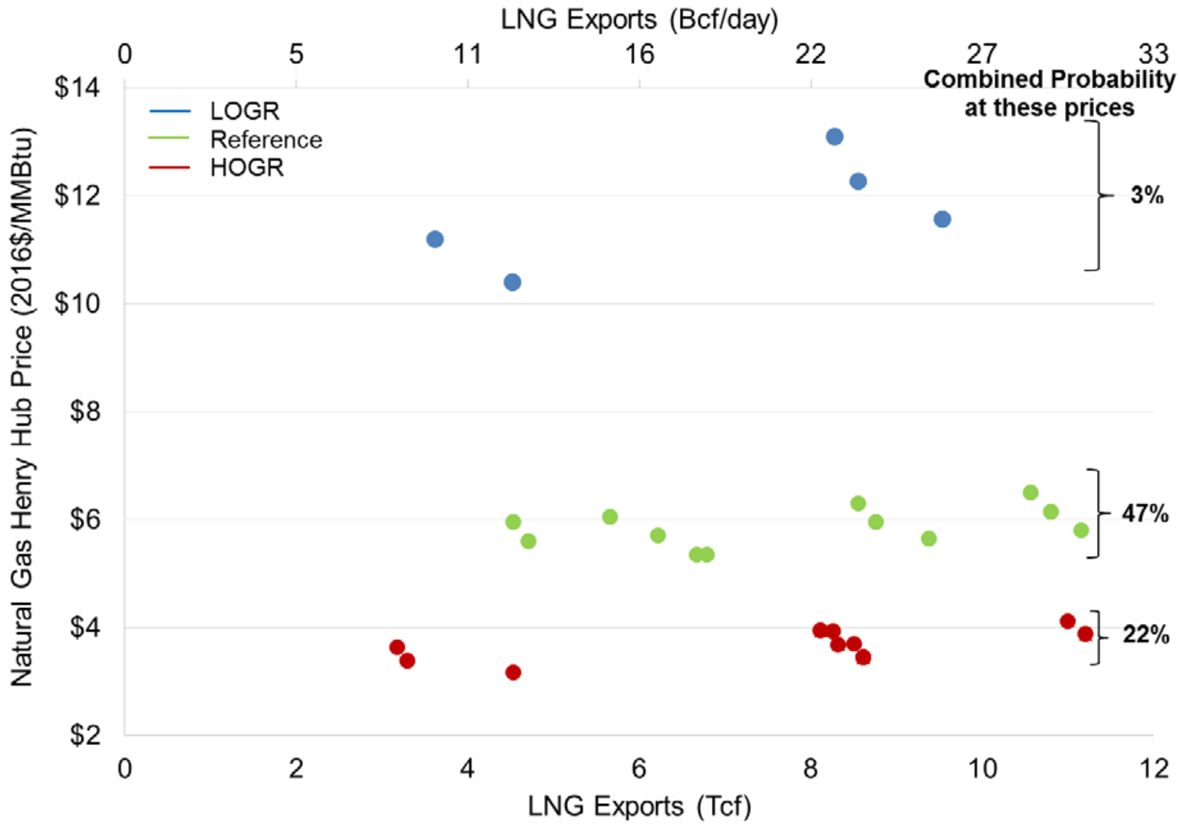
Three of the scenarios serve as baselines. These are indicated in orange in Figure 1. The combination of AEO 2017 HOGR for supply, Reference Growth for U.S. demand, IEO Reference for ROW supply and IEO Reference for ROW demand is the baseline for all scenarios that begin with AEO 2017 HOGR. The combination of AEO 2017 Reference for U.S supply and the reference assumptions for the other three uncertainties is the baseline for all scenarios that begin with AEO 2017 Reference, and likewise the combination of AEO 2017 LOGR for supply and reference assumptions for the other three uncertainties is the baseline for all scenarios that begin with AEO 2017 LOGR.

In EIA's projections, the principle determinant of natural gas prices in the United States is the U.S. natural gas resource and by extension, the technology that enables it to be developed. The higher price blue colored markers in Figure 2 derive from the Low Supply scenarios, which only support significant exports when international gas needs are high. Therefore, the combined probability of prices in the resulting range of $10 to $13 per MMBtu in 2040 is only 3%.

Under Reference case supply assumptions (the green colored markers in Figure 2), prices are much lower and in a more narrow range when international LNG demand varies. (Note: Variation in international LNG demand comes from the combination of assumptions about ROW natural gas supply and demand). These central cases have a combined probability of 47% and prices range from $5 to about $6.50 per MMBtu in 2040.

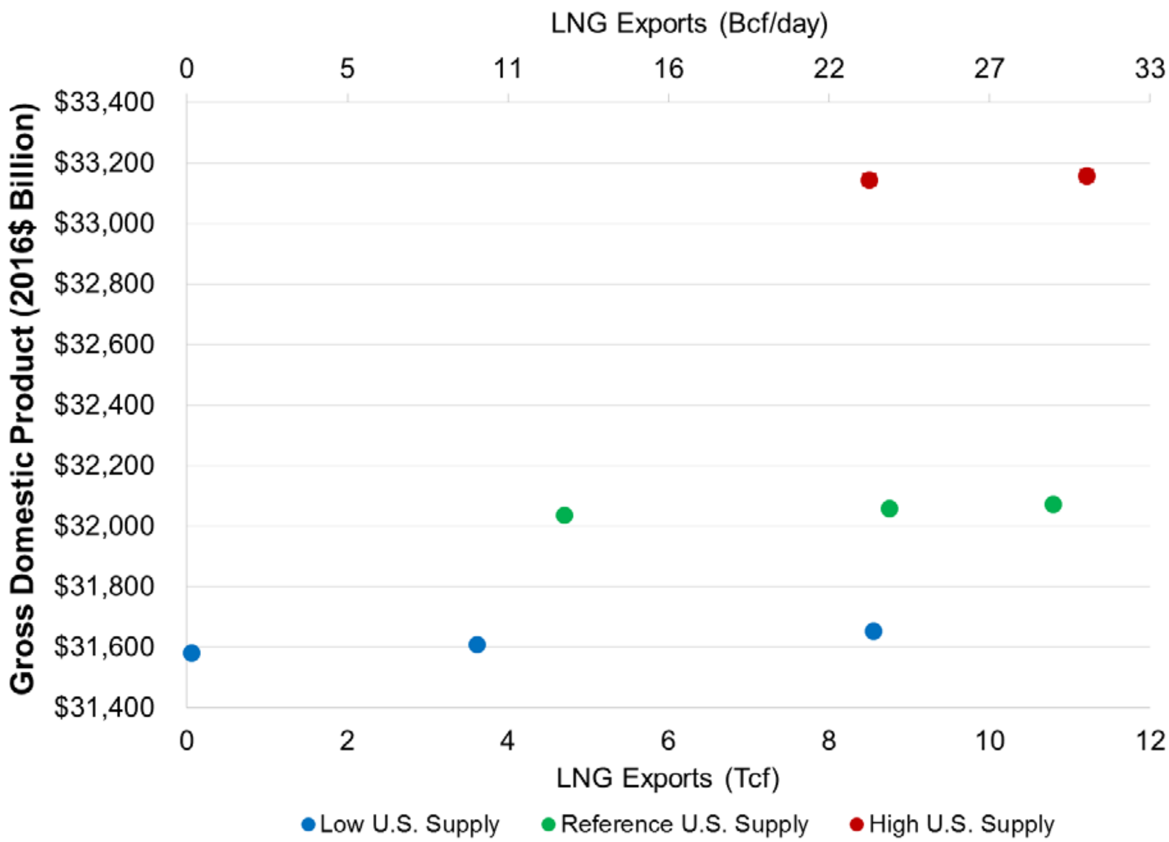
The very low prices (the red colored markers in Figure 2) are achieved when U.S. supply is high, and these cases have a combined probability of 22%. Depending on the level of LNG exports, these prices range from $3 to $4 per MMBtu in 2040.

Figure 2: U.S. Henry Hub Prices Across the More Likely Range of U.S. LNG Exports in 2040



Levels of GDP are also most sensitive to assumptions about U.S. supply, with high natural gas supply driving higher levels of GDP. For each of the supply scenarios, higher levels of LNG exports in response to international demand consistently lead to higher levels of GDP (see Figure 3). GDP achieved with the highest level of LNG exports in each group exceeds GDP with the lowest level of LNG exports by $13 to $72 billion in 2040.

Figure 3: GDP Increases with Rising Levels of LNG Exports within the More Likely Range of Scenarios in 2040[8]

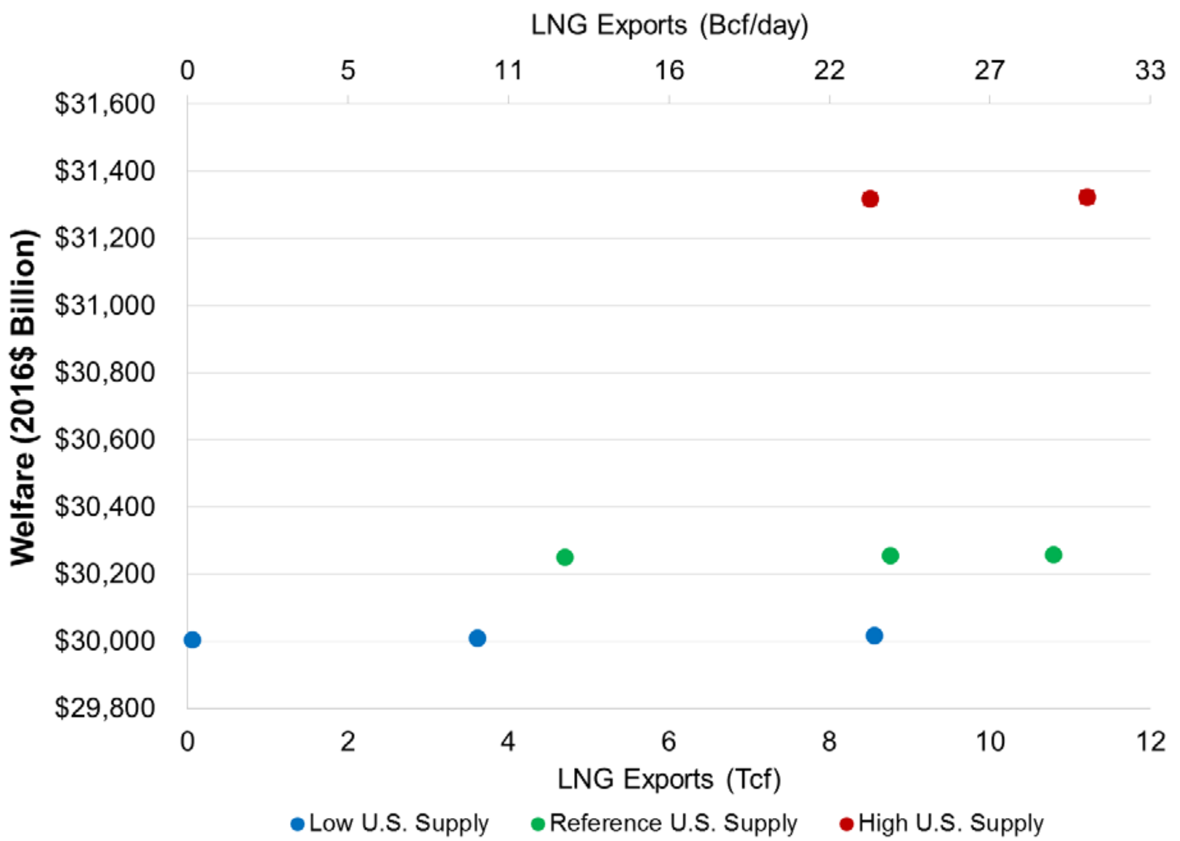


Levels of exports and U.S. GDP are strongly affected by U.S. natural gas supply conditions, with the lowest levels of exports occurring most often when U.S. natural gas supply follows the EIA's LOGR case, and highest levels occurring most often in the HOGR cases. Naturally, economic growth is greater with high U.S. oil and natural gas supply than with low U.S. oil and gas supply. For example, in 2040, when U.S. LNG exports are around 8.6 Tcf (23.4 Bcf/d), the U.S. GDP levels for low, reference, and high U.S. natural gas supply are $31.6, $32.1, and $33.1 trillion, respectively (see Figure 3).

[8] The chart shows LNG exports in the x-axis and GDP in billion dollars on the y-axis for scenarios that fall within one standard deviation (more likely scenarios).

Consumer welfare is a present value measure of the standard of living of all households over the entire period from 2020 to 2040. Consumer welfare, expressed in dollar terms, is also higher when there is greater domestic oil and gas supply, as seen by comparing the red, green and blue groups of dots in Figure 4. In the scenarios that put LNG exports around 8.6 Tcf in 2040, consumer welfare is $30.1, $30.3, and $31.3 trillion in the low, reference and high U.S. supply cases respectively (see Figure 4). As in the case of GDP, consumer welfare within supply case is higher, the higher the level of LNG exports.

Figure 4: Consumer Welfare Increases with Rising Levels of LNG Exports within the More Likely Range of Scenarios in 2040[9]



There are several reasons for these consistently positive relationships between LNG exports and measures of economic performance.

[9] The chart shows LNG exports in the x-axis and GDP in billion dollars on the y-axis for scenarios that fall within one standard deviation (more likely scenarios).

- About 80% of the increase in LNG exports is satisfied by increased U.S. production of natural gas, with positive effects on labor income, output, and profits in the natural gas production sector.

- The higher world prices that bring forth those supplies improve U.S. terms of trade, so that there is a wealth transfer to the U.S. from the rest of the world equal to the increase in prices received for LNG exports times the quantity exported. The transfers from natural gas related activity to the U.S. economy improve the average consumer's ability to demand more goods and services leading to higher economic activity.

These two factors more than make up for the dampening economic effects that are observed in these scenarios, including slightly slower output growth of some natural gas intensive industries, costs of substituting other fuels for a small fraction of natural gas use in power generation, and infinitesimal reductions in natural gas use by households and other industries.

Even the most extreme scenarios of high LNG exports that are outside the more likely probability range, which exhibit a combined probability of less than 3%, show higher overall economic performance in terms of GDP, household income, and consumer welfare than lower export levels associated with the same domestic supply scenarios.

It is also important to note that our analysis also shows that the chemicals subsectors that rely heavily on natural gas for energy and as a feedstock continue to exhibit robust growth even at higher LNG export levels and is only insignificantly slower than cases with lower LNG export levels.

I. INTRODUCTION

U.S. Department of Energy's Office of Fossil Energy (DOE/FE) retained NERA to evaluate macroeconomic effects of different levels of LNG exports. To conduct this analysis, the study employed NERA's Global Natural Gas Model (GNGM) and macroeconomic model, N_{ew}ERA.

A. Project Background

As of October 6, 2017, DOE/FE has received long-term non-free trade agreement (Non-FTA) applications totaling 51.59 billion cubic feet per day (Bcf/d) to export domestically produced LNG from the Lower-48 States. DOE/FE has authorized long-term exports of natural gas to non-FTA countries of 21.35 Bcf/d.[10] These volumes represent significant amounts of natural gas in the context of both current domestic natural gas demand and global demand for LNG. In 2016, U.S. natural gas consumption averaged over 75 Bcf/d, and global LNG demand averaged over 33 Bcf/d. Not all of the export capacity authorized by DOE is under construction in the Lower-48 States. Several projects have not reached final investment decisions (FID), and some projects currently under construction are not building to the level of their authorized capacity.

The Natural Gas Act (NGA), 15 U.S.C. § 717b, requires DOE to conduct a public interest review of applications to export LNG and to grant the applications unless DOE finds that the proposed exports will not be consistent with the public interest.[11] Under this provision, DOE has performed a public interest analysis before acting.[12] To inform this public interest analysis, DOE commissioned several natural gas export studies, which evaluated the effects of increasing volumes of LNG exports from the Lower-48 on natural gas prices and domestic consumption. All but the first study commissioned also evaluated the macroeconomic impact of higher LNG export levels. These previous studies were completed by the Energy Information Administration

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[10] Long Term Applications Received by DOE/FEE to Export Domestically Produced LNG from the Lower-48 States (as of October 6, 2017), https://energy.gov/fe/downloads/summary-lng-export-applications-lower-48-states

[11] The authority to regulate the imports and exports of natural gas, including liquefied natural gas, under section 3 of the NGA has been delegated to the Assistant Secretary for Fossil Energy (FE) in Redelegation Order No. 00-006.02 issued on November 17, 2014.

[12] Under NGA section 3(c), the import and export of natural gas, including LNG, from and to a nation with which there is in effect a free trade agreement (FTA) requiring national treatment for trade in natural gas and the import of LNG from other international sources are deemed to be consistent with the public interest and must be granted without modification or delay. Exports of LNG to non-FTA countries require a DOE/FE public interest review.

(EIA),[13] NERA Economic Consulting,[14] and a team consisting of Oxford Economics and the Baker Institute at Rice University.[15]

The previous studies evaluated different cumulative levels of exports based on a variety of scenarios related to domestic and international natural gas supply and demand. The most recent study completed by Oxford Economics and the Baker Institute in 2015, focused on the impacts of exports at a rate of over 20 Bcf/d, including a sensitivity case evaluating impacts of exports at 28 Bcf/d. With over 21 Bcf/d of exports authorized[16] and more than 30 Bcf/d pending review, this study evaluates the potential macroeconomic effects of higher (and lower) LNG export ranges and also assesses their probability of occurrence.

B. Purpose of the Study

The purpose of this study is to evaluate:

(a) the likelihood of various scenarios of U.S. LNG exports to 2040, and

(b) the potential macroeconomic effects of LNG exports at those levels.

The scope of the project required the conducting of three separate analyses: LNG export scenario development, LNG export scenario likelihood analysis, and LNG export scenario macroeconomic analysis.

Development of LNG export scenarios required us to identify various assumptions for domestic and international natural gas supply and demand dynamics and build a matrix of reasonable scenarios such that the range of LNG export volumes analyzed would exceed those previously studied. The scenarios were to include, but not be limited to, the cases considered in the Annual Energy Outlook 2017, which included:

(a) Reference Case (with the Clean Power Plan (CPP)),

(b) High Oil and Gas Resource and Technology (HOGR) Case

(c) Low Oil and Gas Resource and Technology (LOGR) Case

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[13] "Effect of Increased Natural Gas Exports on Domestic Energy Markets, January 2012" https://energy.gov/sites/prod/files/2013/04/f0/fe_eia_lng.pdf

[14] "Macroeconomic Impacts of LNG Exports from the United States, December 2012" https://energy.gov/sites/prod/files/2013/04/f0/nera_lng_report.pdf

[15] "The Macroeconomic Impact of Increasing U.S. LNG Exports" https://energy.gov/sites/prod/files/2015/12/f27/20151113_macro_impact_of_lng_exports_0.pdf

[16] Long Term Applications Received by DOE/FEE to Export Domestically Produced LNG from the Lower-48 States (as of October 6, 2017), https://energy.gov/fe/downloads/summary-lng-export-applications-lower-48-states

In addition, the study required the consideration of varied assumptions and a range of factors affecting the supply of and demand for U.S. LNG exports, including, but not limited to, economic growth, global market conditions, and domestic natural gas supply and demand. In particular, the study was required to develop three or more international scenarios that combine different assumptions about international supply and demand market developments.

The likelihood analysis of the LNG export scenarios required the study to determine a method of assigning a probability to each of the export scenarios developed, taking into account various assumptions about a range of factors that could affect U.S. LNG exports. The scenarios developed needed to include high and very low probability combinations of assumptions, as well as combinations that spanned a wide range of LNG exports.

Macroeconomic analysis of the LNG export scenarios developed required the study to use a general equilibrium model calibrated to the Reference Case and other natural gas supply cases from the Annual Energy Outlook 2017.

C. Organization of the Report

Following this introductory section of the report, Section II describes how the scenarios were developed taking into account U.S. and international natural gas market conditions. Section III describes the methodology and the models used to develop natural gas market and macroeconomic projections for each scenario. Section IV lays out our approach to assign probabilities for each scenario and how we revised the probability assignments based on a peer review conducted by DOE/FE and KeyLogic Systems, Inc. Sections V and VI discuss natural gas market specific results and the macroeconomic effects of LNG exports, respectively.

Appendix A provides a description of NERA's global natural gas model (GNGM), and Appendix B does the same for NERA's N_{ew}ERA macroeconomic model of the U.S. economy. Appendix C describes the supply and demand ranges and probability assumptions used in developing scenario probabilities. Appendix D discusses the results for the scenarios which are outside the more likely range. Finally, detailed GNGM and N_{ew}ERA modeling results are provided in Appendix E and Appendix F, respectively.

II. SCENARIO DESIGN

The scenarios are based on four different uncertainties affecting natural gas markets. These four uncertainties are U.S. supply of natural gas, U.S. demand for natural gas, rest of the world (ROW) natural gas supply, and ROW natural gas demand. We provide here a summary of the scenario design, followed by a more detailed discussion of each element.

The probability tree, shown in Figure 5, depicts the possible choices for each uncertainty beginning with the EIA's Annual Energy Outlook (AEO) 2017 Reference Case (a DOE requirement for this study).[17,18] Each scenario is defined by the set of choices made for the set of uncertainties, with each scenario defined by a distinct path through the probability tree. Going from left to right through the tree, we identify the different uncertainties that our probability analysis will consider, and going vertically, we describe the various cases developed to represent those uncertainties. Each point of the tree branches represents an additional source of uncertainty. Each case incorporates different assumptions, which results in a range of possibilities for each source of uncertainty.

The first source of uncertainty relates to U.S. natural gas supply. How much natural gas can be supplied at a given price depends on a number of factors, including how extraction technology develops, the magnitude of the extractable resource, political positions for or against limits on unconventional natural gas resource development (e.g., as related to hydraulic fracturing) as well as the cost to develop natural gas resources.

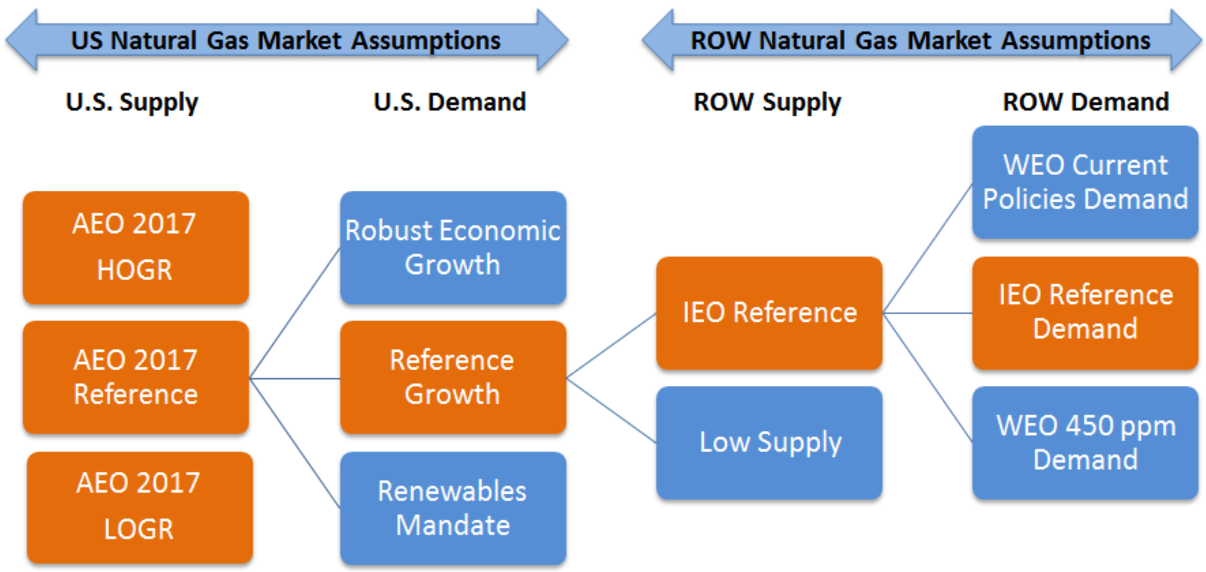
We specify three different cases to capture this uncertainty. These cases are derived from the EIA's AEO 2017. The AEO 2017's Reference case provides a central estimate of U.S. natural gas production, while the High Oil and Gas Resource and Technology (HOGR) and Low Oil and Gas Resource and Technology (LOGR) side cases provide more and less optimistic resource development estimates, respectively. The differences in the natural gas production levels across the three cases arise from varying assumptions around unproven offshore resources, onshore

[17] The AEO is published pursuant to the Department of Energy Organization Act of 1977, which requires the U.S. Energy Information Administration (EIA) Administrator to prepare annual reports on trends and projections for energy use and supply. The Annual Energy Outlook provides modeled projections of domestic energy markets through 2050, and includes cases with different assumptions of macroeconomic growth, world oil prices, technological progress, and energy policies. https://www.eia.gov/outlooks/aeo/

[18] The AEO 2017 Reference cases with and without the Clean Power Plan (CPP) project nearly identical LNG exports, 4.38 and 4.58 Tcf, respectively, in 2040. In addition, EIA's High and Low Oil and Gas Resources side cases include the CPP. To maintain consistency with the Reference and with the EIA's side cases that reflect uncertainty in U.S. supply, we used the AEO 2017 Reference Case with CPP as the baseline for the Reference case. However, we ran the No CPP Reference case as one single sensitivity case.

shale gas resources, tight gas resources, and conventional and tight oil associated gas resources, as well as the costs of producing these resources.[19]

Figure 5: LNG Export Scenario Probability Tree, Based on Four Types of Uncertainty, for Constructing a Set of LNG Export Scenarios



The second source of uncertainty deals with the level of U.S. natural gas demand, which is primarily influenced by economic growth, growth in population, per capita income, and environmental policies that influence fuel choices among sources of energy and total demand for energy. The AEO 2017 High and Low Macroeconomic growth cases provide a range for natural gas consumption with the differences arising out of varying assumptions for the growth rate in the U.S. gross domestic product.[20] However, the resulting range in domestic natural gas demand, based on these two EIA side cases, is rather small.[21] Therefore, we considered some adjustments to these cases and constructed alternative cases to provide for a greater range in U.S. demand for natural gas (details are in a subsequent section).

Combining the three supply cases with the three demand cases yields nine distinct cases or paths for the possible evolution of the U.S. natural gas market. The last two elements of the

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[19] Pg. 12, Annual Energy Outlook 2017 with projections to 2050, January 2017. Available: https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf

[20] Pg. 6, Annual Energy Outlook 2017 with projections to 2050, January 2017. Available: https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf

[21] Natural gas demand in the High and Low economic growth cases in 2040 are 33.3 and 30.6 Tcf respectively, a range of only 2.7 Tcf.

probability tree incorporate uncertainties about natural gas supply and demand in the rest of the world (ROW).

Since none of the publicly available forecasts[22] that we reviewed provided adequate ranges of uncertainty about natural gas supply in the rest of the world, we created our own scenario for a low natural gas supply outlook in the ROW. We also created a central estimate based on the IEO's 2017 Reference Case.[23] We did not create a high ROW supply case.

To create the reference, high, and low estimates of natural gas demand in the ROW, we relied on the cases outlined in the International Energy Agency's (IEA) World Energy Outlook (WEO) 2016 projections.

By combining the three cases for U.S. supply uncertainty, three cases for U.S. demand uncertainty, two cases for ROW supply uncertainty, and three cases for ROW demand uncertainty, we created 54 distinct scenarios or paths for the evolution of world natural gas markets. Each path through the tree represents a distinct set of assumptions about global natural gas market conditions.

In each of these 54 scenarios, we model the level of LNG exports as being determined solely by market factors. We discuss how this is done below.

To reference the scenarios in the report here on out, the scenario nomenclature will be referenced by four components; "A_B_C_D" where "A" denotes the name of the U.S. supply case, "B" denotes the name of the U.S. demand case, "C" denotes the name of the ROW supply case, and "D" denotes the name of the ROW demand case. Thus, for example, the "Ref_High_Ref_Low" scenario denotes a reference level of U.S. supply, a high level of U.S. demand, a reference level of ROW supply, and a low level of ROW demand per the central estimate for the supply and demand quantities.

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[22] We reviewed the EIA's IEO 2017, the IEA's WEO 2016, BP's Energy Outlook to 2035, and Exxon's Outlook for Energy to 2040.

[23] The IEO projections are published under the Department of Energy Organization Act of 1977, which requires the U.S. Energy Information Administration (EIA) to prepare reports on trends and projections for energy use and supply. The International Outlook presents an assessment by the U.S. Energy Information Administration of the outlook for international energy markets through 2050. The U.S. projections appearing in IEO 2017 are consistent with those released in the Annual Energy Outlook 2017. https://www.eia.gov/outlooks/ieo/

A. Natural Gas Market Uncertainties

1. U.S. Natural Gas Supply[24]

In addition to the Reference Case, the AEO 2017 has two side cases which are relevant to this study: the High Oil and Gas Resource and Technology Case (HOGR) and the Low Oil and Gas Resource and Technology Case (LOGR). Both cases are modifications of the assumptions used in the Reference Case. These cases differ from the Reference Case with respect to crude oil and natural gas resource costs and availability. The High Oil and Gas Resource and Technology case assumes additional unproved Alaska resources (for crude oil), offshore Lower 48 resources, and onshore Lower 48 tight oil, tight gas and shale gas resources compared to the Reference case, as well as 50% higher estimated ultimate recovery per tight oil, tight gas, or shale gas well. Further, it assumes lower costs of resource production resulting from continued improvements in drilling technology that lead to an increase in well productivity.[25]

In the HOGR case both crude oil and natural gas production continue to grow relative to today's levels. At the other end of the range, the LOGR Case has more pessimistic assumptions about technological improvements and technically recoverable resources than in the Reference Case, leading to flat natural gas production through 2040.

The high and low natural gas supply sensitivity cases for the U.S. natural gas supply curve were constructed in the Global Natural Gas Model to be consistent with the EIA's AEO 2017 HOGR Case and LOGR Case so that equilibrium U.S. production and prices are similar to the corresponding EIA cases.

2. U.S. Natural Gas Demand

The next branch in the probability tree is U.S. natural gas demand. A high estimate for U.S. natural gas demand was constructed, using a GDP growth scenario of 3.7%[26] on average over the 2015 to 2040 time period and an income elasticity of 0.65. These assumptions result in about 6 Tcf of additional natural gas demand in 2040 compared to the reference case. To construct a low natural gas demand case, we imposed a stringent renewables mandate, which led to natural gas demand being about 6 Tcf lower in 2040 than in the reference case.

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[24] For a complete explanation for the alternative resource cases, see link: https://www.eia.gov/outlooks/archive/aeo17/assumptions/pdf/oilgas.pdf

[25] Pg. 12, Annual Energy Outlook 2017 with projections to 2050, January 2017. Available: https://www.eia.gov/outlooks/aeo/pdf/0383(2017).pdf

[26] See footnote 7.

We created our demand sensitivity cases by shifting the U.S. natural gas demand curve in the Global Natural Gas Model where the price adjustments are carried out using our computed demand elasticities.[27]

Together, these two branches of the probability tree yield nine distinct combinations of assumptions about U.S. natural gas supply and demand (three supply cases multiplied by three demand cases).

3. Rest of the World Natural Gas Supply

The reference case for international natural gas supply and demand was based on the IEO 2017 Reference Case. However, none of the published outlooks that we examined provide a sensitivity analysis on world natural gas supply. Therefore, we constructed our own low ROW supply case for the alternative. We did not construct a high ROW supply case.[28]

Natural gas supply could be limited outside the U.S. for multiple reasons including:

- Production limits by current exporters to maintain higher prices;
- War or insurrection in natural gas producing countries; or
- Unfavorable geology (e.g., low permeability rocks that have significant natural gas content but are not responsive to hydraulic fracturing like major U.S. plays) and/or an inability to deploy hydraulic fracturing technology successfully (e.g. due to political, logistical or geographic reasons) in countries with significant unconventional natural gas resources.

For the ROW alternative supply case, we start with the IEO 2017 Reference and the AEO 2017 Low Oil and Gas Resource and Technology cases. We observe that in the IEO 2017 Reference Case, ROW natural gas production increases from 96 Tcf in 2020 to 139 Tcf in 2040. In the EIA Low Oil and Gas Resource and Technology side case, U.S. production declines by about 6% from 2020 to 2040. Therefore, to create a case for ROW supply that parallels the AEO 2017 U.S. Low Oil and Gas Resource and Technology side case, we decrease the IEO 2017 Reference

[27] The demand elasticities for each model period are the coefficients on the natural gas price in a logarithmic regression of natural gas demand on the natural gas price, using as data the natural gas price and natural gas demand for each of the three AEO 2017 outlooks (Reference, HOGR and LOGR) in that year.

[28] The IEO 2017 Reference outlook for ROW supply assumes large-scale application of hydraulic fracturing and unhindered expansion of pipeline and LNG terminals resulting in an optimistic ROW natural gas supply forecast. We believe that there is little room to expand ROW natural gas supply beyond that which is already reflected in the IEO 2017 Reference outlook. Hence, we do not consider a high ROW natural gas supply case. Even if such an outcome did occur, its effect would be to lower U.S. LNG exports, and the assigned question for this study deals with the macroeconomic effects of higher LNG exports.

Case natural gas production number for 2020 (96 Tcf) by 6% to obtain the Low projection of ROW supply of 90 Tcf in 2040.

4. Rest of World Natural Gas Demand

The next branch point in the probability tree is ROW natural gas demand. There are relatively few global natural gas forecasts that provide a range of scenarios that would allow us to isolate drivers of global natural gas demand outside the U.S. The two that do are the EIA's International Energy Outlook 2017 (IEO 2017) and the International Energy Agency's World Energy Outlook 2016 (WEO 2016). We use the IEO Reference case for our central estimate because of its consistency with the AEO 2017 cases used for the U.S., and we adopt the WEO 2016 as the basis for the sensitivity cases on ROW demand.

The WEO 2016 has three global scenarios, labeled Current Policies, New Policies, and "450 ppm" that differ in their assumptions about the policies that limit greenhouse gas emissions rather than macroeconomic demand drivers. The New Policies scenario, which is the central scenario, incorporates global policies and measures that are already in place and includes goals and intentions that have been announced, even though they are yet to be implemented. These include both greenhouse gas targets as well as the targets that are part of the Nationally Determined Contributions (NDCs) pledged under the Paris Agreement. The IEO 2017 Reference Case adopted as our middle case projects natural gas consumption levels quite similar to those of the WEO New Policies Case. The Current Policies case incorporates only those policies or measures formally adopted as of mid-2016.[29] The 450 ppm case assumes a set of policies with the objective of limiting the average global temperature increase in 2100 to 2 degrees Celsius above pre-industrial levels.[29]

In the WEO 2016 New Policies scenario, global gas demand grows on average at 1.5% per year to 2040 with slower growth observed in the long-term compared to the medium term (2.3%).[30] This slower growth is caused by slower uptake of primary energy demand as more environmental regulations come into effect and saturation levels are reached in certain mature markets. Natural gas demand grows more quickly in the New Policies case, at 1.9% per year on average, but natural gas displaces coal to a lesser extent as coal faces a substantially lower number of environmental regulations.[30] In the 450 ppm case, gas demand grows through the mid-2020s but starts to level off with the average growth over the projection period at 0.5%.[31] Oil and coal demand decline by an average of 1% and 2.6% per year, respectively.

Our reference case for ROW natural gas demand is calibrated to the IEO 2017 Reference Case. Initially, to construct our high case, we calculated the percentage change in natural gas demand

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[29] Pg. 627, World Energy Outlook 2016, International Energy Agency, November 2016
[30] Pg. 166, World Energy Outlook 2016, International Energy Agency, November 2016
[31] Pg. 167, World Energy Outlook 2016, International Energy Agency, November 2016.

between the WEO Current Policies case and WEO New Policies case, and then applied this change to the demand in our IEO Reference.[32] Similarly, to construct our low case we applied the percentage change between the WEO 450 ppm case and WEO New Policies case to the IEO Reference case.

However, based on reviewer feedback described in Sections B and C of Section IV, we ultimately changed the high ROW demand case before carrying out the analysis. In particular, we doubled the difference between our original high demand case and our reference case to arrive at the final high ROW demand case.

B. Range of Outcomes and Implementation of the Shocks

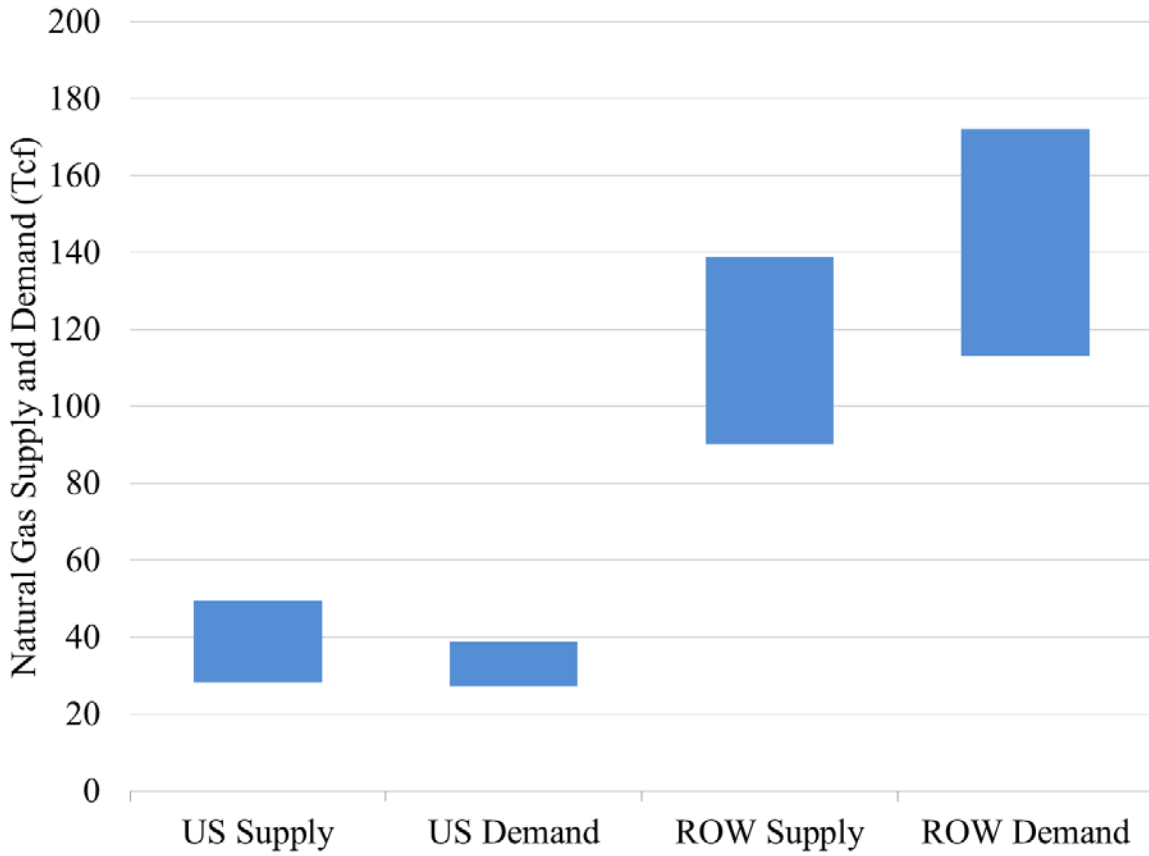
Taking into account the natural gas market conditions of these four branch points yields 54 possible scenarios. The ranges of U.S. demand, U.S. supply, ROW supply, and ROW demand in the study endpoint year 2040, spanning all the scenarios, are shown in Figure **6**.

The highest projections of LNG exports will come from the scenarios that have the highest values for net U.S. supply of natural gas combined with the highest values for net demand for natural gas in the ROW. The scenario with the maximum level of U.S. LNG exports includes supply assumptions per the High Oil and Gas Resource and Technology case and demand assumptions per the Low Economic Growth case for the U.S. with ROW demand levels per the WEO Current Policies and production levels per the Low ROW supply case.

For this scenario, the maximum U.S. excess supply equals about 22 Tcf. This excess supply is computed as the difference between the central estimate for U.S. supply in the AEO 2017 High Oil and Gas Resource and Technology case and that for U.S. demand in the Renewables Mandate case. ROW excess demand equals about 82 Tcf. This excess demand is computed as the difference between the central estimates for ROW demand in the WEO 2016 Current Scenario and that for ROW supply in the Low Supply Case (see Table 19 in Appendix C) at the prices assumed in constructing each of those scenarios.

[32] We use this approach to maintain consistency because there are some differences in the ROW demand between the reference cases of IEO and WEO. We continue to reference the High and the Low cases as WEO 2016 Current Policies and 450 ppm even though the ROW natural gas demand is slightly different than projected in the WEO 2016.

Figure 6: Range of Natural Gas Market Conditions in 2040



Since supply and demand in each of these scenarios are calibrated to different natural gas price levels, the Global Natural Gas Model (GNGM) will apply the supply and demand shifts computed for each case and solve for new equilibrium prices and quantities.

Therefore, when the GNGM finds a new equilibrium for this extreme case, it will increase U.S. excess supply and reduce ROW excess demand, leading to higher world LNG prices and U.S. LNG exports increasing to somewhere between 22 and 82 Tcf (equilibration will raise prices to increase U.S. supply and lower U.S. demand, while simultaneously lowering ROW demand and raising ROW supply) until global supply for natural gas equals global demand.

Where in this range the solution for LNG exports is found will depend on the relative magnitudes of U.S. and ROW supply and demand elasticities.

III. STUDY METHODOLOGY AND KEY ASSUMPTIONS

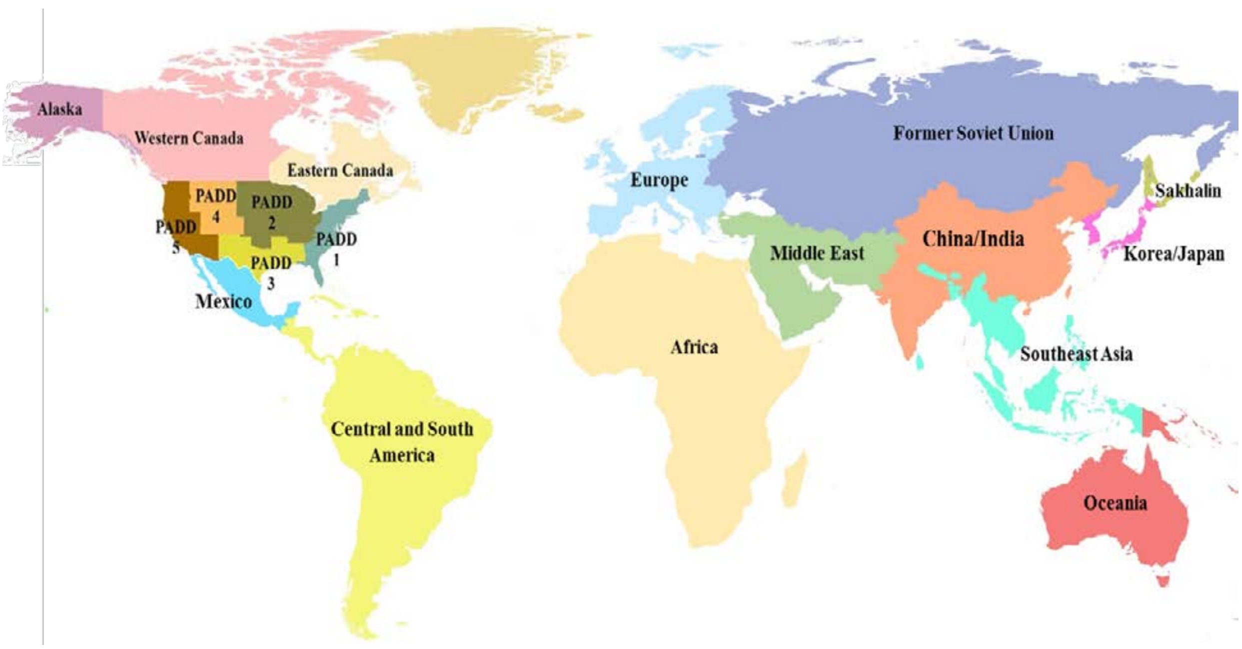
A. The Global Natural Gas Model (GNGM)

The GNGM is a worldwide model of the natural gas market: LNG trade, interregional pipelines, and regional supply and demand. It allows NERA experts to examine the likely direct and indirect impacts on regional gas markets of various industry developments and policy choices. Using the GNGM, we can take into account developments in individual regions and gauge region-specific market outcomes.

The Global Natural Gas Model's structure has full flexibility in terms of the time periods and regions it covers. For this study, the model divides the world into 18 regions and solves for equilibrium natural gas flows, supply, and demand for the years 2020 to 2040 in five-year time steps. The model can be adapted to analyze any individual region, as well as consider a more granular time scale.

The regional structure allows the model to factor in key components driving the natural gas market, including pipeline and marine linkages among regions, competition among supplier regions, and competition between LNG and natural gas pipelines. Figure 7 shows the model's regions for this analysis. A more detailed discussion of the structure of the model and data assumptions is presented in Appendix A.

Figure 7: Global Natural Gas Model Regions



B. N_{ew}ERA Macroeconomic Model

NERA developed the N_{ew}ERA model to forecast the impact of policy, regulatory, and economic factors on the energy sectors and the economy. When evaluating policies that have significant impacts on the entire economy, one needs to use a model that captures the effects as they ripple through all sectors of the economy and the associated feedback effects. The version of the N_{ew}ERA model used for this study includes a macroeconomic model that represents all sectors of the economy.[33]

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

There are great uncertainties about how the U.S. natural gas market will evolve domestically and internationally. The N_{ew}ERA model addresses the key factors affecting future U.S. natural gas demand, supply, and price. One of the major uncertainties is the availability of shale gas in the United States. To account for this uncertainty and the subsequent effect it could have on the domestic markets, the N_{ew}ERA model includes resource supply curves for U.S. natural gas. The model also accounts for pipeline trade in natural gas with Mexico and Canada, and the potential build-up of liquefaction plants for exporting LNG. N_{ew}ERA also has a supply (demand) curve for U.S. imports (exports) that represents how the global LNG market price would react to changes in U.S. imports or exports. On a practical level, there are also other important uncertainties about the ownership of LNG plants and how the LNG contracts will be formulated. These have important consequences on how much revenue can be earned by the U.S. and hence overall macroeconomic effects. [34]

U.S. wellhead natural gas prices in the N_{ew}ERA model are matched to the resulting prices from the GNGM. Supply curves in both models were calibrated consistently to reflect the supply elasticities discussed in Appendix B. The N_{ew}ERA model includes other energy and non-energy markets. Since the N_{ew}ERA model includes trade in goods and services, the international trade account in the N_{ew}ERA model is balanced by constraining changes in the current account deficit over the model horizon.

This treatment of the current account deficit allows for the potential trade benefits from LNG exports. Although trade will be in balance over time, the terms of trade shift in favor of the U.S.

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[33] The current structure of the model is similar to the one used in the 2012 Study.

[34] In the N_{ew}ERA model, it is possible to represent these variations in domestic versus foreign ownership of assets and capture export revenues to better understand the issues. However, this study does not investigate these issues.

because of LNG exports. That is, by exporting goods of greater value to overseas customers, the U.S. is able to import larger quantities of goods than it could if the same domestic resources were devoted to producing exports of lesser value. Allowing the production of high value exports to proceed has a similar effect on terms of trade as would an increase in the world price of existing exports or an increase in productivity in export industries.

The baselines for the N$_{ew}$ERA model are based on the EIA's AEO 2017 Reference, High Oil and Gas Supply and Low Oil and Gas Supply cases. These baselines and other modeling assumptions are discussed in Appendix B.[35]

C. Linkage between GNGM and N$_{ew}$ERA Macroeconomic Model

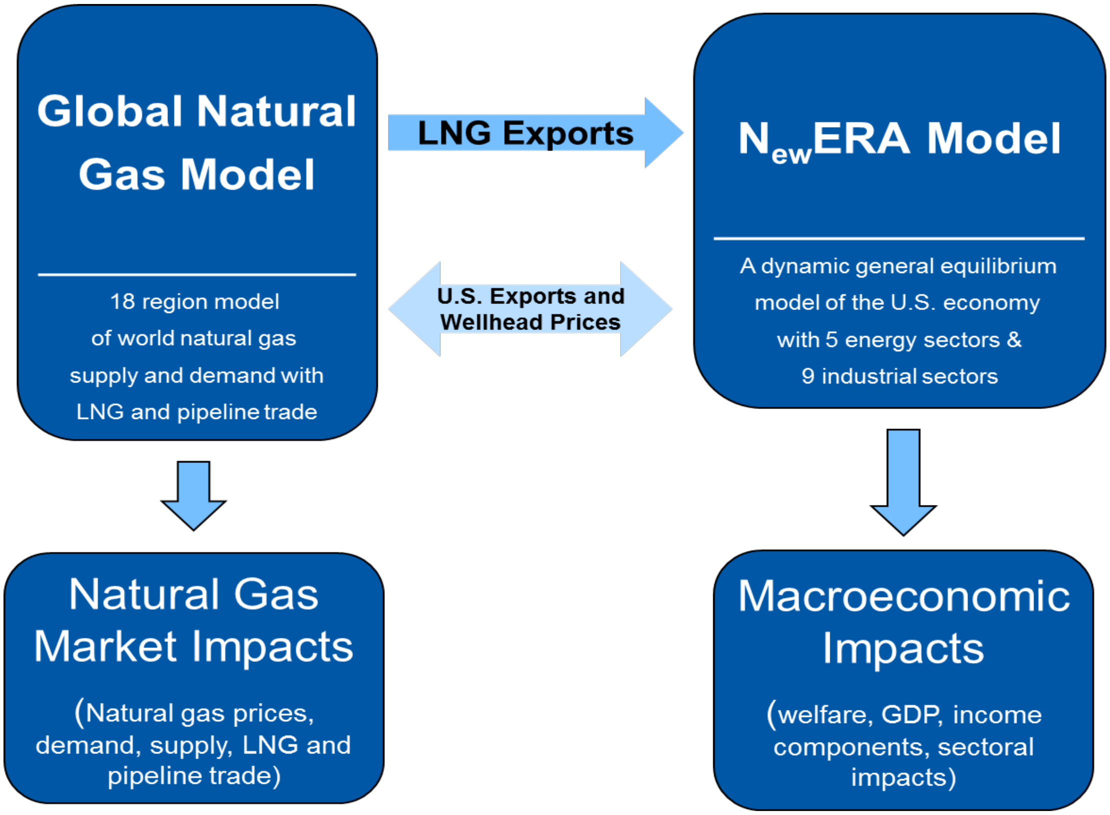
It is important to link consistently the two models to accurately capture the natural gas market effects. The first step is to consistently calibrate the baselines of the two models. In other words, the two models should start with the same natural gas market outlook.

As discussed in Appendix B, the N$_{ew}$ERA model is consistently calibrated to the U.S. natural gas production, demand, and prices generated in three GNGM baselines. Which of the three calibrated models is used depends on the assumed U.S. natural gas supply scenario being analyzed. The U.S. LNG exports volumes and net natural gas pipeline trade from the GNGM are used as inputs to the N$_{ew}$ERA model. The N$_{ew}$ERA model is adjusted so that the resulting U.S. natural gas prices, total natural gas demand, total natural gas supply, and net natural gas trade values are consistent with the GNGM results.[36] Figure 8 presents a schematic of the linkage between the two models.

[35] Natural gas production, demand, and prices in the N$_{ew}$ERA model are calibrated to the GNGM natural gas production, demand, and prices. See Appendix B for a discussion of GNGM calibration.

[36] Since the structures of the GNGM and N$_{ew}$ERA models are different, we make adjustments in the model parameters for elasticity of substitution between energy inputs in the N$_{ew}$ERA model to replicate the natural gas demand response seen in the GNGM. Although the two models use the same natural gas supply elasticities, given the structural differences we marginally change the supply elasticities to get consistent natural gas supply and natural gas price responses between the two models.

Figure 8: Linkage between GNGM and N_{ew}ERA Model



IV. PROBABILITY ASSIGNMENTS

A key feature of this study is to provide not only quantification of the effects to the U.S. natural gas market and its overall economy under each of the scenarios outlined, but also an assessment of the probability of each of these scenarios, and thus the probability of the natural gas and macroeconomic outcomes associated with each. To this end, we first developed our own estimates of the probabilities for the level of U.S. supply and demand as well as supply and demand in the rest of the world. Once we had settled on our probabilities, DOE/FE and its support contractor KeyLogic, Inc. contacted a set of independent experts recommended by DOE to obtain their probability assignments for these same four metrics. After receiving their feedback, we re-evaluated our original probability assignments to arrive at final probabilities. The remainder of this section discusses our process of formulating our original probability estimates and our process of developing our final probability estimates.

A. Original Probability Assignments

Table 2 provides our initial assessment of the probabilities to be assigned to each of the cases for U.S. and ROW supply and demand assumptions. These were later modified based upon feedback from the peer review process. For each of the central estimates, we compute a range around with the upper and lower bound symmetrically located around the central estimate. The probabilities are assigned to the range within which each of the central estimates falls.[37]

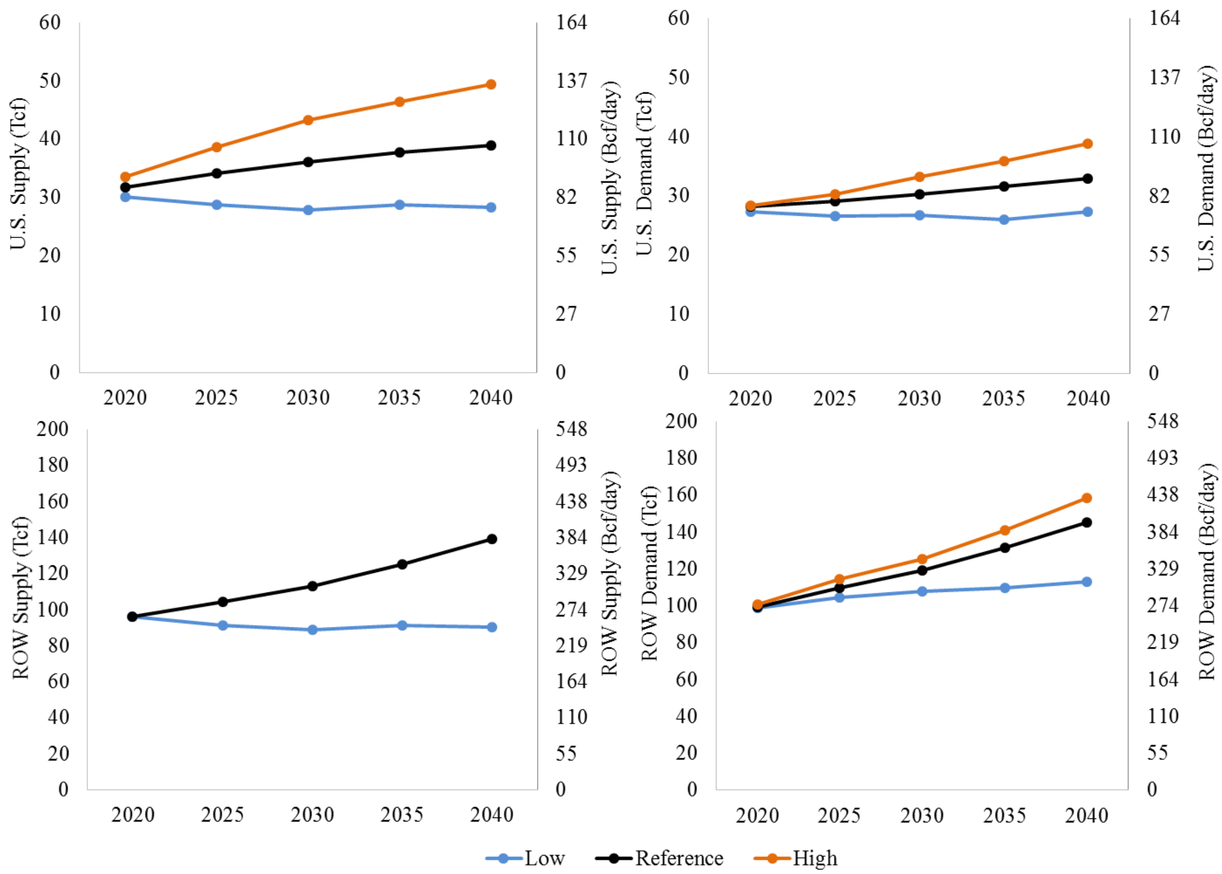
Table 2: Original Probability Assignments for U.S. and ROW Supply and Demand Levels (Tcf)

	US Supply	US Demand	ROW Supply	ROW Demand
Case	AEO 2017, HOGR	Robust Economic Growth		High Demand
Probability	30%	17%		65%
Case	AEO 2017, Reference	AEO 2017, Reference	IEO 2017, Reference	IEO 2017, Reference
Probability	55%	66%	75%	30%
Case	AEO 2017, LOGR	Renewables Mandate	Low Supply	WEO 2016, 450 ppm
Probability	15%	17%	25%	5%

[37] Since technically the probability of any specific outcome is zero, probabilities must be assigned to a finite range around each of the central estimates to be meaningful.

Figure 9 shows the central estimates that were developed initially by the study team for the high, reference, and low cases for the various supply and demand categories for each year within the model horizon.

Figure 9: Central Estimate for High, Reference, Low Cases of U.S. and ROW Supply and Demand



1. U.S. Natural Gas Supply

The AEO 2017 provided the three cases for U.S. natural gas supply. The variations from the AEO 2017 Reference Case are based on the EIA High Oil and Gas Resource and Technology and Low Oil and Gas Resource and Technology side cases for AEO 2017. To create these cases EIA assumed respectively a 50% increase or decrease in technically recoverable resources and a 50% increase or decrease in technology improvements related to drilling costs and productivity compared to the reference case.

Previous EIA forecasts have underestimated growth in U.S. oil and gas production, as the pace of improvement in drilling and hydraulic fracturing technologies outpaced expectations. Moreover, EIA's assessment of the U.S. technically recoverable resource base in its AEO 2017 Reference

Case is lower than the estimates estimated by ICF and other sources.[38] Therefore, we assigned probabilities of 30% to the AEO 2017 High Oil and Gas Resource and Technology Case and 55% to the AEO 2017 Reference Case. We believe that the technology implementation and resource level assumptions in the AEO 2017's Low Oil and Gas Resource and Technology case are highly unlikely. However, taking into account the potential for policies that would restrict access to resources or use of technology; we assigned a probability of 15% to the Low Oil and Gas Resource and Technology Case.

2. U.S. Natural Gas Demand

Many factors influence U.S. natural gas demand such as overall economic growth, industrial sector growth, natural gas related policies and regulation, and other factors that have a direct impact on the natural gas sector. Higher (lower) economic growth tends to lead to higher (lower) demand for all energy sources including natural gas. Similarly, an increase in investment in energy intensive sectors and in particular in the chemicals sector will also support higher demand for natural gas as both fuel and feedstock. Policies and regulations that favor energy sources that compete with natural gas will discourage natural gas demand.

It was not possible to use AEO 2017 side cases for natural gas demand in the same way that we used AEO 2017 alternative supply cases. Variations from the AEO 2017 Reference Case natural gas demand found in the AEO 2017's Reference, High and Low Macroeconomic Growth side cases provide insufficient natural gas demand variation for our analysis. Hence, we constructed our own two side cases that provide a much larger variation in U.S. natural gas demand than the EIA's economic growth side cases.

For the high demand case, Robust Economic Growth, we assume that the economy grows at a much healthier rate than the economic growth rate of 2.1% projected in the AEO 2017 Reference case, and even higher than projections made by the current Administration of the effects of its economic, regulatory and tax policies.[39] We assume that the U.S. economy will exhibit an annual average economic growth rate of 3.7% between 2020 and 2040. To achieve this average growth rate, we assume that the U.S. economy achieves an average growth rate of 3.9% between 2020 and 2030 and then tapers to an average annual rate of 3.5% from 2030 to 2040. Although

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[38] ICF estimates the current U.S. technically recoverable natural gas resource to be 3,693 Tcf. The latest technically recoverable resource estimate from the Potential Gas Agency at the Colorado School of Mines is 3,141 Tcf. The natural gas technically recoverable resource used in the EIA 2017 AEO Reference Case was 2,355 Tcf (including proven reserves defined as of early 2015). Pg. 14, Impact of LNG Exports on the U.S. Economy: A Brief Update, September 2017. Available: https://www.eia.gov/outlooks/archive/aeo17/assumptions/pdf/oilgas.pdf

[39] The White House Office of the Press Secretary Briefing by Secretary of the Treasury Steven Mnuchin and Director of the National Economic Council Gary Cohn April 26, 2017. https://www.whitehouse.gov/briefings-statements/briefing-secretary-treasury-steven-mnuchin-director-national-economic-council-gary-cohn/

these accelerated rates of economic growth are unlikely, we chose them in order to construct a case that provides for differences between the reference and high demand cases comparable in percentage terms to the differences between the reference and high oil and gas resource and technology cases.[40] These high rates of economic growth should be viewed as a proxy for all the factors that could push U.S. natural gas demand growth to very high levels.

To construct natural gas demand under this robust economic growth, assuming that prices remain at baseline levels, we assume an average income elasticity of natural gas demand of 0.65 based on econometric estimates.[41]

Using the income elasticity of natural gas demand and the change in the overall U.S. income (GDP) relative to the AEO 2017 Reference case, we estimate that economy-wide natural gas demand would increase by 6 Tcf compared to the AEO 2017 Reference case in 2040.

For the low demand case, termed the Renewables Mandate case, we assume an aggressive national renewable energy policy that is in line with California's stringent RPS target. This mandate crowds out natural gas generation and natural gas demand in the electric sector. We estimate that by 2040, this mandate will displace 6 Tcf of natural gas in the electric sector.[42]

The last time U.S. economic growth rate exceeded 3% was in 2005. The likelihood that the U.S. would exceed a 3% growth rate over the next three decades and generate high levels of natural gas demand keyed to such a robust and sustained economic growth is relatively low. Similarly, the possibility of the imposition of a more stringent RPS that would displace natural gas in an era of abundant natural gas resource and potentially risk grid stability is equally unlikely. Given these circumstances, we assigned a 66% probability for the Reference case and only a 17% probability to each of the two side cases (Table 2).

3. Rest of the World (ROW) Natural Gas Supply

Having found no projections of global natural gas production under different assumptions about natural gas resource estimates and natural gas resource development technology in the rest of the

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[40] The most recent (March 2017) OMB forecast was for 2.8% real GDP growth from 2018-2022 and for 3.0% real GDP growth from 2022-2027.

[41] Burke, P.J. and Yang, H. "The price and income elasticities of natural gas demand: International evidence." Australian National University, Working Paper No. 2016/14, August 2016.

[42] To estimate the reduction in natural gas demand in the electric sector from a stringent RPS policy, we run NERA's proprietary electricity model (N_{ew}ERA). The electricity sector model simulates the electricity markets in the United States and parts of Canada. The model includes more than 17,000 electric generating units, and capacity planning and dispatch decisions are represented simultaneously. The model dispatches electricity to load duration curves and determines investments to undertake and unit dispatch by solving a dynamic, non-linear program with an objective function that minimizes the present value of total incremental system costs, while complying with all constraints, such as demand, peak demand, emissions limits and transmission limits, and other environmental and electric specific policy mandates.

world, we constructed our own low supply assumptions while using the Reference Case as a basis for the alternative.

The IEO 2017 Reference Case projects rapid growth in ROW natural gas production. This forecast for the rest of the world implies large-scale application of hydraulic fracturing and relatively few obstacles to expanded trade by means of pipeline and LNG terminal construction. We assigned these technology and political outcomes a 75% probability of coming about. We have relatively high confidence that globalization of hydraulic fracturing and highly efficient horizontal drilling technology will occur, with transfer of the relevant technology to regions with appropriate natural gas resources. Global natural gas resources are ample to support Reference case natural gas production, and the economic and strategic advantages of natural gas production for any country with prospective natural gas resources make this case likely. Given the highly favorable institutional environment for hydraulic fracturing in the U.S. we do not project faster growth than that which has occurred in the U.S.

The lower case of ROW natural gas supply assumes that global natural gas production declines at the same rate as U.S. production in the LOGR case out to 2040. Thus far the scale of application of hydraulic fracturing and directional drilling technology to unconventional natural gas reservoirs outside the U.S. is far less extensive than in the U.S., and the low production case assumes that hydraulic fracturing never achieves the same degree of commercial success elsewhere as has been achieved in the U.S. This could be for institutional reasons, as is the case in much of Europe where mineral resources are owned by the government giving property owners no motivation to favor development, technical reasons such as a lack of rock formations amenable to hydraulic fracturing, regulatory hurdles, and a lack of well-developed service company infrastructure or obstacles to technology transfer. We assigned a probability of 25% to this case (Table 2). These probability assignments of 75% and 25% for ROW Supply cases were subsequently adjusted, as will be explained later.

4. Rest of the World (ROW) Natural Gas Demand

The Reference Case for natural gas demand in the ROW is based on the EIA's IEO 2017 Reference Case. The high and low cases for ROW demand are based on scenarios from the IEA's World Energy Outlook. The IEA's scenarios make different assumptions about the adoption of policies to limit greenhouse gas emissions. The highest natural gas demand arises in what is called a "current policy case" which includes only measures that were formally adopted in 2016. The lowest natural gas demand is obtained from a scenario in which the IEA assumes that every country adopts policies sufficient to keep global greenhouse gas concentrations under 450 ppm CO_2e. To achieve this concentration, it is necessary to phase out all fossil fuel use including natural gas over the course of the next century.

The range in natural gas demand implied by these ROW scenarios is much greater than that resulting from other factors, such as differences in rates of economic growth and industrialization. NERA experts have followed the development of international agreements on climate change for many years, and we do not expect that future progress will be very much greater than in the past. Therefore, we assign a low probability to the WEO 450 ppm case, and the highest probability to the WEO Current Policies case that assumes no additional actions to limit emissions in the ROW. Specifically, we assumed that the high natural gas demand case is about twice as likely (65% probability) as the Reference case (30% probability) and that the probability of the world adopting policies that would achieve the WEO 450 ppm CO_2e target is just 5% (Table 2). These probabilities for ROW Demand were subsequently adjusted based on peer review, as discussed in the next section.

The 54 scenarios that we analyzed are formed through every possible combination of cases from the four categories. In doing this, we assumed that a case which corresponds to an uncertainty category is independent of all other cases in the other uncertainty categories. Therefore, the probability assigned to each case is independent of the probabilities assigned to the other cases from other categories with which it is combined.

In constructing each of the categories of uncertainty, we have identified exogenous factors that affect the location of supply and demand curves, so that the assumptions made in each supply and demand category are conceptually distinct from those made in the other categories. Thus, oil and gas resources and technology have no direct effect on demand except through their influence on prices. Likewise, choices about macroeconomic growth rates and climate policy are assumed to have no effect on the development of production technology or on the nature of natural gas resources.

B. External Peer Review of the Scenario Design and Probability Assignments

In designing this study, DOE wished to avail itself of the broadest possible perspective on the potential range of natural gas supply and demand outcomes during the review period. KeyLogic Systems, Inc. organized and implemented a review of the study's proposed domestic and international demand and supply ranges, scenario probability assignments, and probability assignment rationale. Nine experts on international LNG supply and demand, listed in the acknowledgement, agreed to review and comment on the proposed forecast assumptions and propose modifications to the probabilities assigned to each case. The reviewers were provided with a brief written report[43] describing the proposed probabilities and assumptions. KeyLogic Systems, Inc. gathered the individual reviewer's responses and provided them to the study team for consideration.

C. Final Probability Assignments and Ranges

We reviewed the feedback from the peer reviewers to identify any commonalities among the recommendations for modification of the proposed scenario probabilities and the associated

[43] "Scenario Description and Probability Assignment Report," NERA Economic Consulting, October 23, 2017 was submitted to KeyLogic Systems, Inc.

ranges. After completing the review, we made the following modifications to the scenario probability assignments and ranges defined in the previous sections.

U.S. Supply Case Probabilities and Ranges: The peer reviewers did not converge on common recommendations. One reviewer suggested focusing the probabilities more towards the reference case by reducing the prominence of both the high and low cases. Another recommended reducing the probability for the reference case and increasing the probabilities for both the high and low cases. Several other reviewers agreed with the original assignment of probabilities. Since there did not appear to be a consensus on how to change the proposed probabilities as the recommendations seemed to either offset each other or agree with the original probabilities, it was decided to retain the original probability assignments. There were no changes made to our original range of U.S. Supply values or the probabilities assigned to them.

U.S. Demand Scenario Probabilities and Ranges: Here again the peer reviewers' recommendations did not have a consistent theme. One reviewer recommended greater emphasis on the reference case while another recommended deemphasizing the reference case in order to increase the importance of the high and low cases. Two other peer reviewers recommended not changing the probability assignments. Because the recommendations lacked a common theme but nevertheless seemed balanced, we retained the original probability assignments and made no changes to our original range of U.S. Demand.

Rest of World Supply Scenario Probabilities and Ranges: In this instance, there did appear to be several common themes from the peer reviewers. Several of the peer reviewers felt the proposed probabilities were reasonable. Another peer reviewer recommended assigning greater probability to the reference case. No one recommended that the low case receive more emphasis. As a result, the probability of the reference case was increased by 5% while reducing the probability of the low case by the same amount. There were no changes made to our original range of ROW Supply.

Rest of World Demand Scenario Probabilities and Ranges: In this instance there was common agreement on several themes. None of the peer reviewers recommended increasing the probability of the low world demand case. Several of the peer reviewers agreed that the reference case should receive greater importance and that the high case should receive less importance. The reviewers disagreed on the degree to which the relative importance should be modified. In addition, reviewers felt that the high end of the range for ROW demand should be increased to a level double the original differential between the reference and high cases. Based on the peer review recommendations, the high end of the range was increased as proposed by the one reviewer. The high case probability was decreased to 50% and the reference case probability was increased to 45% while keeping the low case at a probability of 5%. Table 3 presents the final probability assignments and the central estimate of the ranges that were adopted for the analysis.

Table 3: Final Probability Assignments and Central Supply/Demand Estimates (Tcf) for Each Case in 2040

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

Figure 10 shows the central estimate for the high, reference, and low cases for the various supply and demand categories across the model horizon incorporating our revised estimates for ROW supply and demand. Table 22 and Figure 29 in Appendix C present the range for U.S. natural gas supply across the model horizon. Table 23 and Figure 30 in the Appendix present the range for U.S. natural gas demand across the model horizon. Table 24 and Figure 31 in the Appendix present the range for ROW natural gas supply across the model horizon. Table 25 and Figure 32 in the Appendix present the range for ROW natural gas demand across the model horizon.

It can be seen in Figure 10 that even with the unrealistically high assumptions about U.S. GDP growth that went into the highest case for U.S. natural gas demand, the range for U.S. demand cases is far smaller than the range for U.S. supply cases.

Figure 10: Central Estimate for High, Reference, Low Cases of U.S. and ROW Supply and Demand

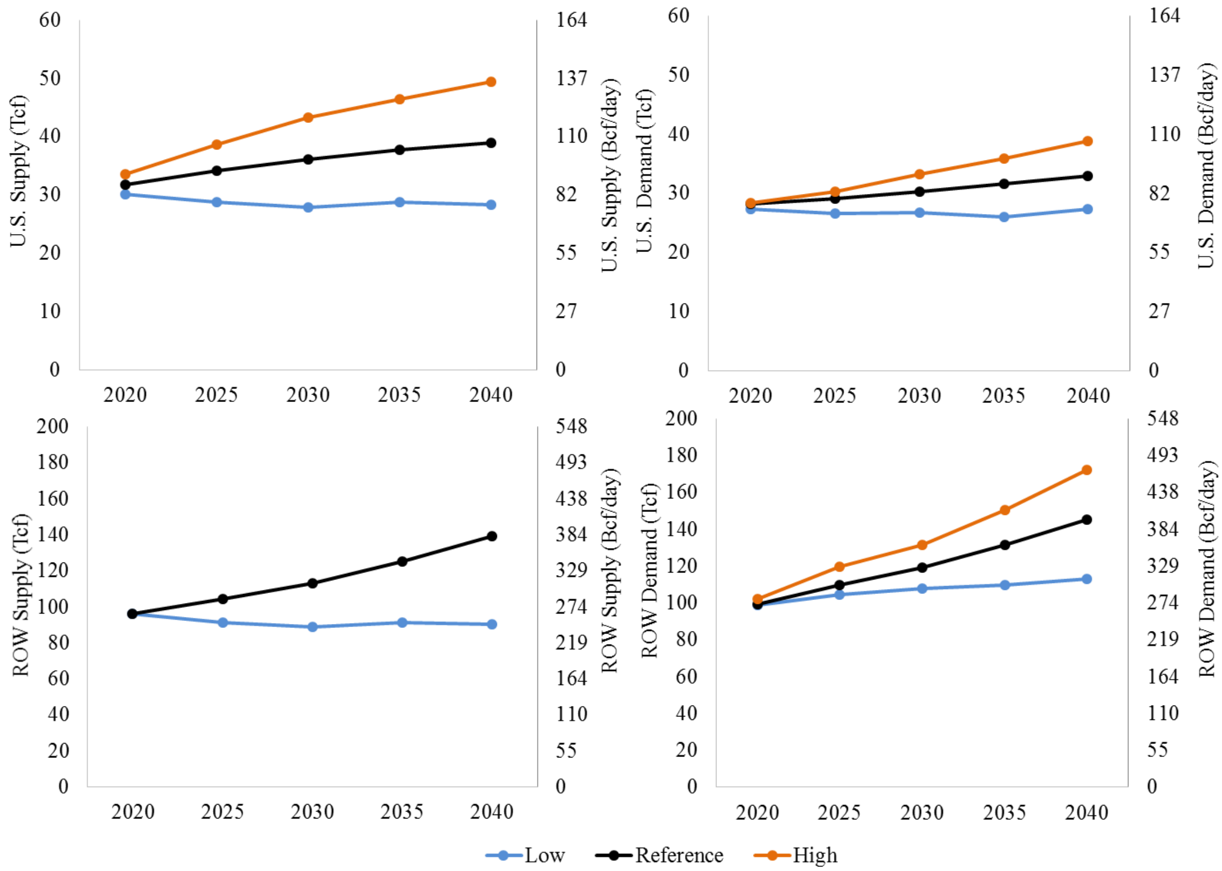

Table 21 in Appendix C provides our computation of the probability of each of the scenarios that combines one case from each of the categories of uncertainties into a full specification of assumptions for that model run. Each of the branches (scenarios) derived from in Figure 1 is a specific probability, which add up to 1 across all 54 branches. Based on the final probabilities, 40 scenarios have less than 2% chance of occurring; while the chance of occurring for rest of the other 14 scenarios is greater than 2%. There are only 2 scenarios that have probability of greater than 10% (see Table 21). For example, the scenario that combines Ref U.S. supply, Ref U.S. demand, Ref international supply, and High international demand (Ref_Ref_Ref_High) assigned relatively high probabilities for likely case assumptions resulting in the scenario probability of 14.5% (rounds to 15%). The scenario formed from unlikely case assumptions (such as Low U.S. supply, Low U.S. demand, Low international supply, and Low international demand) has a probability that rounds to zero.

To construct the scenarios built up from these cases, the demand or supply curves in GNGM were shifted by the difference between the central estimate for the uncertainty case and the corresponding estimate for the reference case. For example, to construct the Ref_High_Ref_Ref scenario, the U.S. natural gas demand curve in the Ref_Ref_Ref_Ref scenario was shifted in the direction of greater demand by 6 Tcf in 2040 and smaller amounts as shown in Figure 10 for earlier years. The natural gas markets were then balanced to generate the natural gas market effects in the Ref_High_Ref_Ref scenario.

V. NATURAL GAS MARKET RESULTS

The 54 scenarios provide a wide range of results. In this section of the report, we focus primarily on the more likely outcomes given our assumptions about the probabilities associated with U.S. natural gas production and demand and supply and demand for natural gas in the rest of the world. We define the more likely outcomes as those that result in U.S. LNG exports that are within a one standard deviation of the mean level of exports. We chose an interval of plus or minus one standard deviation[44] as the more informative because it indicates a reasonable range of uncertainty without unduly emphasizing very unlikely outcomes. This section first briefly discusses the full range of results for U.S. LNG exports. The remainder of this section focuses on the low end (16% probability) and high end (84% probability) of the "more likely range."

A. Probabilities Associated with Different Levels of Exports

One of the three major tasks of this study was to evaluate the likelihood of different levels of LNG exports and prices by means of a scenario analysis and probability assessment. Figure 11 depicts the cumulative probability distribution of LNG exports derived in this manner. A cumulative probability distribution is constructed by arranging LNG exports estimated in each of the scenarios in order by size. For each of the scenarios listed in Table 21, we find both a level of exports and a probability associated with that scenario. If we were to plot the level of exports versus its probability, we would see a graph that starts at around 1% for very low levels of exports and then rises for levels of exports near the Reference baseline and then declines back to about 1% for very high levels of exports.

To construct a cumulative distribution, we replace the probability assigned to each scenario with the sum of the probabilities for that scenario and for all scenarios with lower exports. This cumulative distribution is shown in Figure 11. The vertical axis indicates the probability that LNG exports will be less than or equal to the value of LNG exports on the horizontal axis.

The blue line in Figure 11 represents cumulative probability distribution for 2030 and the red line the cumulative probability distribution for 2040. The circled marks show where the three baselines are located. The Low_Ref_Ref_Ref baseline has less than 1 Tcf of exports in either 2030 or 2040 and probabilities of less than 10% of exports being that low or lower.

There is about 30% probability that LNG exports will be no higher than those in the Ref_Ref_Ref_Ref baseline in 2030 and about 33% in 2040. The expected value of LNG exports is found at the 50% probability level. In 2030, the expected value is about 4.5 Tcf, and in 2040 it is almost 9 Tcf. It may seem surprising at first that the scenario that combines Reference case assumptions for all four uncertainties (Ref_Ref_Ref_Ref) is so far below the mean. The reason

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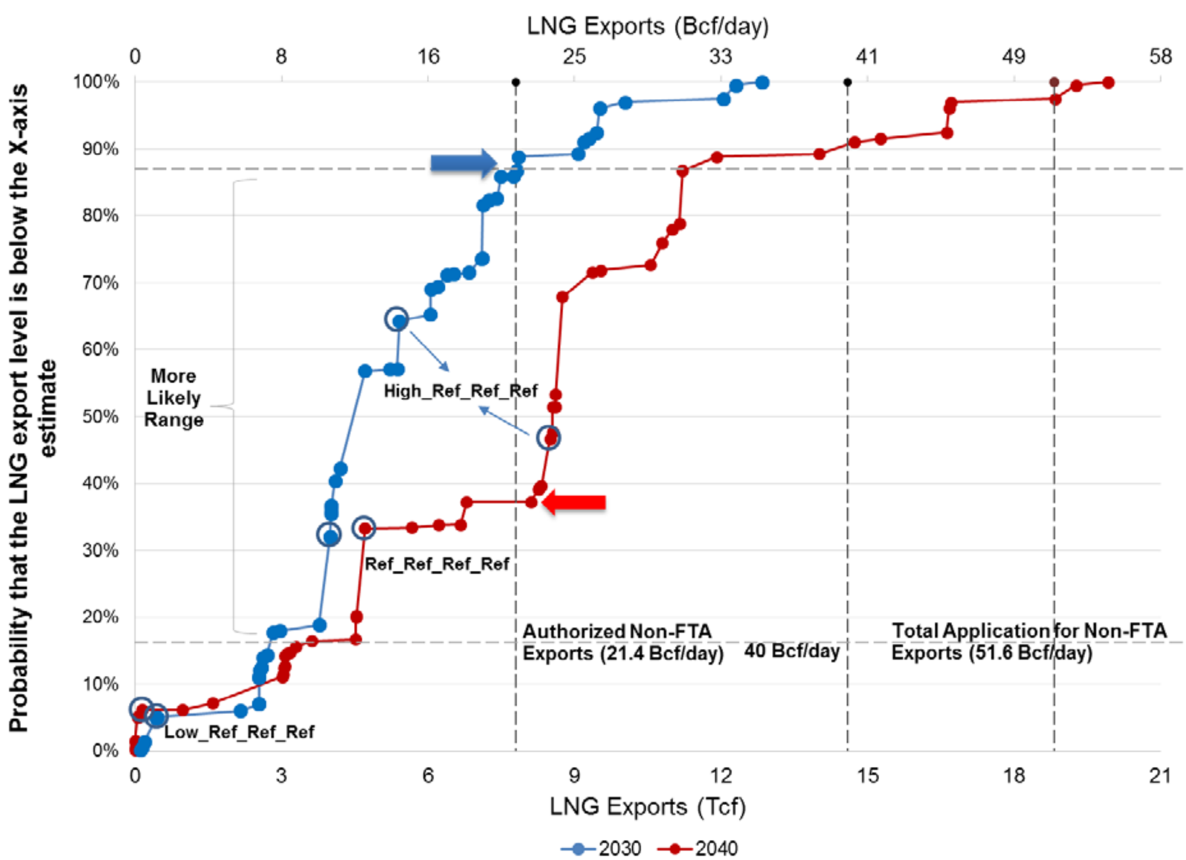
[44] Because of the discrete nature of the scenarios (i.e., we do not have a continuous probability distribution), the range includes a probability mass of 72% rather than exactly one standard deviation or 68%. For ease of discussion, we refer to the range as a "one sigma" or "more likely" range.

derives from the asymmetric assignment of probabilities to each of the cases. The U.S. High supply case is deemed much more likely than the U.S. Low supply case, and the ROW Low supply case is not balanced by any ROW High Supply case (giving ROW supply over Reference levels zero probability). Both these choices drive the mean level of LNG exports up above the Ref_Ref_Ref_Ref level.

Exports in the High_Ref_Ref_Ref scenario are about 5.5 Tcf in 2030, and there is about a 66% probability that exports will not exceed this level in 2030. In 2040 the High_Ref_Ref_Ref exports are close to 9 Tcf and just lower than the mean.

Figure 11 also serves to allow a comparison of levels of LNG exports from all 54 scenarios constructed for this study to levels of LNG exports for which DOE has received applications and authorized exports to Non-FTA countries (dashed lines on graph). This following discussion focuses on the red line; the cumulative probabilities of LNG export levels for 2040. Keep in mind that the vertical axis shows the probability that LNG exports will be less than the amount indicated by the graph; thus, the probability that LNG exports will exceed that level is 100% minus the plotted probability.

Figure 11: Cumulative Distribution of Probabilities of LNG Export Levels



Non-FTA exports up to 21.4 Bcf/d have already been authorized by DOE, and this level of exports falls well within the one-standard deviation interval around the mean scenario in 2040. There is a greater than 63% (100% - 37% indicated as a red arrow in the chart) probability that exports will reach this level by 2040, but there is only a 12% (100% - 88% indicated as a blue arrow in the chart) probability that they will reach this level by 2030.

The next step up in LNG exports, 40 Bcf/d[45], is much less likely to be reached. The cumulative probability distribution indicates that there is a less than 10% chance of exports reaching 40 Bcf/d by 2040, and virtually no chance of reaching that level by 2030 based on the study assumptions of the domestic and international natural gas markets.

As of February 26, 2018, DOE has received applications for a total of 55.04Bcf/d of LNG exports to Non-FTA countries. Again, there is virtually no chance that this level of LNG exports could be reached before 2040, and only a 2% chance that this level could be reached or exceeded by 2040.

B. Core Results – More Likely Range for U.S. LNG Exports

The core results are concerned with the more likely outcomes given our assumptions about the probabilities associated with U.S. natural gas production and demand and supply and demand for natural gas in the rest of the world.

Over time the more likely range of U.S. LNG exports increases as the spread among the scenarios with different assumptions about U.S. and ROW supply and demand widens. In 2030, the lower and upper range of the more likely range intersects the blue line at 7.7 Bcf/d and 20.5 Bcf/d, respectively (see Figure 11). The more likely range for U.S. LNG exports extends from 7.7 Bcf/d on the low end to 20.5 Bcf/d on the high end. By 2040, the high end becomes about 50% higher than the 2030 high end or 30.7 Bcf/d; while the low end remains at about the same level of 9.0 Bcf/d. In going from 2030 to 2040, the mean level of exports about doubles from 12.3 Bcf/d (4.5 Tcf) to 24.7 Bcf/d (9 Tcf), see Figure 11. Over time, the low end of the range remains fairly stable while the mean and high end continues to grow.

Of interest is how these U.S. LNG export ranges compare to the level of non-FTA exports in applications that DOE had approved as of October 2017. It is very unlikely that actual exports will reach this level of 21.4 Bcf/d by 2030. By 2040 there is about a 63% chance that the market driven level of U.S. LNG exports would reach the currently authorized level of non-FTA exports.

To summarize, our analysis finds that by the year 2040 there is a 16% chance that U.S. LNG exports will be below 9.0 Bcf/d and a 16% chance that they will be above 30.7 Bcf/d; or to put it

[45] 40 Bcf/d is an arbitrary intermediate point of reference chosen between the authorized and total application for Non-FTA export to discuss probability of export.

differently, there is about a 68% probability that U.S. LNG exports will be between 9.0 and 30.7 Bcf/d in 2040.

The Ref_Ref_Ref_Ref scenario gives rise to far less than 21 Bcf/d of LNG exports in both 2030 and 2040. As discussed, there is about a 60% probability that LNG exports will exceed the Ref_Ref_Ref_Ref level in both years. Even in 2040 this scenario yields only about 12 Bcf/d of LNG exports, while the mean value of LNG exports just exceeds the currently authorized level of 21.4 Bcf/d.

Table 4 lists twenty-seven scenarios (twelve Reference U.S. natural gas supply scenarios, five Low U.S. natural gas supply scenarios, and ten High U.S. natural gas supply scenarios) that are the more likely scenarios in 2040 (i.e., within one standard deviation of the mean for all 54 scenarios). To understand the conditions within the U.S. and internationally that define the low and high end of the range for U.S. LNG exports, we investigate the scenarios that yield these results. The remainder of this section focuses on the low end (16% probability) and high end (84% probability) of this "more likely range".[46]

Table 4: LNG Exports and Scenario Probability for the More Likely Scenarios in 2040

Scenario	LNG Exports		Scenario Probability (%)
	Tcf	Bcf/day	
Low_High_Low_High	8.3	22.7	0.3%
Low_Low_Low_High	9.5	26.1	0.3%
Low_Low_Low_Ref	4.5	12.4	0.2%
Low_Ref_Low_High	8.6	23.4	1.0%
Low_Ref_Low_Ref	3.6	9.9	0.9%
Ref_High_Low_Low	5.7	15.5	0.1%
Ref_High_Low_Ref	10.6	28.9	0.8%
Ref_High_Ref_High	8.6	23.4	3.7%
Ref_High_Ref_Ref	4.5	12.4	3.4%
Ref_Low_Low_Low	6.7	18.3	0.1%
Ref_Low_Low_Ref	11.1	30.5	0.8%
Ref_Low_Ref_High	9.4	25.7	3.7%

[46] Adding the probabilities of natural gas prices falling into each of these three groups yields a probability measure of about 72%, slightly above the definition of a one-standard deviation range because of the discrete nature of the scenarios.

Ref_Low_Ref_Ref	6.8	18.6	3.4%
Ref_Ref_Low_Low	6.2	17.0	0.4%
Ref_Ref_Low_Ref	10.8	29.6	3.3%
Ref_Ref_Ref_High	8.8	24.0	14.5%
Ref_Ref_Ref_Ref	4.7	12.9	13.1%
High_High_Low_Low	8.1	22.2	0.1%
High_High_Ref_High	11.0	30.1	2.0%
High_High_Ref_Low	3.2	8.7	0.2%
High_High_Ref_Ref	8.3	22.6	1.8%
High_Low_Low_Low	8.6	23.6	0.1%
High_Low_Ref_Low	4.5	12.4	0.2%
High_Low_Ref_Ref	8.6	23.6	1.8%
High_Ref_Low_Low	8.3	22.8	0.2%
High_Ref_Ref_High	11.2	30.7	7.9%
High_Ref_Ref_Low	3.3	9.0	0.8%
High_Ref_Ref_Ref	8.5	23.3	7.1%

In 2040, there are five scenarios that yield U.S. LNG exports at about the lower end of the more likely range (about 16% cumulative probability) as shown in Table 5:

Table 5: Scenarios at About 16% Cumulative Probability

Scenario	Cumulative Probability in 2040	U.S. Supply	U.S. Demand	ROW Supply	ROW Demand
High_Ref_Ref_Low	16%	High	Ref	Ref	Low
Low_Ref_Low_Ref	16%	Low	Ref	Low	Ref
Low_Low_Low_Ref	17%	Low	Low	Low	Ref
Ref_High_Ref_Ref	20%	Ref	High	Ref	Ref
High_Low_Ref_Low	20%	High	Low	Ref	Low

These five scenarios have one of the following characteristics – Low U.S. natural gas supply or negative to slightly positive net natural gas demand outside North America (i.e. the difference between natural gas demand and natural gas supply outside North America). In the cases where the U.S. natural gas production is costly and limited (i.e., LOGR cases), the U.S. natural gas demand situation and the natural gas supply and demand situation outside the U.S. are mostly irrelevant. Under LOGR, only the small probability scenario of low natural gas supply outside North America coupled with high natural gas demand outside North America leads to U.S. LNG exports well above the lower end of the more likely range.

When net natural gas demand outside North America is negative or slightly positive (i.e., Ref ROW supply/Low ROW demand or Ref ROW supply/Ref ROW demand), U.S. LNG exports occur only when U.S. natural gas production is low cost and abundant (HOGR). For the cases where ROW natural gas supply is set at its reference level and ROW natural gas demand is set at its low level, the natural gas demand shock in the ROW causes ROW natural gas supply to exceed ROW natural gas demand by almost 26 Tcf in 2040. In this situation U.S. LNG exports can compete with natural gas supply in other regions of the world only if U.S. natural gas prices are significantly below that of natural gas prices in ROW regions. Such a relationship occurs only in the HOGR scenarios. For the cases where ROW natural gas supply and natural gas demand were set at their reference levels, ROW natural gas demand exceeds ROW natural gas supply by only 6 Tcf in 2040.

In 2040, there are three scenarios that yield levels of LNG exports close to the high end of the more likely range. These are identified in Table 6. In general, these scenarios assume U.S. natural gas resources are low cost and abundant (HOGR) and are combined with assumptions about international markets that result in large net international natural gas demand (positive differentials between ROW natural gas demand and ROW natural gas supply). All else being equal, the HOGR cases yield higher levels of U.S. LNG exports than the reference U.S. natural gas supply cases, but the dominant contributor to the high U.S. LNG exports in the year 2040 is the level of net international natural gas demand (i.e., large positive differential between ROW natural gas demand and ROW natural gas supply).

Scenarios that have large net international natural gas demand contain characteristics of either Low ROW supply/Ref ROW demand or Ref ROW supply/High ROW demand. For these cases net international natural gas demand is 23 and 33 Tcf, respectively, leading to a strong demand for U.S. LNG exports.

Table 6: Scenarios at About 84% Cumulative Probability

Scenario	Cumulative Probability in 2040	U.S. Supply	U.S. Demand	ROW Supply	ROW Demand
High_High_Ref_High	78%	High	High	Ref	High
Ref_Low_Low_Ref	79%	Ref	Low	Low	Ref
High_Ref_Ref_High	87%	High	Ref	Ref	High

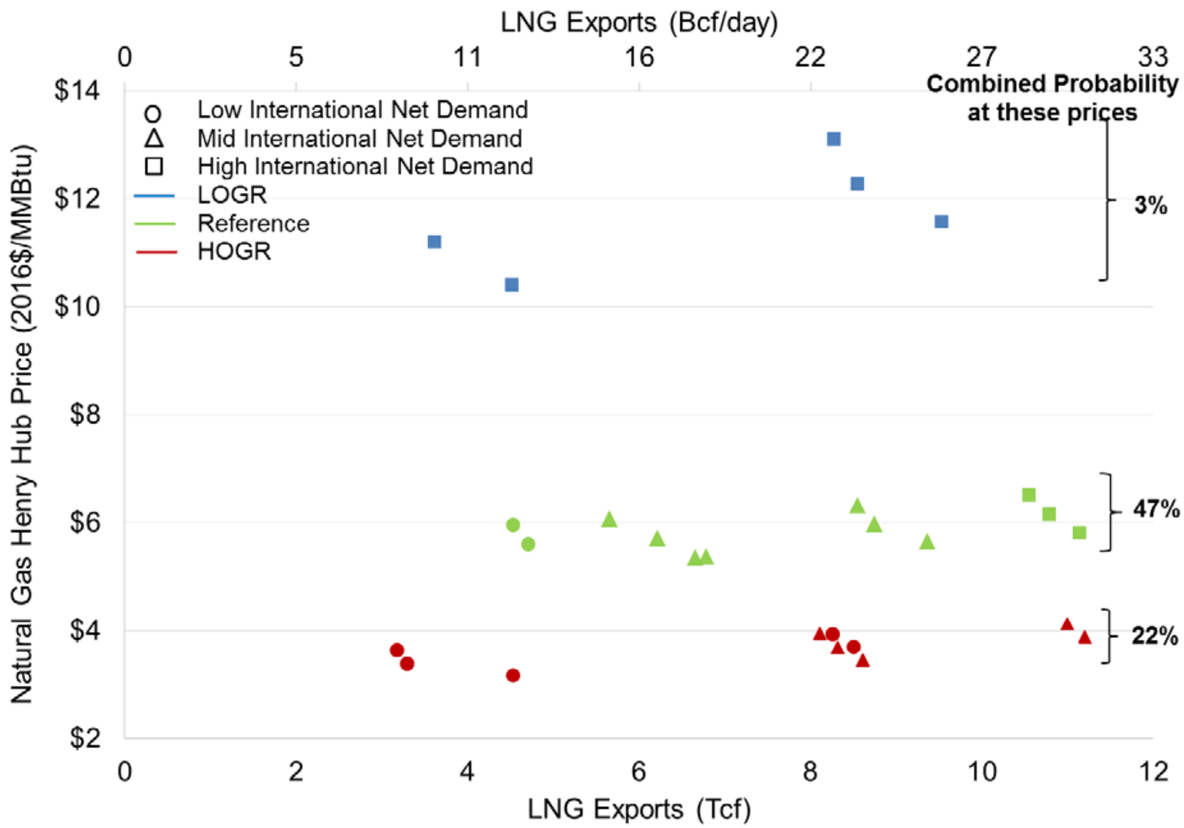
The U.S. natural gas demand forecast is of little consequence as the High_High_Ref_High and High_Ref_Ref_High scenarios have similar levels of U.S. LNG exports. The same occurs at the low end of the more likely range, where Low_Ref_Low_Ref and Low_Low_Low_Ref have a similar level of LNG exports.

C. Natural Gas Henry Hub Prices for the More Likely Range of Exports

So far, this section has concentrated on the causes for different levels of U.S. LNG exports. Impacts of the U.S. and international natural gas supply and demand balance on prices are also of interest. To this end, Figure 12 presents for the year 2040 the range of U.S. LNG exports and

U.S. natural gas prices that were estimated across all the 27 scenarios contained within the more likely range.

Figure 12 U.S. Henry Hub Prices across the More Likely Range of U.S. LNG Exports in 2040



Changes in assumptions for U.S. natural gas supply were found to have a material impact on the level of U.S. LNG exports, but U.S. natural gas demand was found to have only a second order effect. Similar to U.S. natural gas supply, net international natural gas demand affects demand for U.S. LNG exports. Therefore, each point on Figure 12 conveys information about the U.S. supply and net international natural gas demand assumptions. Colors are used to differentiate among the different U.S. natural gas supply cases: U.S. Reference (green), U.S. HOGR (red), and U.S. LOGR (blue).

Shapes are used to differentiate among the International cases. Net natural gas demand is defined as international natural gas demand minus international natural gas supply: more international natural gas supply reduces net natural gas demand for U.S. LNG exports and more international natural gas demand increased demand for U.S. LNG exports. Low net international natural gas demand cases (Ref ROW supply with either Low or Ref ROW demand) are represented by circles; mid net natural gas demand for ROW (Low ROW supply and low ROW demand or Ref ROW supply and High ROW demand) are represented by triangles; and high net international natural gas demand cases (Low ROW supply coupled with either Ref or High ROW demand) are represented by squares.

It is very clear that natural gas prices in the upper range all come from scenarios with U.S. LOGR supply. Based on the probability curve, the combined probability of all of the U.S. LOGR scenarios in the more likely range is only 3%.

For the scenarios containing U.S. reference natural gas supply levels (green) the U.S. LNG export levels are clustered according to the level of net international natural gas demand. As the net international natural gas demand increases so do the U.S. LNG exports, with circle markers representing low net international natural gas demand associated with LNG exports around 4.5 Tcf and triangle markers representing mid net natural gas demand having LNG exports from 5 to 9 Tcf. All scenarios that combine reference natural gas supply assumptions with high net international natural gas demand are represented by squares that are about one and one-half to two Tcf to the left of the triangles. For all the reference supply scenarios in the more likely range, natural gas prices could be from $5 to $6.50 per MMBtu in 2040. These mid-range scenarios have a combined probability of 47%.

The red markers (HOGR) represent the lowest natural gas prices, from $3.50 to $4 per MMBtu in 2040 and are clustered along a nearly horizontal line. With HOGR assumptions, U.S. natural gas supply can be increased at relatively low cost, enabling larger levels of LNG exports to be economic. The three red triangles in the middle and the three red circles with the lowest level of LNG exports share the same assumptions for U.S. natural gas supply and natural gas demand. They differ only in their assumptions about the net natural gas demand from the ROW. Similarly, the red triangles representing the highest LNG exports share the same assumptions about U.S. natural gas supply and natural gas demand as the two red circles in the middle and only differ in their assumption about net natural gas demand for ROW. Under the HOGR cases, the cases with high net natural gas demand lead to U.S. LNG exports exceeding the high end of the more likely range.[47] These scenarios with natural gas prices at the low end of the range have a combined probability of 22%.

[47] There is often interest in New England natural gas prices because of the frequent price spikes that have been observed there. We expect the average basis differential between New England and Henry Hub to be unaffected by changes in U.S. LNG exports in the long run. Currently, the changes in basis differential between New England and Henry Hub are often caused by changes internal to New England's natural gas supply and demand balance. When New England natural gas demand exceeds New England natural gas supply, the basis will increase. This increase in basis between New England and Henry Hub can become greater than that for other Eastern regions such as Mid-Atlantic and Henry Hub. The reason for this greater change is the limited natural gas pipeline capacity into New England. New England has no indigenous natural gas production and little storage capacity relative to swings in natural gas demand. Aside from pipeline shipments, the only other supply source to New England is delivered LNG

Figure 12 reveals two important relationships between U.S. LNG exports and U.S. natural gas prices:

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

- Available natural gas resources have the largest impact on natural gas prices. Therefore, U.S. natural gas prices are far more dependent on available resources and technologies to extract available resources than on U.S. policies surrounding LNG exports.

Figure 13 plots the entire cumulative probability distribution for Henry Hub prices, constructed in the same way as Figure 11 but plotting natural gas price on the horizontal scale instead of exports. Applying the same one-standard deviation interval of a probability greater than 16% and less than 84% (dashed lines) reveals that the more likely range of Henry Hub prices (where the curve intersects these dashed lines) is from $3.90 to $6.70 per MMBtu.

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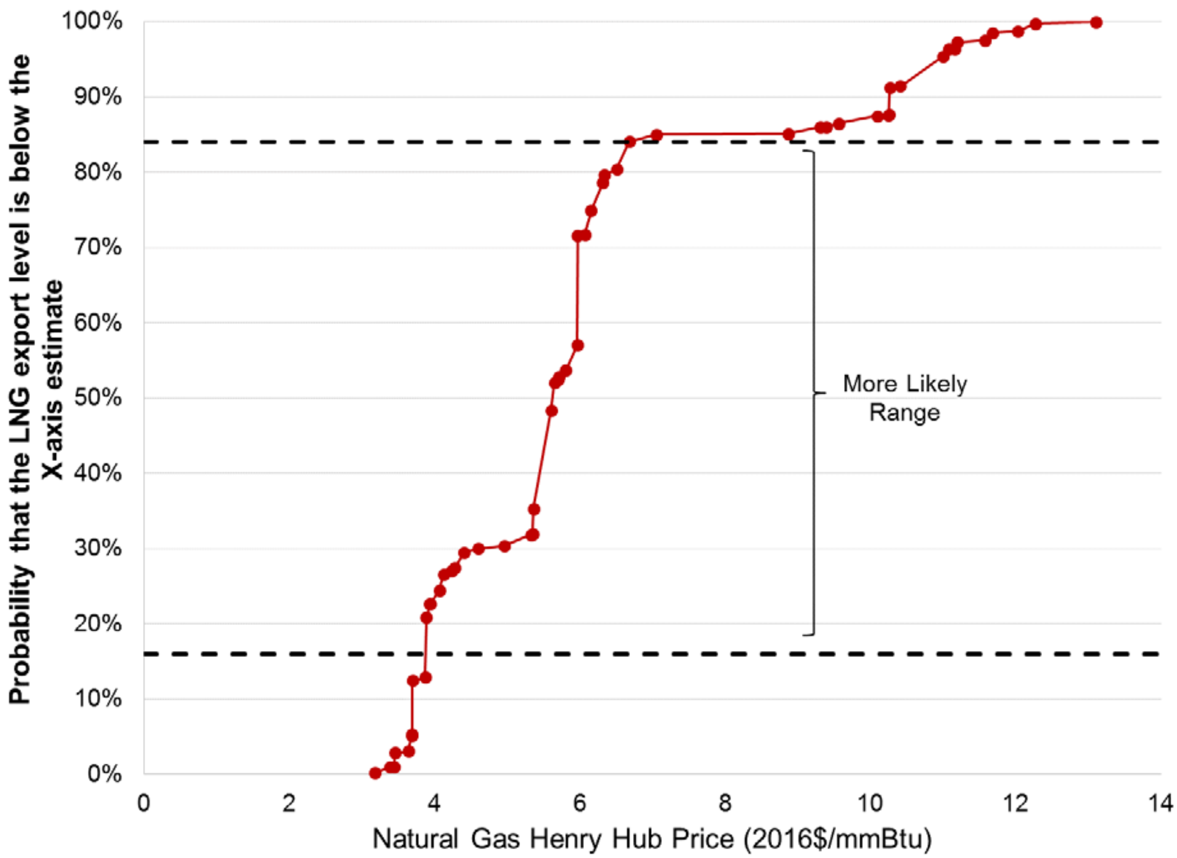
and New England's capacity to receive and store LNG is also limited. These shipments normally originate in foreign countries because the Jones Act makes shipments from the Gulf Coast prohibitively expensive. As a result, New England supply is limited by natural gas pipeline capacity into New England, New England regasification capacity, and regional storage capacity. When local demand exceeds these capacities, natural gas prices in New England will increase because it is no longer possible to deliver additional natural gas supplies into the region. This increase will happen irrespective of whether or not U.S. LNG exports are increasing or decreasing.

Figure 13: Cumulative Probabilities of U.S. Henry Hub Prices



To better understand the full range of activity in the natural gas market under different levels of LNG exports, we summarize the U.S. and outside of North America[48] natural gas supply and demand in 2040. Table 7 presents the values for these metrics for the average of the five scenarios, within the more likely range, that produce the least volume of LNG exports and the five scenarios that produce the most volume of LNG exports.

[48] Since countries in the North American region share a single natural gas market, we compare results between U.S. and outside of North America.

Table 7: Average Supply and Demand for the U.S. and Outside of North America for the Low and High Ends of the More Likely Range of Scenarios in 2040 (Tcf)

	United States		Outside North America	
Scenario	**U.S. Supply**	**U.S. Demand**	**ROW Supply**	**ROW Demand**
Low End of	35	30	116	120
High End of	47	34	126	137

For both the low and the high end of the range, U.S. natural gas supply exceeds U.S. natural gas demand as expected, since for all scenarios the U.S. exports LNG. Of interest is that this difference exceeds the difference between natural gas demand and supply outside of North America, indicating that the U.S. is a net exporter of pipeline natural gas as well.

As Figure 12 illustrates, the U.S. LNG and pipeline exports are greatest when U.S. natural gas prices are the lowest. These low natural gas prices induce greater global demand for natural gas. Thus, we see natural gas production increase both within the U.S. as well as in other regions of the world.

D. The Different Effects of U.S. Natural Gas Supply Assumptions and International Natural Gas Demand Conditions

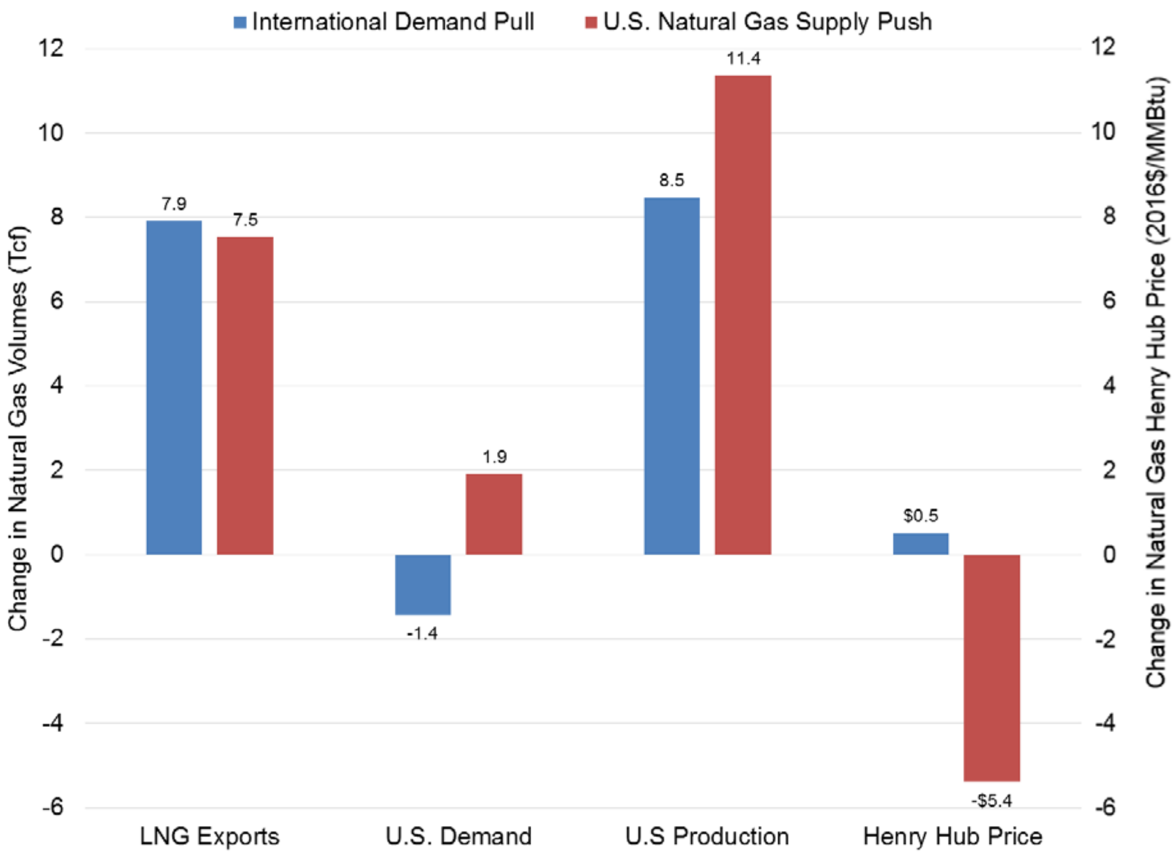
A natural gas supply/demand shock occurring in the U.S. can have a very different impact on natural gas prices than a natural gas supply/demand shock occurring outside North America even though both types of natural gas supply/demand shocks result in similar levels of U.S. LNG exports.

As an example, we describe how a natural gas supply shock on the U.S. compares to a natural gas demand shock outside North America and how diverse types of shocks in different regions of the world can result in very different outcomes for the U.S. and other regions even though the market shock brings about similar levels of additional LNG exports from the U.S. We illustrate this point by choosing to analyze two different pairs of scenarios. Each pair includes a scenario that yields a low amount of U.S. LNG exports and one that yields a high amount of U.S. LNG exports, and there is about a one standard deviation difference between the scenario that produces a low level of exports and the one that produces a high level of exports. For the first pair, the scenarios that yield a high and low level of U.S. LNG exports differ only in their assumption about the demand for natural gas in the ROW. The first pair compares the High_Ref_Ref_Low and High_Ref_Ref_High scenarios. These scenarios have two different assumptions for demand in the rest of the world, one of which gives rise to high LNG exports and the other to low LNG exports. This comparison is classified as a demand-pull ("International Demand Pull"). In the second case, we couple two scenarios that differ in their assumptions about the U.S. natural gas market that gives rise to about the same difference in LNG exports as the first pair. The second pair compares the Low_Ref_Low_Ref and Ref_Low_Low_Ref scenarios. This combination of assumptions about U.S. domestic natural gas supply and demand gives the largest range of LNG export supply (defined as domestic supply minus domestic demand. Therefore, this comparison is classified as a supply-push scenario ("U.S. Natural Gas Supply Push").

To see how the two comparisons differ in their impacts for the U.S. and outside North America while yielding similar levels of U.S. LNG exports, we display the U.S. supply, demand, Henry Hub price, and LNG exports in one figure (see Figure 14) and supply, demand, and average wellhead prices outside of North America along with U.S. LNG exports on another figure (see Figure 15). It can be seen that in the demand pull comparison, the difference in international demand for LNG induces 7.8 Tcf additional exports in the first comparison (first blue bar in both figures). The supply push from the U.S. induces 7.5 Tcf of additional LNG exports (first red bar in both figures). Thus, as designed, the two comparisons have about the same change in LNG export levels.

However, how the two comparisons arrive at these increased levels of LNG exports differs. In the international demand-pull comparison, the increase in LNG exports comes from both lower U.S. natural gas consumption (the second blue bar) and higher U.S. supply (third red bar). Because countries outside North America are competing for more U.S. natural gas, U.S. (i.e., Henry Hub) prices increase. While in the supply push comparison, both U.S. demand (second red bar) and supply (third red bar) increase. Thus in the supply push comparison, greater abundance in U.S. supply is shared between relatively elastic exports and relatively inelastic domestic demand. As we observed earlier, even in the demand pull case 80% of the increase in LNG exports comes from U.S. natural gas supply and the remaining 20% from changes in natural gas consumption. With U.S. supply push, more favorable supply conditions lead to additional U.S. natural gas production that pushes down U.S. natural gas prices so U.S. natural gas demand as well as LNG exports is greater.

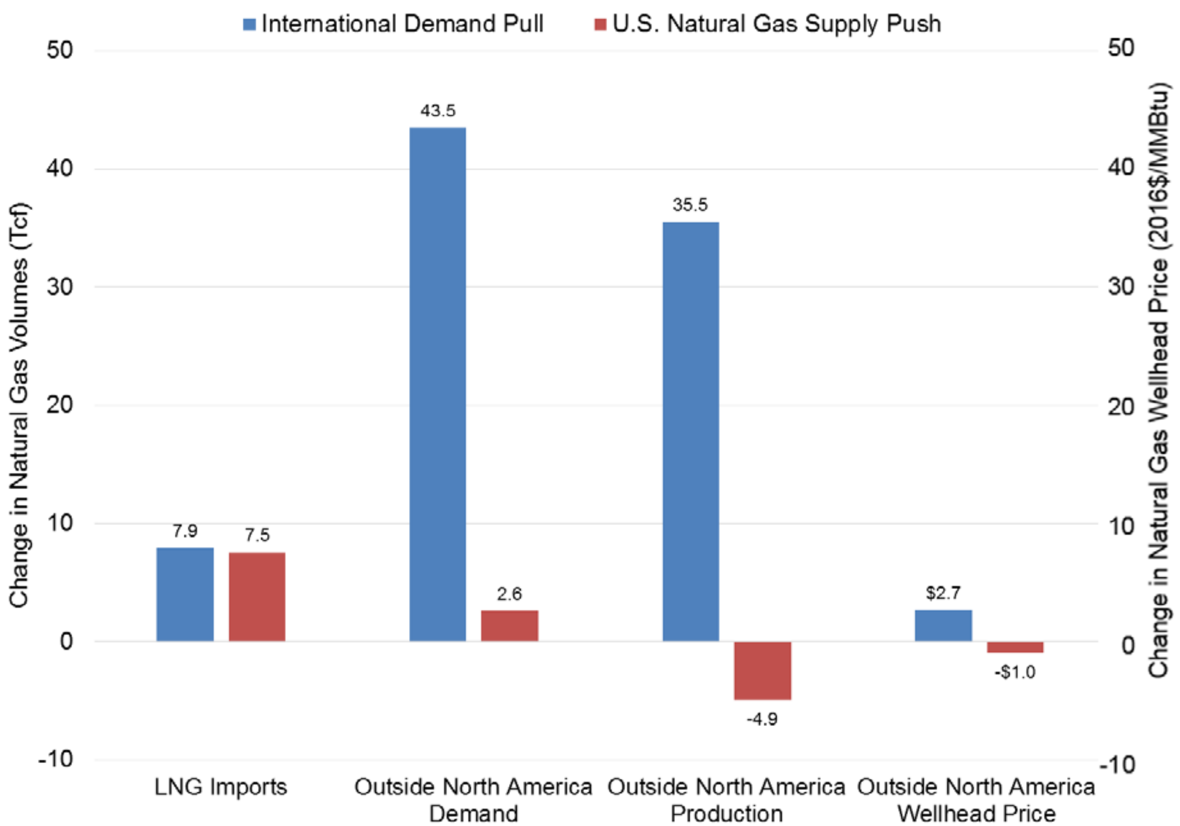
Figure 14: U.S Natural Gas Market Changes from U.S Supply and International Demand Assumptions



Note: Natural gas Henry Hub price units are represented on the secondary (right) axis.

As with the U.S. impacts, the two comparisons differ in their international impacts even though change in net trade with the U.S. (i.e., U.S. LNG exports or international imports of LNG) is about the same. Figure 15 shows that LNG imports from the U.S. into the rest of the world, which mirror U.S. LNG exports, are about the same in the two comparisons. The contrast is in international natural gas demand, where the international demand pull comparison has 43.5 Tcf in additional natural gas demand outside North America (second set of bars) while U.S. supply push stimulates only 2.8 Tcf additional natural gas demand. The last pair of bars, which show how international natural gas prices move, helps explain the changes in international supply of and demand for natural gas. In the international demand pull comparison (blue bars), higher natural gas demand in regions outside the U.S. causes natural gas prices throughout the world to increase. Moving to the left, higher natural gas prices outside the U.S. stimulate more natural gas production worldwide. In the U.S. supply push comparison, world natural gas prices are driven down by additional U.S. natural gas supply, so that natural gas production outside North America also falls.

Figure 15: Natural Gas Market Changes Outside North America from U.S. Supply and International Demand Assumptions



Note: Natural gas wellhead price units are represented in the secondary (right) axis.

In summary, the international demand pull comparison arises from an outward shift of the natural gas demand curve outside the U.S., which results in higher world natural gas prices as these are needed to induce higher levels of natural gas supply to meet the increased natural gas demand. The U.S. supply push comparison comes about from essentially a shift in the U.S. natural gas supply curve, which results in lower natural gas prices in the U.S. and abroad and greater levels of LNG and pipeline exports as greater demand is needed to absorb increased U.S. supply. Therefore, demand pull and supply push will result in very different movements in global natural gas prices and production patterns, even if they lead to similar changes in U.S. LNG exports.

E. U.S. LNG Export Revenues

U.S. LNG export revenues are higher with higher LNG prices and also with higher levels of LNG exports. Table 8 shows LNG exports and LNG export revenues for a subset of the more likely scenarios. The range of the highest LNG export revenues across different U.S. natural gas supply assumptions is from $71 billion to $129 billion in 2040. The high end of this range is from the scenarios that provide the most favorable conditions for LNG exports (higher U.S.

natural gas supply or low international natural gas supply coupled with high international natural gas demand), and the low end of the range is from the scenarios that provide less favorable conditions for LNG exports (low or reference U.S. supply with reference international supply and reference U.S. and international demand).

Table 8: LNG Exports (Bcf/d) and LNG Export Revenues for a Subset of the More Likely Scenarios in 2040

Scenario	LNG Exports (Bcf/day)	LNG Export Revenues (2016$ Billion)
Low_Ref_Ref_Ref	0.1	4
Low_Ref_Low_Ref	9.9	5
Low_Ref_Low_High	23.4	129
Ref_Ref_Ref_Ref	12.9	38
Ref_Ref_Ref_High	24.0	75
Ref_Ref_Low_Ref	29.6	94
High_Ref_Ref_Ref	23.3	52
High_Ref_Ref_High	30.7	71

For supply push comparisons in which only assumptions about U.S. supply differ, such as Ref_Ref_Low_Ref versus Low_Ref_Low_Ref, U.S. LNG exports will increase and drive down world natural gas prices, so that LNG export revenues may increase more slowly than LNG exports. Comparing Low_Ref_Low_Ref to Ref_Ref_Low_Ref, we see LNG export revenue differs by only 87% even though LNG exports triple. In a supply-push comparison, the natural gas price is higher in the scenario with lower natural gas supply and lower LNG exports, Low_Ref_Low_Ref in this specific comparison, so that higher LNG exports are offset to some extent by lower natural gas prices when U.S. natural gas supply is increased and all other assumptions remain the same.

On the other hand, demand pull comparisons results in both higher LNG exports and higher natural gas prices, so that revenues increase faster than LNG exports. The rate of increase is not that much greater for LNG export revenues though, because as shown in Figure 12, U.S. natural gas prices increase slowly with increasing U.S. LNG exports.

VI. MACROECONOMIC OUTCOMES

A. Organization of the Findings

Many factors influence the volume of LNG that the U.S. might export into the global market. These factors include supply and demand conditions in the global market and the availability of natural gas in the U.S. The GNGM analysis, discussed in the previous section, identified 54 distinct LNG export scenarios under different U.S. and world gas market dynamics. Out of these 54 scenarios, 12 representative scenarios were selected for macroeconomic analysis. The 12 scenarios include 3 different baselines and 9 alternative shock scenarios (three per baseline), henceforth referred to as "Macroeconomic scenarios."[49] The scenarios are grouped according to the outlook for U.S. natural gas resources as:

- **Reference U.S. natural gas resource outlook with CPP:** With this group, Ref_Ref_Ref_Ref is the baseline that is consistent with EIA's AEO 2017 with CPP case. Against this baseline, we analyzed three alternative scenarios: low international supply, low international supply combined with high international demand, and high international demand, referred to as Ref_Ref_Low_Ref, Ref_Ref_Low_High, and Ref_Ref_Ref_High, respectively.
- **High U.S. Oil and Gas Resource and Technology outlook:** With this group, High_Ref_Ref_Ref is the baseline that is consistent with EIA's AEO 2017 High Oil and Gas Resource and Technology case. Against this baseline, the alternative scenarios analyzed are low international supply, low international supply combined with high international demand, and high international demand, referred to as High_Ref_Low_Ref, High_Ref_Low_High, and High_Ref_Ref_High, respectively.
- **Low U.S. Oil and Gas Resource outlook:** With this group, Low_Ref_Ref_Ref is the baseline that is consistent with EIA's AEO 2017 Low Oil and Gas Resource and Technology case. Against this baseline, the alternative scenarios are low international supply, low international supply combined with high international demand, and high international demand, referred to as Low_Ref_Low_Ref, Low_Ref_Low_High, and Low_Ref_Ref_High, respectively.

All of the nine alternative N_{ew}ERA scenarios project LNG export levels that are higher than their corresponding reference scenario. This selection of scenarios allows the analysis to capture the macroeconomic effects of higher LNG exports associated with higher levels of demand for U.S. LNG exports from the rest of the world. The data describing the macroeconomic effects of LNG exports for all 12 N_{ew}ERA scenarios are provided in Appendix-F.

However, not all of the scenarios evaluated produce LNG export levels that fall within a one-standard deviation interval around the mean of modeled LNG export volumes (the "more likely"

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[49] All macroeconomic scenarios assume Reference levels of U.S. natural gas demand.

range). Therefore, we discuss here the macroeconomic effects for the seven Macroeconomic scenarios that do fall within the range of more likely scenarios (shown in bold in Table 9).

Table 9: Macroeconomic Scenarios[50]

Scenario Name	U.S. Supply	U.S. Demand	ROW Supply	ROW Demand	LNG Exports (Bcf/day)	Cumulative Probability
Ref_Ref_Ref_Ref	**Ref**	**Ref**	**Ref**	**Ref**	**12.9**	**33%**
Ref_Ref_Low_Ref	**Ref**	**Ref**	**Low**	**Ref**	**29.6**	**76%**
Ref_Ref_Low_High	Ref	Ref	Low	High	45.7	96%
Ref_Ref_Ref_High	**Ref**	**Ref**	**Ref**	**High**	**24.0**	**68%**
High_Ref_Ref_Ref	**High**	**Ref**	**Ref**	**Ref**	**23.3**	**47%**
High_Ref_Low_Ref	High	Ref	Low	Ref	40.4	91%
High_Ref_Low_High	High	Ref	Low	High	52.8	99%
High_Ref_Ref_High	**High**	**Ref**	**Ref**	**High**	**30.7**	**87%**
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	0.1	5%
Low_Ref_Low_Ref	**Low**	**Ref**	**Low**	**Ref**	**9.9**	**16%**
Low_Ref_Low_High	**Low**	**Ref**	**Low**	**High**	**23.4**	**48%**
Low_Ref_Ref_High	Low	Ref	Ref	High	8.2	11%

These seven scenarios are Ref_Ref_Ref_Ref, Ref_Ref_Low_Ref, Ref_Ref_Ref_High, High_Ref_Ref_Ref, High_Ref_Ref_High, Low_Ref_Low_Ref, and Low_Ref_Ref_High.[51] In addition to the seven scenarios described we also include the effects of Low_Ref_Ref_Ref since it is a baseline for all the low U.S. supply based scenarios, even though Low_Ref_Ref_Ref does not fall within the more likely range. These scenarios capture the macroeconomic effects of "more likely" LNG exports ranging from 3.6 Tcf (9.9 Bcf/d) to 11.2 Tcf (30.7 Bcf/d) in 2040. The probability of actual exports being below the lower end of this range is only 16% and the probability that exports will not exceed the higher end of the range is around 84%. The details of the other N_{ew}ERA scenarios that have even higher (and less likely) levels of LNG exports, induced by assuming low international natural gas supply combined with high international natural gas demand, are discussed in Appendix D.

[50] Scenarios which fall within the more likely range are highlighted in bold. The N_{ew}ERA model was used to simulate the macroeconomic effects of LNG exports for all 12 representative scenarios.

[51] Note that Ref_Ref_Ref_Ref and High_Ref_Ref_Ref scenarios are calibrated to be consistent with the corresponding GNGM scenario's natural gas market outlooks.

B. Macroeconomic Effects

LNG exports affect the U.S. economy in multiple ways. Their direct impacts are increases in natural gas production, LNG export revenues, wealth transfers in the form of tolling charges on LNG exports, and domestic natural gas prices. Indirect effects in response to these direct effects appear in all sectors of the economy. Higher LNG export demand that leads to an increase in natural gas production to meet the demand puts upward pressure on the domestic wellhead and Henry Hub prices. How large the price impacts are depends upon the incremental cost of supplying additional natural gas for the export market. Changes in domestic natural gas prices could affect natural gas-using sectors of the economy to the extent that higher natural gas costs increase the cost of production in these sectors. In addition, reallocation of capital and labor resources to natural gas production and away from natural gas-using sectors could affect prices of goods and services throughout the economy, including those purchased by consumers. All these effects depend in turn on the degree to which particular U.S. industries are exposed to global competition.

U.S. LNG exports have positive effects on some segments of the U.S. economy and negative effects on others. On the positive side, U.S. LNG exports provide an opportunity for natural gas producers to realize additional profits by selling incremental volumes of natural gas and increase demand for labor and capital investment in natural gas production. Demand for intermediate goods used in natural gas production also increases. The value of natural gas resources and specialized assets for natural gas production will increase, as will the earnings of workers with specialized skills needed in the natural gas production industry. The latter two effects are only partially distinguished from increases in resource income in the N_{ew}ERA model.

Increased exports of natural gas will improve the U.S. balance of trade and result in a wealth transfer into the U.S. Construction of the liquefaction facilities will require capital investment to produce LNG. If this capital originates from sources outside the U.S., it will represent another form of wealth transfer into the U.S. Households will benefit from the additional wealth transferred into the U.S, which increases the value of the dollar and reduces prices of other imported goods. If U.S. households, or their retirement funds, hold stock in natural gas producers, they will benefit from the increase in the value of their investment.

On the negative side, producing incremental natural gas volumes to support natural gas exports will increase the marginal cost of supplying natural gas and therefore raise domestic natural gas prices and increase the value of natural gas in general. Households will pay higher prices for the natural gas that they use (e.g., for heating and cooking). Domestic industries, especially sectors in which natural gas is a significant component of their cost structure, will experience increases in their cost of production, which could lead to lower demand for their commodities.

How increased LNG exports affect different U.S. households will depend on their income sources. Like other trade measures, LNG exports will cause shifts in industrial output, employment, and in sources of income. These economic effects change the well-being of consumers.

Sections below discuss the broad macroeconomic effects on the U.S. economy of increased LNG exports. Macroeconomic projections for each scenario are reported in constant 2016 dollars. The macroeconomic effects of each scenario can be measured by different metrics. We used metrics such as the wellbeing of the average U.S. consumer, total household income from all sources, economy-wide investment, output effects on key manufacturing sectors, and gross domestic product (GDP) to characterize the effects on the economy of the scenarios. The scenario results provide a range of outcomes that reflect uncertainties in the international and U.S. natural gas markets.

1. U.S. Consumer Well-being Increases with Rising LNG Exports

Expansion of natural gas exports changes the price of goods and services purchased by U.S. households. U.S. households receive income from several sources with increased LNG exports. They receive labor income when they work and income from capital and resources they own. These sources provide consumers with additional income to spend on goods and services. At the same time relative prices will change so that some goods will become more expensive and some less. Overall, consumers will pay lower prices for imported goods because of the wealth transfers that increase the value of the dollar. Changes in income and prices affect the purchasing power of the consumer, and the final result is a change in consumption and hence well-being of consumers. We measure the value of this change in consumption as the equivalent variation in income, which includes all these sources of economic gain or loss. The equivalent variation measures the change in income that would make a consumer indifferent between two scenarios with different levels of LNG exports.[52] We express this metric in dollars per household to provide a meaningful measure.

A positive change in welfare means that the policy improves overall economic well-being from the perspective of the average household. Figure 16 shows the monetary value of consumer's welfare for the seven representative scenarios and the baseline for the low U.S. supply condition. The difference in welfare between any two scenarios is the amount that the consumer gains by moving from the scenario with lower welfare to that with higher welfare.

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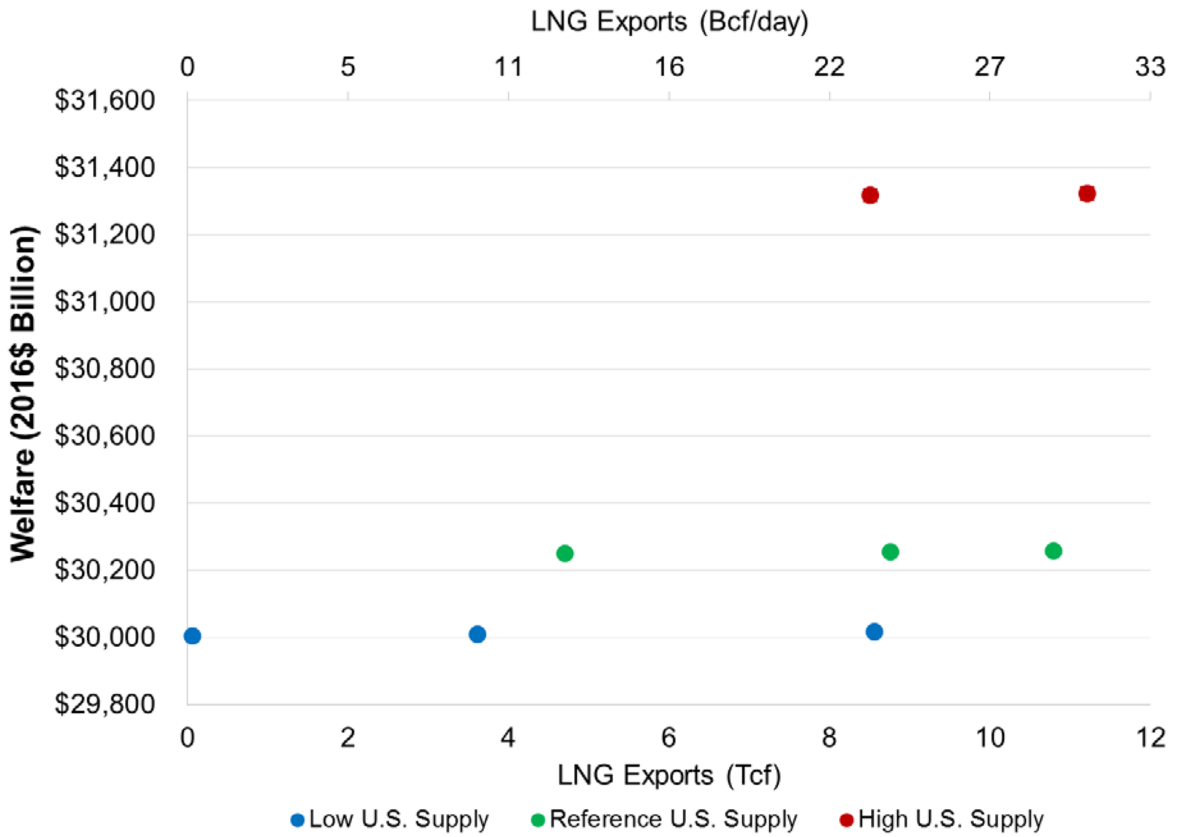
[52] *Intermediate Microeconomics: A Modern Approach*, Hal Varian, 7th Edition (December 2005), W.W. Norton & Company, pp. 255-256. "Another way to measure the impact of a price change in monetary terms is to ask how much money would have to be taken away from the consumer *before* the price change to leave him as well off as he would be *after* the price change. This is called the **equivalent variation** in income since it is the income change that is equivalent to the price change in terms of the change in utility."

Figure 16: Consumer Welfare Expressed in Monetary Value for More Likely Scenarios (2016$ Billion) in 2040



The more likely range of results shows four key insights:

- The most important variable affecting consumer welfare in this study is U.S. oil and gas resources and technology,
- All scenarios are welfare-improving for the average U.S. household,
- Higher exports within the same U.S. supply group lead to larger improvements in welfare, and
- For a similar LNG export volume (~ 8.3 Tcf) as a result of international demand pull, consumer welfare is the highest when the U.S. is endowed with cheap and abundant U.S. natural gas supply.

The scenarios that share Reference U.S. natural gas supply assumptions differ in the amount of demand pull for LNG exports. As increased demand pull due to changes in the international market induces more LNG exports, consumer welfare measured in dollars also increases. In the Ref_Ref_Ref_Ref scenario, LNG exports in 2040 are about 12.9 Bcf/d and under the two different international natural market conditions (LNG demand pull scenarios), LNG exports expand to 23.9 Bcf/d (under Ref_Ref_Ref_High) and 29.6 Bcf/d (under Ref_Ref_Low_Ref) scenarios. Consumer welfare ranges from $30.25 trillion to $30.26 trillion respectively, (a variation of $10 billion) as seen in Figure 16 and Table 10. Similar improvement in consumer welfare as increases in LNG exports is also observed in the group of scenarios based on the Low U.S. natural gas supply assumptions and in those based on the High U.S. natural gas supply assumptions. Consumer welfare rises along with world demand for U.S. LNG exports. U.S. wealth rises with world demand for U.S. LNG exports because of the larger wealth transfer from outside the U.S. to the U.S. associated with increased demand.

Under these export scenarios, as U.S. LNG exports increase, U.S. households[53] receive additional income from two sources. First, the LNG exports provide additional export revenues, and second, households who hold shares in companies that own liquefaction plants receive additional income from take-or-pay tolling charges for LNG exports. These additional sources of income for U.S. consumers outweigh the income loss associated with higher energy prices.

Table 10: Consumer Welfare for the More Likely Scenarios in 2040

	LNG Exports (Bcf/day)	Consumer Welfare (2016$ Billion)
Low_Ref_Ref_Ref	0.1	$30,006
Low_Ref_Low_Ref	9.9	$30,011
Low_Ref_Low_High	23.4	$30,018
Ref_Ref_Ref_Ref	12.9	$30,252
Ref_Ref_Ref_High	24.0	$30,255
Ref_Ref_Low_Ref	29.6	$30,260
High_Ref_Ref_Ref	23.3	$31,320
High_Ref_Ref_High	30.7	$31,323

2. Total Economic Activity (GDP) Expands with Rising U.S. LNG Exports

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

Figure 17 illustrates the positive correlation between GDP and LNG exports for the more likely scenarios in 2040. In all scenarios with common assumptions about U.S. natural gas supply and demand, there is greater gain in GDP as the LNG export volume increases. As discussed in the

[53] Households own all production processes and industries by virtue of owning stock in them.

previous section, gains in GDP result from higher net income to households and investment in LNG facilities. An important implication of this result is that if the market is allowed to determine exports, changes in global markets that bring forth increased LNG exports will also lead to an increase in overall economic activity leading to higher GDP. In addition, Figure 17 illustrates that any restrictions on LNG exports would forgo the additional GDP to be gained by allowing exports to respond to market conditions.

Figure 17: LNG Exports and GDP for the More Likely Scenarios in 2040

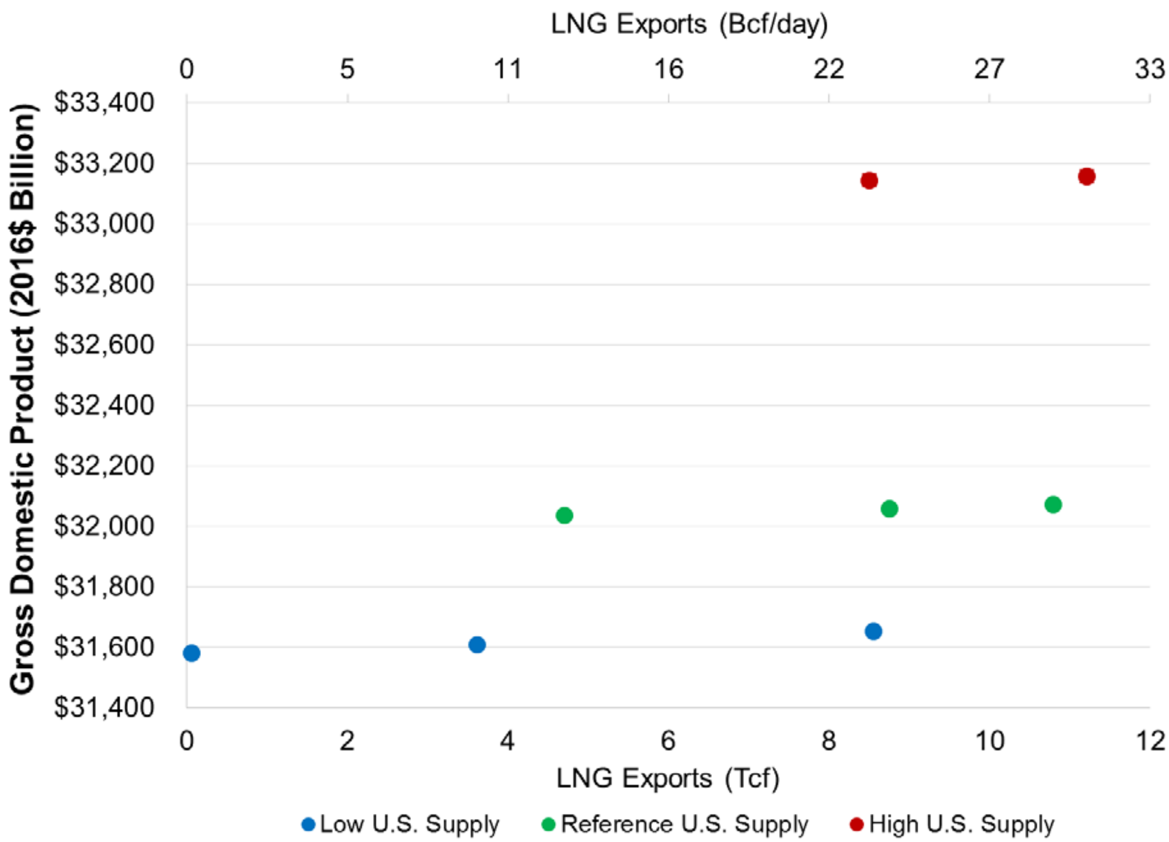


Figure 14 also reveals how strongly U.S. economic growth responds to improvements in natural gas resources and technology. In the High U.S. supply cases, GDP is projected to rise to about $33,200 billion by 2040, but in the Low U.S. supply cases U.S. GDP remains below $31,600 billion. That is a difference of $1.6 Trillion in GDP provided by a robust oil and gas sector. Between GDP projections with Reference U.S. supply assumptions and Low U.S. supply assumptions the difference is about $460 billion. That is, for example, the GDP that would be lost if opposition to use of advanced drilling and well stimulation technology forced the U.S. into the Low supply scenario rather than the Reference scenario. Under each of the different U.S. natural gas supply conditions, GDP is also marginally higher as international demand for U.S. LNG exports increases, see Table 11.

Table 11: GDP for the More Likely Scenarios in 2040

	LNG Exports (Bcf/day)	Gross Domestic Product (2016$ Billion)
Low_Ref_Ref_Ref	0.1	$31,582
Low_Ref_Low_Ref	9.9	$31,610
Low_Ref_Low_High	23.4	$31,654
Ref_Ref_Ref_Ref	12.9	$32,038
Ref_Ref_Ref_High	24.0	$32,060
Ref_Ref_Low_Ref	29.6	$32,074
High_Ref_Ref_Ref	23.3	$33,146
High_Ref_Ref_High	30.7	$33,159

3. Sectoral Output Changes for Some Key Economic Sectors and Energy-intensive Sectors

To support higher LNG exports, natural gas production grows more rapidly in all scenarios than in scenarios with lower exports. In order to do so, the natural gas sector must attract capital and labor away from other sectors. This increased use of capital and labor inputs in this sector is the opportunity cost of natural gas production, and it implies that some other sectors will grow more slowly so that the overall demand for labor and capital inputs does not exceed their supply. This change provides net GDP benefits because natural gas production and export, with recent advances in drilling and well stimulation technology, provides higher returns and as good or better wages than the alternatives.

The slightly higher price of natural gas with higher levels of LNG exports causes these changes in the rate of growth in output to be concentrated in energy-intensive sectors, the chemicals sector, other manufacturing sectors, and in the portion of the services sector that depends on natural gas as a fuel or feedstock. The relative effect on these particular sectors from higher gas prices depends on their natural gas intensity (i.e., the value share of natural gas as an input to their production). In addition the electricity generation sector, which depends on natural gas, also grows more slowly due to reduced consumption due to the effect of increased natural gas prices on electricity prices and slower growth of energy-intensive industries that consume electricity.

These varying impacts will shift income patterns among economic sectors. The overall effect on the economy depends on the degree to which the economy adjusts by fuel switching, introducing new technologies, or mitigating costs by compensating parties that are disproportionately impacted. It should also be noted that the increase in natural gas exports is accompanied by faster growth in imports of goods produced by sectors whose domestic output is growing less rapidly. Since the U.S. has a comparative advantage in natural gas production, the sum of domestically produced and imported goods consumed by households is larger with LNG exports than without. This is the fundamental reason for the overall increase in economic welfare and aggregate consumption as LNG exports increase, which is described in sections below.

Table 12 shows average annual rates of growth in output of key production sectors (Chemicals, Iron and Steel, and Energy-Intensive Sectors) that use natural gas as fuel or feedstock, for the more likely scenarios. The Chemicals and Energy Intensive Sectors (EIS) are the most natural gas intensive sectors. EIS includes paper and pulp manufacturing, glass manufacturing, cement manufacturing, and aluminum manufacturing. All negatively affected sectors, and in particular the natural gas intensive sectors, continue to grow robustly at higher levels of LNG exports, albeit at slightly lower rates of increase than they would at lower levels.

Table 12: Compound Annual Growth Rate (CAGR) from 2020 through 2040 for Natural Intensive Sectors

Scenario	**LNG Exports (Bcf/day)**	**Sectoral Output Annual Growth Rate from 2020-2040 (%)**		
		Chemicals	Iron and Steel	Energy-Intensive Sectors
Low_Ref_Ref_Ref	0.1	2.41%	2.25%	2.26%
Low_Ref_Low_Ref	9.9	2.40%	2.22%	2.24%
Low_Ref_Low_High	23.4	2.37%	2.17%	2.22%
Ref_Ref_Ref_Ref	12.9	2.59%	2.68%	2.50%
Ref_Ref_Ref_High	24.0	2.58%	2.66%	2.49%
Ref_Ref_Low_Ref	29.6	2.57%	2.66%	2.49%
High_Ref_Ref_Ref	23.3	2.66%	2.55%	2.49%
High_Ref_Ref_High	30.7	2.65%	2.54%	2.48%

The compound annual growth rates from 2020 to 2040 for the Chemicals, Iron and Steel, and Energy-Intensive sectors in Table 12 are particularly interesting. In the Ref_Ref_Ref_Ref scenario, the Chemicals sector grows at an annual rate of 2.59%; while under the scenario with the highest natural gas demand pull (Ref_Ref_Ref_High), the sector grows by 2.58%. Sectoral growths rates remain robust for all of the sectors that rely on natural gas as fuel and raw material input. The variation in the growth rates attributable to differences in LNG exports ranges from one to seven basis points (0.01% to 0.07%). Even for the scenario with the largest change in sectoral growth rates, the change is still relatively small. Therefore, it is reasonable to conclude that an increased level of LNG exports will have a negligible effect on how quickly these sectors grow.

4. Household Income Shifts between Different Sources but is Positive Overall

Households generate income from different sources. Because households supply labor and own capital and other resources, they derive income from wages, capital returns, and resource rents.

The value-added income sources, wage and capital income, form a large share of GDP. Households use this income to consume goods and services that are either produced domestically or imported. As discussed in the previous section, tolling charges and reservation fees on LNG exports are received from overseas LNG purchasers. This income component balances in the national accounts with a book entry that increases exports. Therefore, in order to maintain a constant merchandise trade balance, imports must also rise. For consistent accounting, this foreign transfer is also allocated to the household as an additional income.

Where the income comes from is in effect a change in the value of the dollar that makes imports more attractive – that is, an increase in the value of the dollar that makes imports just enough less costly to make the value of increased imports equal to the amount paid for tolling charges and import fees. Since revenue from production of natural gas is not affected by payment of these fees and tolls, we allocate the value of the transfer to value-added measured in constant dollars.[54]

Value-added is by definition the sum of labor income and capital income, but the basic structure of the N_{ew}ERA model does not provide enough detail on the specialized skills and capital required in different industries to allocate the increase in value added between labor and capital. As discussed earlier, increased production of natural gas in support of exports leads to a shift of both labor and capital from a number of other industries, principally the natural gas-intensive industries, toward natural gas production.

Each of these industries has specialized capital equipment that cannot be switched from, for example, producing plastics to drilling wells. As a result, the return on existing capital in industries that grow more slowly is likely to fall while existing capital serving higher natural gas production is likely to experience higher returns. Likewise, workers with specialized skills required for natural gas production will see their wages increase more rapidly while those in industries that are growing less rapidly will see their wages increase more slowly than they would without the shift in industry structure.

On top of these changes in wage rates by industry, there will be a shift of labor (as new entrants enter the labor force and are trained) toward the industries with more rapidly growing wages and away from those with slower growing wages. None of the details about sector-specific labor or capital needed to project changes in labor and capital income attributable to increases in LNG exports are contained in the N_{ew}ERA model.

It requires a bottom-up model of natural gas production with details on the geology within each of the resource plays to determine the types of equipment and labor skills required for increased

[54] The additional wealth from net transfers is unique to the export policy. In addition, these net transfers could also be represented as “capital income” since it can be assumed to represent returns to capital for the liquefaction plants.

production. Assessments of decline rates and enhanced recovery possibilities for existing wells are also needed to distribute the value added in natural gas production across labor and capital.

The lower cost of imported goods brought about by payments for tolling charges and reservation fees is likewise impossible to allocate between purchases of capital goods, which improves real capital income, and consumer goods, which improves real wages. Therefore, we combine labor and capital income with transfers into a single category of value-added, which is the part of the increase in GDP that does not go to resource owners or the government.

We find that the shares of value added and resource income in the higher GDP attributable to higher levels of exports range from 40% to 60% across the scenarios (Figure 18).

Figure 18: Shares of Components of Gross Domestic product for the More Likely Scenarios in 2040

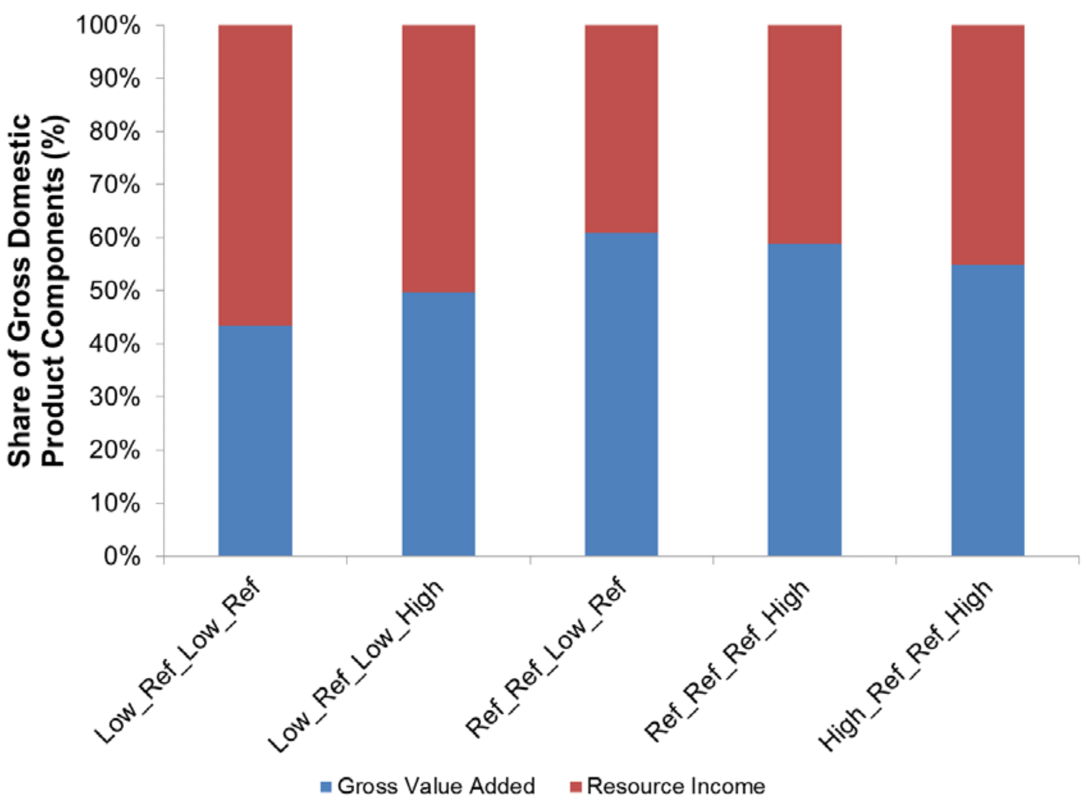


Figure 18 shows how the difference in GDP between each scenario and its baseline is distributed between value-added and resource income, within the limits of the ability of the N_{ew}ERA model to assign resource income to specific factors of production.[55] For scenarios with Low U.S. natural gas supply assumptions, the split between resource income and gross value-added is roughly 50 -50 or somewhat more favorable to the resource. These scenarios, as designed, contain relatively large increases in LNG exports and prices relative to the corresponding baseline. As a result, the resource gets revenue above cost of production. The two different international demand pull scenarios with Reference U.S. natural gas supply conditions have a split of 61-39 in favor of value-added.

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

The resource income associated with coal and crude oil changes minimally; therefore, the total change in resource income is positive for the scenarios and the changes in resource income increase with the level of LNG exports. Income associated with net transfers includes government transfers and all tolling charges on LNG exports. Government transfers remain the same between the baseline and scenarios, so the net transfer reflects the additional wealth transfer. Changes in tax revenue are grossed up in value added.

It should be noted that since the N_{ew}ERA model does not differentiate wage rates or human capital between sectors, it is very likely that some of what is categorized as resource income in N_{ew}ERA will accrue as wages and labor income to workers with the specialized skills required in energy-producing sectors. Resource income is a residual, in that the most that an owner of mineral rights can expect to be paid is the difference between the cost of producing oil and gas (including a return on capital and risk) and revenues from its sale. Depending on how rapidly the supply of such workers, ranging from petroleum engineers and project managers to roughnecks on drilling crews, responds to demand, a substantial portion of what is shown in these results as resource income would in fact be income to workers. Similar considerations apply to capital goods that might be in short supply, such as drilling pipe. This reallocation of income from resource income to labor and capital income would offset an unknown portion of differences in value-added shown in Table 13.

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[55] The resource used in each of the extractive sectors (coal, natural gas, and crude oil) represents the sector-specific capital and labor in addition to natural resource required for production in these sectors. Resource income represents income from natural resource and fixed factors associated with the resource sector. We disaggregate these individual subcomponents and augmented the incomes into their respective income categories (labor and capital). In addition, we also assume that the resource sector pays corporate income tax of 39.2% (federal statutory rate) on the resource base.

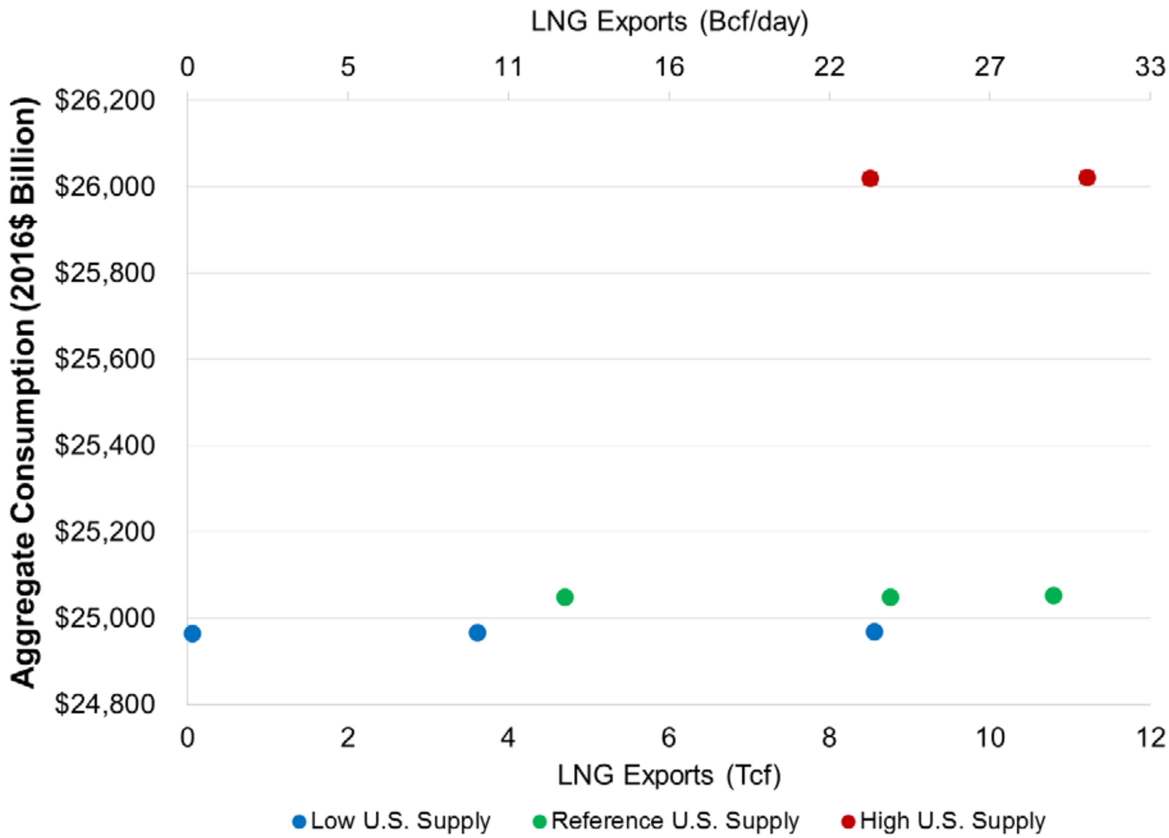
Table 13: Composition of Resource Income and Gross Value-added for the More Likely Scenarios in 2040

	Resource Income (2016$ Billion)	Gross Value Added (2016$ Billion)	Gross Domestic Product (2016$ Billion)
Low_Ref_Ref_Ref	$70	$31,513	$31,582
Low_Ref_Low_Ref	$85	$31,525	$31,610
Low_Ref_Low_High	$106	$31,548	$31,654
Ref_Ref_Ref_Ref	$77	$31,961	$32,038
Ref_Ref_Ref_High	$86	$31,974	$32,060
Ref_Ref_Low_Ref	$91	$31,983	$32,074
High_Ref_Ref_Ref	$92	$33,054	$33,146
High_Ref_Ref_High	$98	$33,061	$33,159

5. Aggregate Consumption and Investment

Aggregate consumption measures the total spending on goods and services in the economy. Figure 19 shows aggregate consumption levels in billions of dollars for the more likely scenarios in 2040. It shows that within each supply category, aggregate consumption is higher when LNG exports are higher.

Figure 19: LNG Exports and Aggregate Consumption for the More Likely Scenarios in 2040



As with the welfare and GDP results, wealth transfer associated with LNG exports increases household income that leads to higher spending on goods and services. Under the Reference U.S. natural gas supply scenario, Ref_Ref_Ref_Ref, aggregate consumption is $24,049 billion and LNG exports are 12.9 Bcf/d. When LNG exports increase as a result of natural gas demand pull, aggregate consumption is $25,054 (for 29.6 Bcf/d), an increase of about $5 billion, (see Table 14). A similar pattern is observed in the outcomes for aggregate consumption in each of the groups of scenarios based on alternative U.S. natural gas supply assumptions (see Table 14). Higher aggregate consumption or spending indicates more purchasing power for consumers. Although the variations in the all of the macroeconomic metrics (GDP, consumer welfare, and consumption) are relatively small in magnitude, all macroeconomic outcomes are qualitatively increasing, within each of the U.S. natural gas supply scenarios, with higher LNG exports.

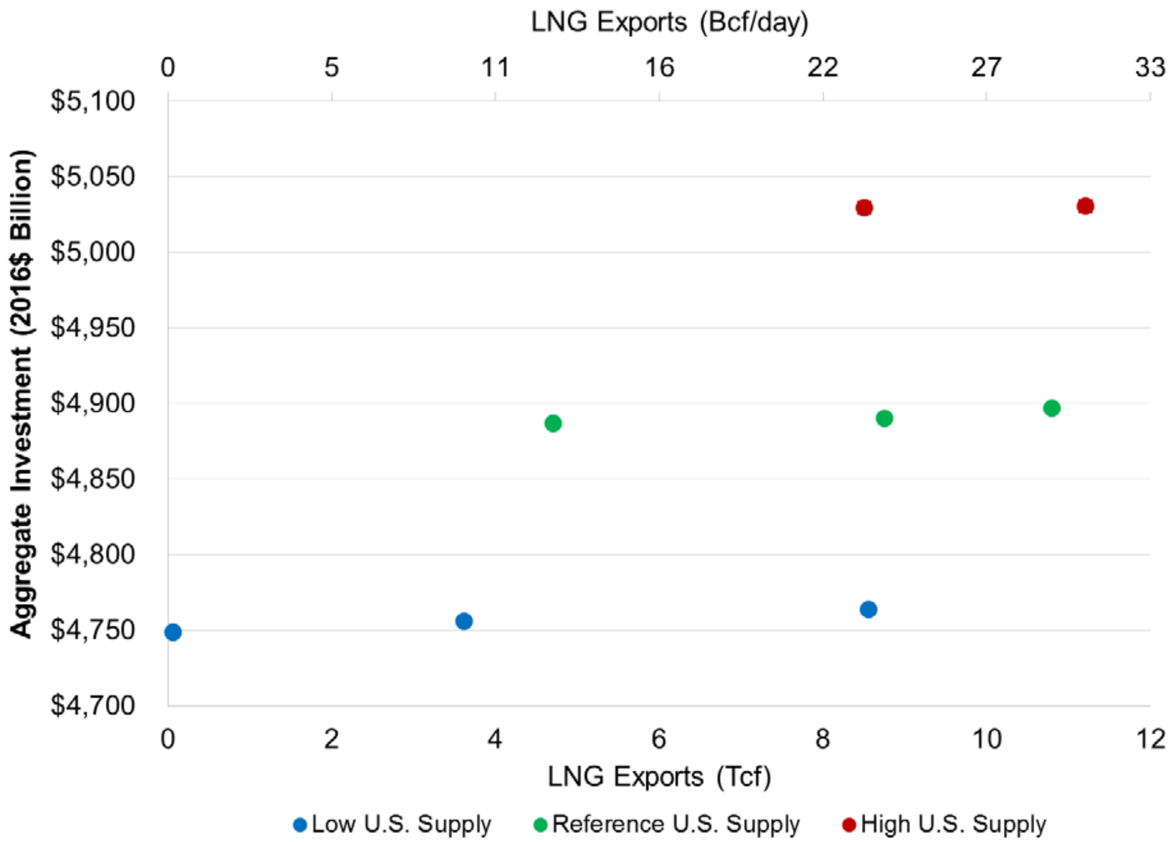
Table 14: Aggregate Consumption for the More Likely Scenarios in 2040

	LNG Exports (Bcf/day)	Aggregate Consumption (2016$ Billion)
Low_Ref_Ref_Ref	0.1	$24,965
Low_Ref_Low_Ref	9.9	$24,967
Low_Ref_Low_High	23.4	$24,970
Ref_Ref_Ref_Ref	12.9	$25,049
Ref_Ref_Ref_High	24.0	$25,050
Ref_Ref_Low_Ref	29.6	$25,054
High_Ref_Ref_Ref	23.3	$26,021
High_Ref_Ref_High	30.7	$26,022

Investment in the economy occurs to replace old capital and augment new capital formation (see Figure 20). In this study, additional investment also takes place to expand natural gas production and to build liquefaction capacity at either existing LNG import terminals or new green-field export terminals. Overall aggregate investment also grows, as capacity is added in industries that supply the machinery and equipment used in natural gas production and processing, used for construction of export facilities and installed in the export facilities themselves, and used in industries that will supply the industries producing such machinery and equipment with raw materials and components. The increase in investment in the natural gas sector is partially offset by a decline in investment in other sectors that experience slower rates of increase in sectoral output.

The additional investment required to produce natural gas and construct export facilities in scenarios with growing LNG export demand also comes in part from additional savings, attracted by the higher return on capital. This increase in savings is accompanied by a reduction in aggregate consumption during the period of investment, which is recovered along with a return on capital when that tranche of LNG exports is being produced and shipped. Since LNG exports grow out to 2040, investment to support them must also grow. Thus there is a tendency for the increase in investment to become larger out to 2040 and for the increase in consumption to become smaller. For example, the Low_Ref_Low_High scenario with increasing investment to support rapid LNG export growth has $22 billion higher consumption in 2020 compared to Low_Ref_Ref_Ref with no LNG export growth, but only $5 billion higher consumption in 2040.

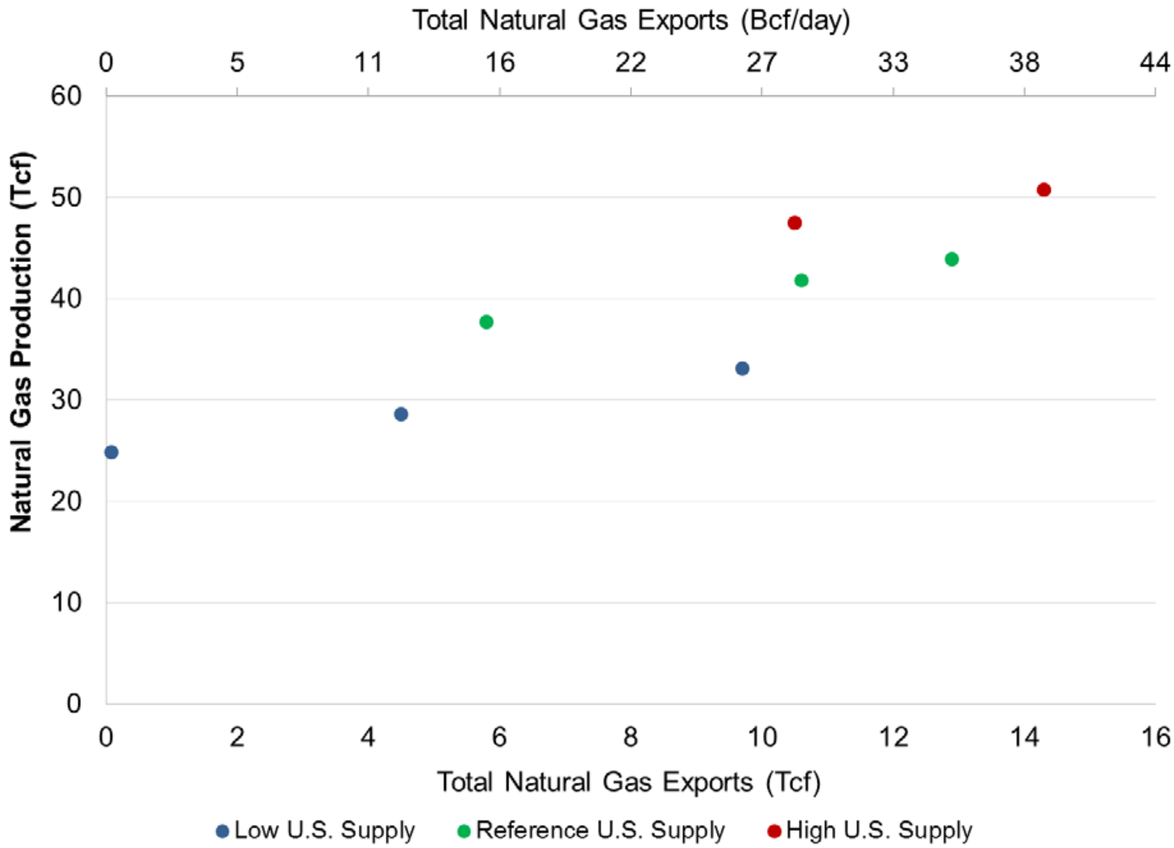
Figure 20: LNG Exports and Aggregate Investment for the More Likely Scenarios in 2040



7. U.S. LNG Exports are backed by Increased Natural Gas Production

The results from the analysis suggest that there is no support for the concern that LNG exports would come at the expense of domestic natural gas consumption. In fact, a large share of the increase in LNG exports is supported by an increase in domestic natural gas production leading to a modest increase in natural gas prices and additional income from export revenues. For 2040, Figure 21 shows the relationship between total natural gas exports and total natural gas production for all of the more likely scenarios.

Figure 21: Total Natural Gas Exports and Natural Gas Production for the More Likely Scenarios in 2040



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

In the three Low U.S. natural gas supply scenarios (blue dots), total exports increase from 0.05 Tcf to 3.61 Tcf to 8.55 Tcf as international LNG demand increases. U.S. natural gas production increases a great deal more than U.S. natural gas demand declines due to greater international LNG demand pull (see Table 15 that shows changes in U.S. natural gas exports, supply, and demand for the three groups of more likely scenarios).

Table 15: Change in Natural Gas Production, Demand and Trade for the More Likely Scenarios in 2040

	LNG Exports (Bcf/day)	LNG Exports (Tcf)	Net Pipeline Gas Exports (Tcf)	Natural Gas Production (Tcf)	Natural Gas Demand (Tcf)
Low_Ref_Ref_Ref	0.1	0.05	0.03	24.9	24.8
Low_Ref_Low_Ref	9.9	3.6	0.9	28.6	24.1
Low_Ref_Low_High	23.4	8.5	1.2	33.1	23.3
Ref_Ref_Ref_Ref	12.9	4.7	1.1	37.7	31.9
Ref_Ref_Ref_High	24.0	8.8	1.8	41.8	31.3
Ref_Ref_Low_Ref	29.6	10.8	2.1	43.9	31.0
High_Ref_Ref_Ref	23.3	8.5	2.0	47.5	37.0
High_Ref_Ref_High	30.7	11.2	3.1	50.8	36.5

Other U.S. supply scenarios also show a similar relationship such that most of the increase in exports comes from increases in production.

APPENDIX A. DESCRIPTION OF NERA'S GLOBAL NATURAL GAS MODEL

The GNGM is a partial-equilibrium model designed to estimate the amount of natural gas production, consumption, and trade by major world natural gas consuming and/or producing regions. The model maximizes the sum of consumers' and producers' surplus, less transportation costs, subject to mass balancing constraints and regasification, liquefaction, and pipeline capacity constraints.

Model Calibration

For this analysis, GNGM was calibrated to three different U.S. AEO 2017 cases: AEO Low Oil and Gas Resource case, AEO Reference case, and AEO's High Oil and Gas Resource case. For all cases, the regions outside North America were calibrated to match the EIA's *IEO 2017* Reference case. This calibration defines the following three scenarios:

- Ref U.S. Supply_Reference U.S. Demand_Reference ROW Supply_Reference ROW Demand (Ref_Ref_Ref_Ref);

- Low U.S. Supply_Reference U.S. Demand_Reference ROW Supply_Reference ROW Demand (Low_Ref_Ref_Ref); and

- High U.S. Supply_Reference U.S. Demand_Reference ROW Supply_Reference ROW Demand (High_Ref_Ref_Ref).

These scenarios were calibrated against the EIA's IEO 2017 Reference case's regional supply and demand as well as the appropriate *AEO 2017* case's natural gas production, consumption, wellhead, and delivered price forecasts, after adjusting the *AEO 2017* and *IEO 2017* production and consumption forecasts so that:

- Global supply equaled global demand;
- U.S. pipeline trade with Canada equaled total U.S. net imports with Canada as defined by the *AEO 2017*;
- U.S. pipeline trade with Mexico equaled total U.S. net exports with Mexico as defined by the *AEO 2017*;

Input Data Assumptions for the Model Baseline

GNGM Regions

The GNGM regional mapping scheme is largely adapted from the EIA's *IEO 2017* regional definitions with modifications to address the LNG-intensive regions.

- OECD Regions: the OECD region of Americas maps to GNGM regions PADDs I-V and Alaska, Canada, Mexico, and Central and South America; OECD Europe maps to GNGM Europe; OECD Asia maps to GNGM Korea-Japan and Oceania.

- Non-OECD Regions: the non-OECD regions of Eurasia and Europe map to GNGM regions FSU and Sakhalin; Non-OECD Asia maps to GNGM regions China-India and Southeast Asia; Middle East maps to GNGM Middle East; Africa to GNGM Africa; Non-OECD Central and South America maps to GNGM Central and South America.

Time Horizon

GNGM reads in forecast data from each year and outputs the optimized gas trade flows. The model's input data currently covers years 2020 through 2040, but can be readily extended given data availability. For this analysis, we solved the model in five-year time steps starting with 2020.

Projected World Natural Gas Production and Consumption

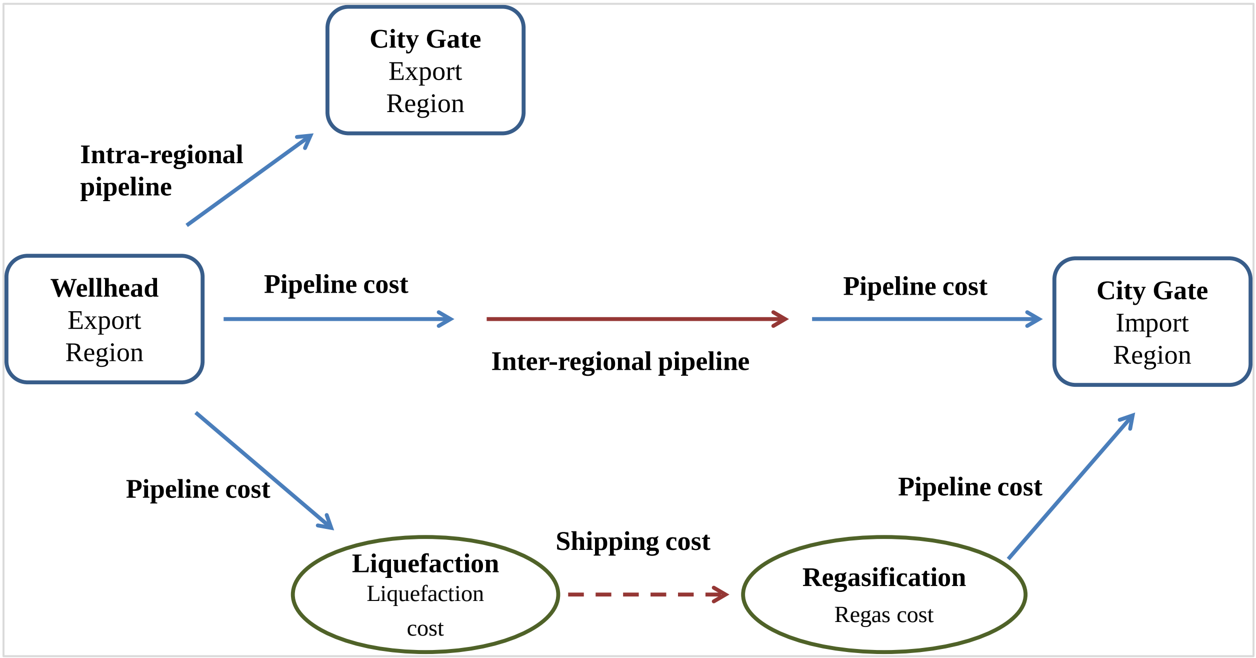
The model's international natural gas consumption and production projections are based upon the *IEO 2017* Reference case. GNGM assumes three different future U.S. natural gas markets: the *AEO 2017* Reference case is adopted as the baseline and two other U.S. futures are obtained with the following modifications.

- HOGR: U.S. natural gas production and wellhead prices are replaced by the *AEO 2017* High Oil and Gas Resource projections.
- LOGR: U.S. natural gas production and wellhead prices are replaced by the *AEO 2017* Low Oil and Gas Resource projections.

Natural Gas Transport Options

Figure 22 displays the different transport options in GNGM. This figure shows the full set of links to take gas from the wellhead to the citygate.

Figure 22: Natural Gas Transport Options



a) Pipelines

GNGM assumes that all intra-regional pipeline capacity constraints are non-binding. Each region is able to transport its indigenously-produced natural gas freely within itself at an appropriate cost.

b) LNG Routes

GNGM sets two constraints on LNG transportation. Each export region is subjected to a liquefaction capacity constraint and each import region to a regasification capacity constraint. There are five components in transporting LNG (Figure 22), and capacity constraints on the wellhead to liquefaction pipeline, LNG tankers, and regasification to city gate pipeline are assumed to be non-binding.

Natural Gas Supply Curves

The supply of natural gas in each region is represented by a CES supply curve. The supply curve provides a relationship between the supply of gas (Q) and the wellhead price of gas (P). The elasticity of the supply curves dictates how the price of natural gas changes with changes in production.

$$\mathbf{Q(t) / Q_{0,t} = (P(t) / P_{0,t})^{\text{elasticity of supply}}}$$

Each supply curve is calibrated to the benchmark data points ($Q_{0.t}$, $P_{0.t}$) for each year t, where the benchmark data points represent those of the EIA's adjusted forecasts. $Q_{0.t}$ represents the EIA's adjusted forecasted quantity of natural gas production for year t, and $P_{0.t}$ represents the EIA's forecasted wellhead price of gas for year t.

Our estimates for supply elasticity are based on supply curves obtained from four secondary sources.[56]

Natural Gas Demand Curves

The demand curve for natural gas has a similar functional form as the supply curve. As with the supply curves, the demand curve in each region is represented by a CES function. The demand curve provides a relationship between the demand for gas (Q) and the city gate price of gas (P). The demand curves dictate how the price of natural gas changes with changes in demand in each region.

$$Q(t) / Q_{0,t} = (P(t) / P_{0,t})^{\text{elasticity of demand}}$$

Each demand curve is calibrated to the benchmark data points ($Q_{0.t}$, $P_{0.t}$) for each year t, where the benchmark data points represent those of the EIA's adjusted forecasts. $Q_{0.t}$ represents the EIA's adjusted forecasted demand for natural gas for year t and $P_{0.t}$ represents the EIA's forecasted city gate price of gas for year t. To calculate the demand elasticity, we carry out a simple regression analysis of the natural gas demand and the corresponding natural gas price for the AEO 2017's Reference, HOGR and the LOGR scenarios for each year in the model horizon.

[56] See Appendix B for a discussion of the supply elasticity computation

APPENDIX B. DESCRIPTION OF THE NEWERA MODEL

Overview of the NewERA Macroeconomic Model

The NewERA macro model is a forward-looking, dynamic, computable general equilibrium model of the United States economy. The model simulates all economic interactions in the U.S. economy, including those among industry, households, and the government. The economic interactions are based on the IMPLAN ©[57] database that is updated for 2017 benchmark year. The database includes regional detail on economic interactions among 440 different economic sectors. The model is calibrated to the macroeconomic and energy forecasts from the most recent *Annual Energy Outlook (AEO) 2017* with the CPP outlooks produced by the Energy Information Administration (EIA). The model structure is particularly well-suited to analyze macroeconomic impacts of economic policies because the model is calibrated to an internally-consistent forecast and represents the full economy.

Model Data

The economic data is taken from the updated IMPLAN database, which includes balanced Social Accounting Matrices (SAM) for all states. These inter-industry matrices provide a snapshot of the economy. Since the IMPLAN database contains only economic values, we benchmark energy supply, demand, trade, and prices to EIA historical statistics to capture the physical energy flows. We integrate the EIA energy quantities and prices and update the SAM to be consistent with 2017 aggregate macroeconomic metrics, such as aggregate consumption, investment, and GDP. The resulting database is a balanced energy-economy dataset that represents 2017 economic flows.

Future economic growth is calibrated to macroeconomic GDP, energy supply, energy demand, and energy price forecasts from the EIA *AEO 2017 with CPP* outlooks (AEO 2017 Reference with CPP, AEO 2017HOGR, and AEO 2017LOGR).[58] To ensure consistency with the GNGM baselines, the NewERA model's natural gas production, demand, and prices are calibrated to the GNGM baseline outlook.[59] Labor productivity, labor growth, and population forecasts from the U.S. Census Bureau are used to project labor endowments along the baseline and ultimately, employment by industry.

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[57] IMPLAN produces a unique set of national structural matrices. The structural matrices form the basis for the inter-industry flows which we use to characterize the production, household, and government transactions. See www.implan.com.

[58] We used CPP outlook to be consistent with the other two baselines High Oil and Gas Resource and Technology (HOGR) and Low Oil and Gas Resource and Technology (LOGR) which include the CPP in its outlook.

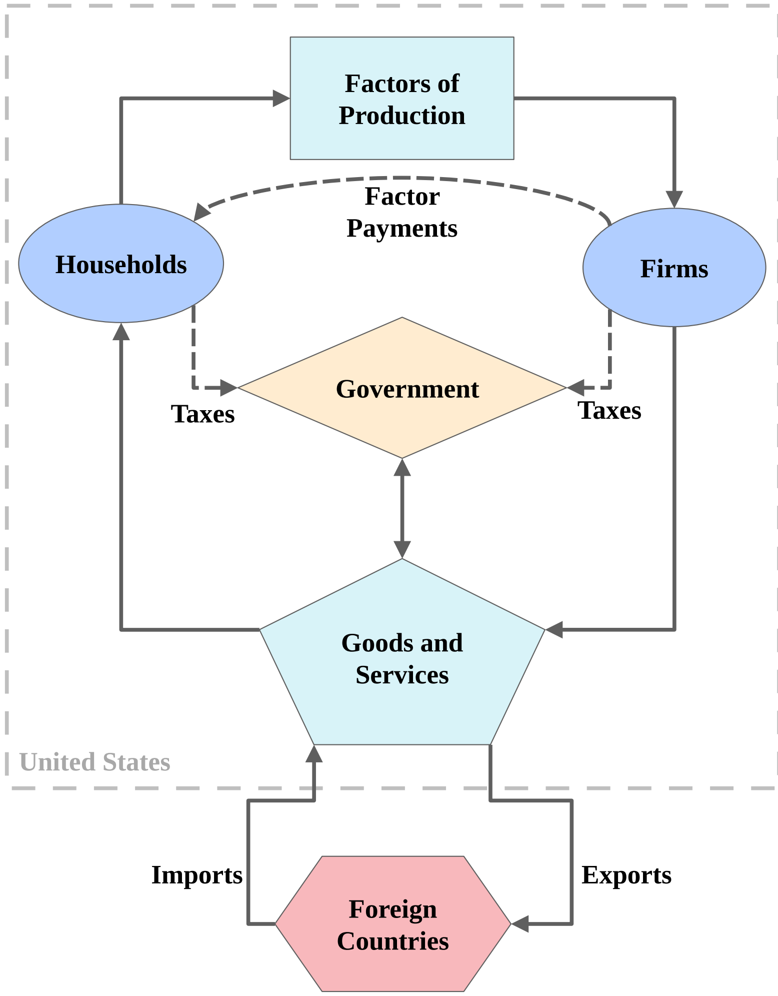
[59] Natural gas production, demand, and prices are slightly different than the AEO 2017 cases since the GNGM model assumes a single demand curve for all of its three baseline outlooks.

Model Structure

The theoretical construct behind the N$_{ew}$ERA model is based on the circular flow of goods, services, and payments in the economy (every economic transaction has a buyer and a seller whereby goods/service go from a seller to a buyer and payment goes from the buyer to the seller). As shown in Figure 23, the model includes households, businesses, government, financial markets, and the rest of the world economy as they interact economically in the global economy. Households provide labor and capital to businesses, taxes to the government, and savings to financial markets, while also consuming goods and services and receiving government subsidies. Businesses produce goods and services, pay taxes to the government and use labor and capital. Businesses are both consumers and producers of capital for investment in the rest of the economy. Within the circular flow, equilibrium is found whereby goods and services consumed are equal to those produced and investments are optimized for the long term. Thus, supply is equal to demand in all markets.

The model assumes a perfect foresight, zero profit condition in production of goods and services, no changes in monetary policy, and full employment within the U.S. economy.

Figure 23: Circular Flow of Income



Production and Consumption Characterization

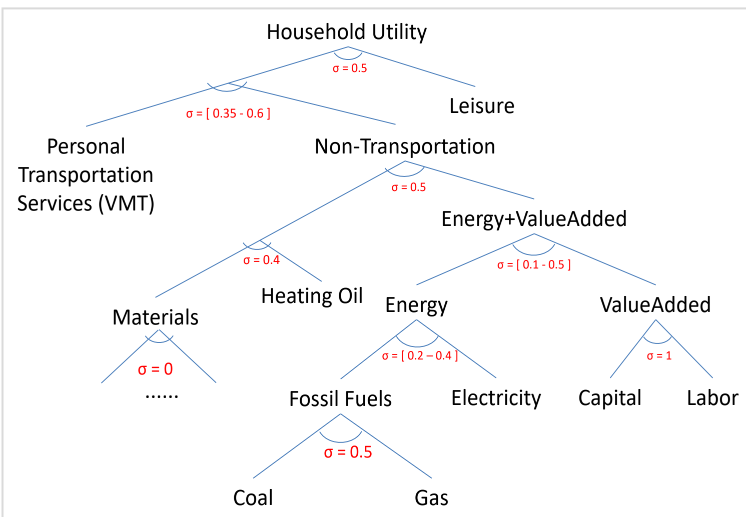
Behavior of households, industries, investment, and government is characterized by nested constant elasticity of substitution (CES) production or utility functions. Under such a CES structure, inputs substitute against each other in a nested form. The ease of substitutability is determined by the value of the elasticity of substitution between the inputs. The greater the value of the substitution elasticity between the inputs, the greater is the possibility of tradeoffs.

The CES nesting structure defines how inputs to a production activity compete with each other. In the generic production structure, intermediate inputs are aggregated in fixed proportion with a composite of energy and value-added inputs. The energy input aggregates fossil and non-fossil energy sources, and the value-added aggregates capital and labor inputs. Sectors with distinctive production characteristics are represented with structures different from the generic form. For the bulk chemicals sector, we assumed natural gas and oil feedstock are in fixed proportion to output. Similarly, for the iron and steel sector we assumed a share of metallurgical coal as feedstock which is consumed in fixed proportion to the output. The characterization of nonrenewable resource supply adds a fixed resource that is calibrated to a declining resource base over time, so that it implies decreasing returns to scale. This also implies rising marginal costs of production over time for exhaustible resources. The detailed nesting structure of the households and production sectors, with assumed elasticity of substitution parameters, is shown in figures below.

Households

Consumers are represented by a single representative household. The representative household derives utility from both consumption of goods and services, transportation services, and leisure. The utility is represented by a nested CES utility function. The elasticity of substitution parameters between goods are shown in Figure 24.

Figure 24: NewERA Household Representation



Other Sectors

The trucking and commercial transportation sector production structure is shown in Figure 25.

The trucking sector uses diesel as transportation fuel. This sector has limited ability to substitute into other fossil fuels. The other industrial sectors (excluding the bulk chemicals, iron and steel, manufacturing, and construction sectors) and the services sector production structure with assumed elasticity of substitution, is shown in Figure 26.

In the model, each region has a single representative refinery sector that has a production structure similar to other industrial sectors. We assume that crude oil is traded in the world market as a homogenous good that responds to a single world price. This means that the domestic price of crude oil is set by the world price.

Figure 25: NewERA Trucking and Commercial Transportation Sector Representation

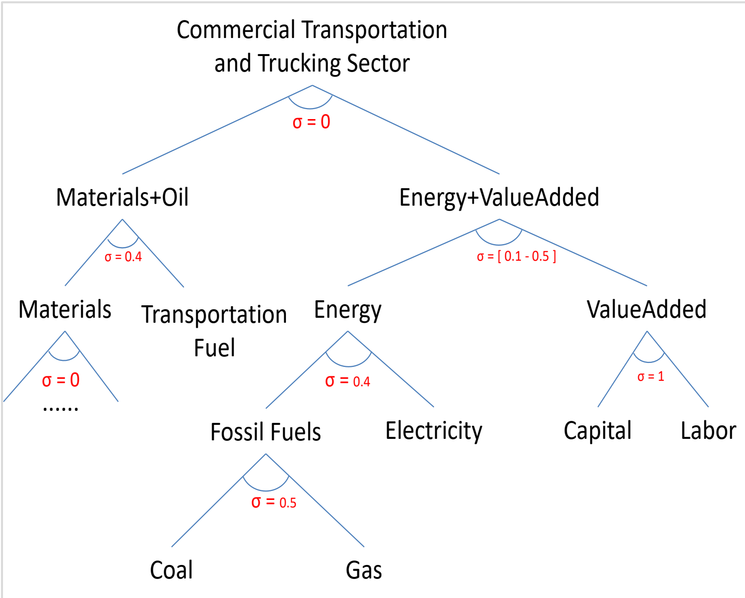
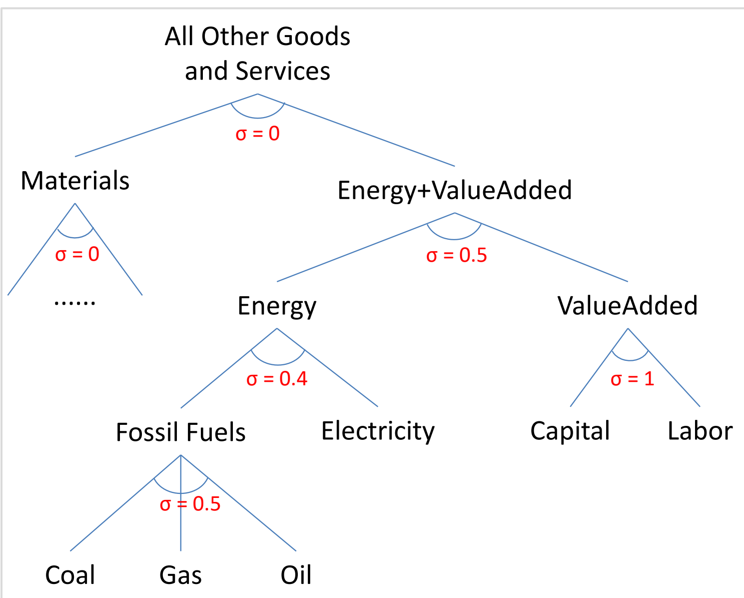


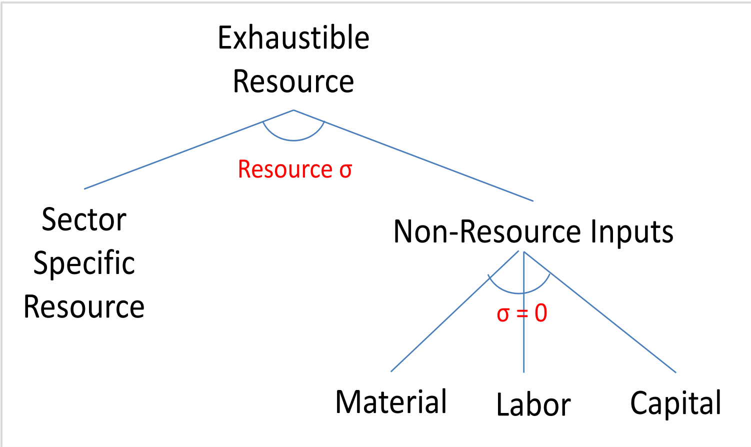
Figure 26: NewERA Other Production Sector Representation



Exhaustible Resource Sector (Natural Gas, Crude Oil, and Coal)

The simplest characterization of non-renewable resource supply adds a fixed resource that is calibrated to decline over time, so that the decreasing returns to scale implied for the non-resource inputs lead to rising marginal costs of production over time. The top level elasticity of substitution parameter is calibrated to be consistent with resource supply elasticity. This characterization is illustrated in Figure 27.

Figure 27: NewERA Resource Sector Representation



Production from the crude oil and natural gas sectors is either supplied to the domestic market or exported. Crude oil that is supplied to the domestic market is comingled with imported crude oil and is supplied to the domestic refinery. Natural gas also follows a similar supply chain.

Natural Gas Supply Elasticity

We reviewed four recent studies that provided information about their explicit or implicit natural gas supply curves for the period 2020 to 2050. The four sources for supply curves were: EIA's AEO 2017, Kenneth Medlock at Rice University, ICF, and IHS. Each of the studies expressed its supply curve as the breakeven price versus cumulative production.[60] Two features of these supply curves can be seen in the graphs of each supply curve reproduced below in Figure 28.

Figure 28: Supply Curves from Secondary Sources used for Supply Elasticity Estimation

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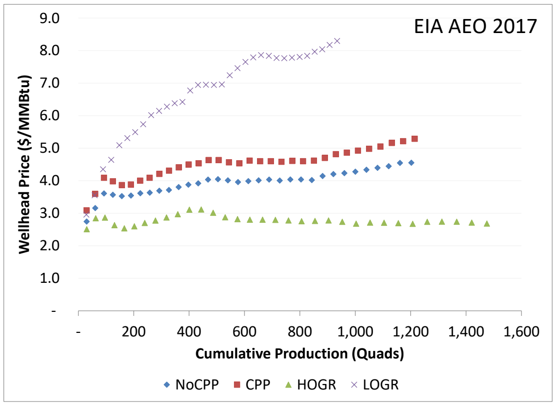
[60] U.S. Energy Information Administration (EIA) , Annual Energy Outlook 2017.

Kenneth B Medlock III, PhD, Baker Institute for Public Policy, Rice University, 2017.

Bob Ineson, "IHS Markit Energy Briefing: A supply rich world, but for how long?" IHS Markit, October 2017.

H. Vidas, "Impact of LNG Exports on the U.S. Economy: A Brief Update." ICF, September 2017.



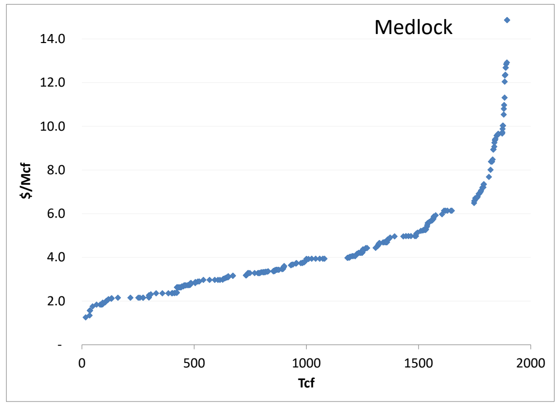
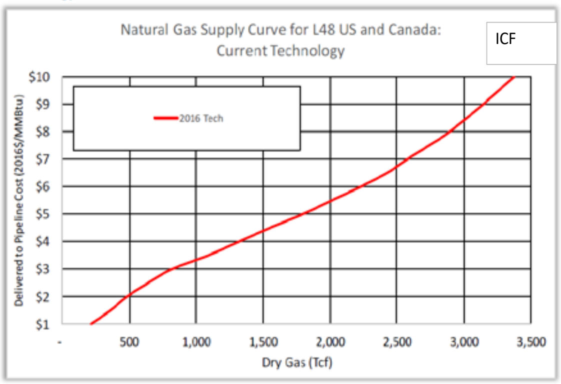
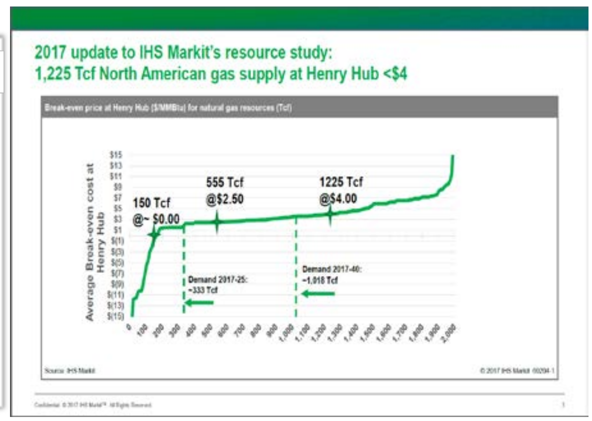


Exhibit 3-3: U.S. and Canadian Natural Gas Supply Curve Under Current Technology





EIA's prices in the Reference cases increase by less than $1/Mcf as cumulative extraction after 2020 increases by 1200 Tcf, and in the HOGR case the price is nearly constant for cumulative extraction up to 1475 Tcf.

The Medlock, IHS, and ICF studies have prices rising linearly over time up to inflection points at about 1,700 Tcf, 1,800 Tcf, and over 3,300 Tcf respectively. Thus the linear range covers the maximum cumulative extraction expected in the current study.

The implied elasticities from these four sources and from the 2012 Study of LNG exports are outlined in Table 16 below:

Table 16: Range of Natural Gas Supply Elasticity Estimates

DOE 2012 Study	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Gas-Ref	0.25	0.62	0.88	1.06	1.19	1.28
Gas-HOGR	0.40	0.55	0.65	0.73	0.78	0.81
Reference Case Elasticities		**2020**	**2025**	**2030**	**2035**	**2040**
EIA		0.8				
AEO 2017	Maximum	0.52	0.76	0.73	0.75	0.67
AEO 2017	Average	0.47	0.67	0.69	0.65	0.55
Medlock (2015)				2.50		5.90
Medlock (2015) – (Implied)	LNG12_Ref	12.15	2.73	0.81	1.00	1.59
Medlock (2015) – (Implied)	LNG20_Ref	0.96	0.90	0.94	1.33	1.67
IHS (2017)				1.00		2.00
ICF (2017)				1.40		1.55
HOGR Elasticities		**2020**	**2025**	**2030**	**2035**	**2040**
Medlock (2015) – (Implied)	LNG12_HRR	0.61	-0.06	0.76	1.16	1.09
Medlock (2015) – (Implied)	LNG20_HRR	0.46	2.52	0.89	1.20	1.30

Medlock and EIA supplied their own calculations of elasticities. We calculated ICF and IHS elasticities by dividing the percent change in cumulative quantity by the percent change in price at the cumulative output levels each forecasted for 2030 and 2040.

For the Reference case in 2040, EIA has the lowest elasticities, both below 0.7. Of the three estimates of Medlock's implied elasticities, 1.59 was the lowest estimate for a scenario with pessimistic LNG exports (12 Tcf of exports); while the elasticity estimate was 1.67 for a scenario with optimistic LNG exports scenario (20 Tcf of exports). ICF's elasticity estimate was of 1.55 and IHS was the highest with an elasticity of 2.

For a high oil and gas resource and technology case, only Medlock has done the sensitivity analysis required to produce elasticities, and his HOGR elasticities are lower than his elasticities for reference cases (1.09 and 1.3 versus 1.59 and 1.67).

For the Reference case in the year 2040 the study used elasticities based on Medlock's 2040 calculations for his 20 Tcf export case. These elasticities are at the middle of the range of the three other studies, and are more stable in early years than the elasticities he computed for his 12 Tcf export scenario. For the earlier years, we increase elasticities linearly from 0.70 in 2020 to 1.60 in 2040.

For modeling purposes it is desirable to have elasticities that increase smoothly. Our starting point of 0.7 is the midpoint between EIA's 2020 elasticity and Medlock's. The linear increase from this level matches the increase in EIA's elasticities from 2020 to 2025 and puts us close to Medlock's 2035 elasticity of 1.33.

Table 17: Natural Gas Supply Elasticity Estimates

	2020	**2025**	**2030**	**2035**	**2040**
Reference	0.70	0.93	1.15	1.38	1.60
HOGR	0.70	0.85	1.00	1.15	1.30
LOGR	0.70	0.93	1.15	1.38	1.60

For consistency and also due to the lack of an alternative source, Medlock's elasticity of 1.30 for his 20 Tcf exports scenario in 2040 was used as the HOGR elasticity. Medlock's computed elasticities for 2020 and 2025 are unstable, so we chose a higher value for 2020 and lower for 2025. To do this and keep a linear increase in elasticities, we assumed that elasticities increase linearly from 0.70 in 2020 to 1.15 in 2035 to match Medlock's 2035 elasticity. For the LOGR we used the Reference elasticities consistent with the DOE 2012 study assumption.

The final natural gas supply elasticity estimates we used (Table 17) were in line with the implied supply elasticities estimated by researchers Gürcan Gülen and Svetlana Ikonnikova at the Texas Bureau of Economic Geology's Center for Energy Economics.

Trade Structure

All goods and services except crude oil are treated as Armington goods, which assume that domestic and foreign goods are differentiated and thus are imperfect substitutes. International prices are held constant in the model assuming a small open economy assumption. As a result, effects of changes in the international gas prices on the U.S. trade position of goods and services are omitted. The level of imports depends upon the elasticity of substitution between the imported and domestic goods. The Armington elasticity among imported goods is assumed to be twice as large as the elasticity between domestic and aggregate imported goods, characterizing greater substitutability among imported goods.

We balance the international trade account in the N_{ew}ERA model by constraining changes in the current account deficit over the model horizon. The condition is that the net present value of the foreign indebtedness over the model horizon remains at the benchmark year level. This prevents distortions in economic effects that would result from perpetual increases in borrowing, but does not overly constrain the model by requiring current account balances in each year.

Investment Dynamics

Periods in the model are linked by capital and investment dynamics. Capital turnover in the model is represented by the standard process that capital at time $t + 1$ equals capital at time t plus investment at time t minus depreciation. The model optimizes consumption and savings decisions in each period, taking account of changes in the economy over the entire model horizon with perfect foresight. The consumers forego consumption to save for current and future investment.

An important aspect of LNG expansion modeling is to account for LNG plant investment. Consistent with the 2012 Study, we assumed the following updated assumptions regarding LNG financing terms.

Liquefaction plant is owned and operated by a domestic firm.

- Investment in liquefaction plant is domestically financed so that there is some crowding out and some reduction in consumption.
- Assumed investment cost of $5 billion for each billion cubic feet a day of liquefaction capacity.[61]
- 10% of the natural gas feedstock to the liquefaction plant is consumed internally.

Liquefaction capacity is built for the maximum level of exports.

- If the export level drops, the plant is underutilized but still collects tolling charge.

U.S. households receive wealth transfer from foreign sources to cover: [62]

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[61] The investment estimate was based on investment information for 8 announced LNG facilities which were available in the public domain. The 8 LNG facilities were: (1) Corpus Christi Liquefaction (http://www.bechtel.com/newsroom/releases/2013/12/contract-cheniere-corpus-christi-liquefaction/); (2) Sabine Pass Liquefaction (https://www.2b1stconsulting.com/5-4-billion-funding-cheniere-lng/); (3) Golden Pass Products LLC (Pg. 1, Pg. 31, "Application for Long-term Authorization to Export LNG to NAFTA Nations"); (4) Cameron LNG (http://cameronlng.com/pdf/2016,%2004-25%20CLNG%20Liquefaction%20Project%20Details.pdf); (5) Freeport LNG (http://www.1derrick.com/cbi-jv-bags-5-billion-freeport-lng-contract/12180/); (6) Dominion Cove LNG (https://www.reuters.com/article/lng-dominion-export/dominion-signs-deals-to-export-us-natural-gas-from-cove-point-idUSL2N0CO0TT20130401); (7) Elba Island Liquefaction (http://ir.kindermorgan.com/press-release/kinder-morgan-units-award-epc-contract-ihi-ec-planned-lng-export-facility-elba-island-); (8) Magnolia LNG (http://www.lngworldnews.com/lng-limited-extends-epc-contract-for-magnolia-lng/).

In addition, our investment estimate was validated by DOE and was also in line with DOE's estimate of $4 Bcf/d plus an additional $2 Bcf/d for greenfield projects.

[62] These assumptions were similar to the 2012 Study based on Sabine Pass and Chenier's Corpus Christi LNG facility contract information (see, http://www.naturalgasintel.com/articles/103450-henry-prices-too-

- "pay-or-take" tolling charges of $2.50 per Million Btu of the exported volumes net of natural gas loss in liquefaction process.

- 15% of the new Henry Hub price of exported volumes net of natural gas loss in liquefaction process.

Labor Representation

The underlying assumptions of labor growth and initial capital stock drive the economy over time in the model. The model assumes full employment in the labor market. This assumption means total labor demand in a policy scenario would be the same as the baseline labor projection. The baseline labor projections are based on population growth and labor productivity forecasts over time. Hence, the labor projection can be thought to be a forecast of efficient labor units. The model assumes that labor is fungible across sectors. That is, labor can move freely out of one production sector into another without any adjustment costs or loss of productivity. Like labor, each region is endowed with its own capital stock and can move across sectors without any adjustment cost.

Tax Representation

The N_{ew}ERA macroeconomic model includes a simple tax representation. The model accounts for the following categories of taxes: corporate income tax rate, personal income tax rate on capital and labor, payroll taxes collected for Social Security under the Federal Insurance Contributions Act (FICA) and for Medicare hospital insurance. The tax rates are based on the National Bureau of Economic Research (NBER) tax simulation model, TAXSIM[63] and Tax Foundation[64]. Other indirect taxes such as excise and sales are included in the output values and not explicitly modeled.

Model Scope: Time Horizon, Regions, and Sectoral Aggregation

Time Horizon

The model was run from 2017 to 2050 in three-year time steps and results in the study are reported for 2020 through 2040 in five-year steps.

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high-to-support-new-long-term-lng-contracts-bofa-says and https://www.icis.com/resources/news/2014/04/02/9768950/spain-s-endesa-signs-1-5mtpa-with-cheniere-s-corpus-christi/)

[63] For details on the TAXSIM model please see: http://users.nber.org/~taxsim/

[64] See http://taxfoundation.org/ for more information.

Model Regions

The U.S. economy is represented as a single region in the model.

Sectoral Aggregation

The model has the flexibility to represent sectors at different levels of aggregation. For this specific study, the N_{ew}ERA model includes 14 sectors: five energy sectors (coal, natural gas, crude oil, electricity, refined petroleum products) and nine non-energy sectors (services, bulk chemicals, motor vehicle manufacturing, iron and steel, other energy-intensive manufacturing, other non-energy-intensive manufacturing, agriculture, commercial transportation, and trucking).

Transportation sector in the model is represented by two types of transportation services: Commercial transportation (TRN) which includes air, rail, and water borne transportation services and the Trucking sector (TRK). The detailed sectors in the model are in Table 18.

Table 18: NewERA Sectoral Definition

	NewERA Sector	**AEO Sector**	
Final Demand	C	C	Household Consumption
	G	G	Government Consumption
	I	1	Investment Demand
Energy Sectors	COL	COL	Coal
	GAS	GAS	Natural Gas
	OIL	OIL	Refined Petroleum Products
	CRU	CRU	Crude Oil
	ELE	ELE	Electricity
Non-Energy Sectors	AGR	AGR	Agriculture Production-Crops and Other Agriculture including Livestock (NAICS 111,112-115)
	M_V	M_V	Motor Vehicle
	SRV	SRV	Services
	SRV	DWE	Dwellings
	EIS	PAP	Paper and Allied Products (NAICS 322)
	CHM	CHM	Bulk Chemicals including Inorganic, Organic, Resins and Agricultural (NAICS 32512-32518, 32511-32519, 3252, 3253)
	EIS	GLS	Glass and Glass Products (NAICS 3272)
	EIS	CMT	Cement (NAICS 32731)
	EIS	ALU	Aluminum (NAICS 3313)
	I_S	I_S	Iron and Steel (NAICS 3311-3312)
	MAN	CNS	Construction (NAICS 233-235)

	MAN	MIN	Mining (NAICS 2121,211,2122-2123)
	MAN	FOO	Food Products (NAICS 311)
	MAN	FAB	Fabricated Metal Products (NAICS 332)
	MAN	MAC	Machinery (NAICS 333)
	MAN	CMP	Computer and Electronic Products (NAICS 334)
	MAN	TRQ	Electrical Equipment (NAICS 335)
	MAN	ELQ	Transportation Equipment (NAICS 336)
	MAN	WOO	Wood Products (NAICS 321)
	MAN	PLA	Plastic and Rubber Products (NAICS 326)
	MAN	OMA	Balance of Manufacturing (All Remaining NAICS 312-316, 323)
	TRN	TRN	Transportation
	TRN	TRK	Trucking

APPENDIX C. SUPPLY AND DEMAND RANGES AND PROBABILITY ASSIGNMENTS

Table 19: Range of Natural Gas Market Conditions in 2040 (Tcf)

	U.S. Supply		
	AEO 2017, LOGR	AEO 2017, Reference	AEO 2017, HOGR
Upper Bound	34	44	55
Central Estimate	28	39	49
Lower Bound	23	34	44
Range	23-34	34-44	44-55
	U.S. Demand		
	Renewables Mandate	AEO 2017, Reference	Robust Economic Growth
Upper Bound	30	36	42
Central Estimate	27	33	39
Lower Bound	25	30	36
Range	25-30	30-36	36-42
	ROW Supply[65]		
	Low Supply	IEO 2017, Reference	
Upper Bound	115	163	
Central Estimate	90	139	
Lower Bound	66	115	
Range	66-115	115-163	
	ROW Demand		
	WEO 2016, 450 ppm	IEO 2017, Reference	High Demand
Upper Bound	129	159	186
Central Estimate	113	145	172
Lower Bound	97	129	159
Range	97-129	129-159	159-186

[65] We do not include a High ROW supply scenario since we believe this to be associated with a 0% probability

Table 20: Probability Assigned to Each Case

	U.S. Supply		U.S. Demand		ROW Supply		ROW Demand	
High	AEO HOGR	30%	Robust Economic Growth	17%			High Demand	50%
Ref	AEO Reference	55%	AEO Reference Growth	66%	IEO Reference Supply	80%	IEO Reference	45%
Low	AEO LOGR	15%	Renewables Mandate	17%	Low Supply	20%	WEO 450 ppm	5%

Table 21: Probability Assigned to Each Scenario

Scenario	U.S. Supply	U.S. Demand	ROW Supply	ROW Demand	Scenario Probability
Ref_Ref_Ref_Ref	AEO Reference	AEO Reference Growth	IEO Reference Supply	IEO Reference	13.1%
Ref_Ref_Ref_High	AEO Reference	AEO Reference Growth	IEO Reference Supply	High Demand	14.5%
Ref_Ref_Ref_Low	AEO Reference	AEO Reference Growth	IEO Reference Supply	WEO 450	1.5%
Ref_High_Ref_Ref	AEO Reference	Robust Economic Growth	IEO Reference Supply	IEO Reference	3.4%
Ref_High_Ref_High	AEO Reference	Robust Economic Growth	IEO Reference Supply	High Demand	3.7%
Ref_High_Ref_Low	AEO Reference	Robust Economic Growth	IEO Reference Supply	WEO 450	0.4%
Ref_Low_Ref_Ref	AEO Reference	Renewables Mandate	IEO Reference Supply	IEO Reference	3.4%
Ref_Low_Ref_High	AEO Reference	Renewables Mandate	IEO Reference Supply	High Demand	3.7%

Ref_Low_Ref_Low	AEO Reference	Renewables Mandate	IEO Reference Supply	WEO 450	0.4%
High_Ref_Ref_Ref	AEO HOGR	AEO Reference Growth	IEO Reference Supply	IEO Reference	7.1%
High_Ref_Ref_High	AEO HOGR	AEO Reference Growth	IEO Reference Supply	High Demand	7.9%
High_Ref_Ref_Low	AEO HOGR	AEO Reference Growth	IEO Reference Supply	WEO 450	0.8%
High_High_Ref_Ref	AEO HOGR	Robust Economic Growth	IEO Reference Supply	IEO Reference	1.8%
High_High_Ref_High	AEO HOGR	Robust Economic Growth	IEO Reference Supply	High Demand	2.0%
High_High_Ref_Low	AEO HOGR	Robust Economic Growth	IEO Reference Supply	WEO 450	0.2%
High_Low_Ref_Ref	AEO HOGR	Renewables Mandate	IEO Reference Supply	IEO Reference	1.8%
High_Low_Ref_High	AEO HOGR	Renewables Mandate	IEO Reference Supply	High Demand	2.0%
High_Low_Ref_Low	AEO HOGR	Renewables Mandate	IEO Reference Supply	WEO 450	0.2%
Low_Ref_Ref_Ref	AEO LOGR	AEO Reference Growth	IEO Reference Supply	IEO Reference	3.6%
Low_Ref_Ref_High	AEO LOGR	AEO Reference Growth	IEO Reference Supply	High Demand	4.0%
Low_Ref_Ref_Low	AEO LOGR	AEO Reference Growth	IEO Reference Supply	WEO 450	0.4%
Low_High_Ref_Ref	AEO LOGR	Robust Economic Growth	IEO Reference Supply	IEO Reference	0.9%

Low_High_Ref_High	AEO LOGR	Robust Economic Growth	IEO Reference Supply	High Demand	1.0%
Low_High_Ref_Low	AEO LOGR	Robust Economic Growth	IEO Reference Supply	WEO 450	0.1%
Low_Low_Ref_Ref	AEO LOGR	Renewables Mandate	IEO Reference Supply	IEO Reference	0.9%
Low_Low_Ref_High	AEO LOGR	Renewables Mandate	IEO Reference Supply	High Demand	1.0%
Low_Low_Ref_Low	AEO LOGR	Renewables Mandate	IEO Reference Supply	WEO 450	0.1%
Ref_Ref_Low_Ref	AEO Reference	AEO Reference Growth	Low Supply	IEO Reference	3.3%
Ref_Ref_Low_High	AEO Reference	AEO Reference Growth	Low Supply	High Demand	3.6%
Ref_Ref_Low_Low	AEO Reference	AEO Reference Growth	Low Supply	WEO 450	0.4%
Ref_High_Low_Ref	AEO Reference	Robust Economic Growth	Low Supply	IEO Reference	0.8%
Ref_High_Low_High	AEO Reference	Robust Economic Growth	Low Supply	High Demand	0.9%
Ref_High_Low_Low	AEO Reference	Robust Economic Growth	Low Supply	WEO 450	0.1%
Ref_Low_Low_Ref	AEO Reference	Renewables Mandate	Low Supply	IEO Reference	0.8%
Ref_Low_Low_High	AEO Reference	Renewables Mandate	Low Supply	High Demand	0.9%
Ref_Low_Low_Low	AEO Reference	Renewables Mandate	Low Supply	WEO 450	0.1%

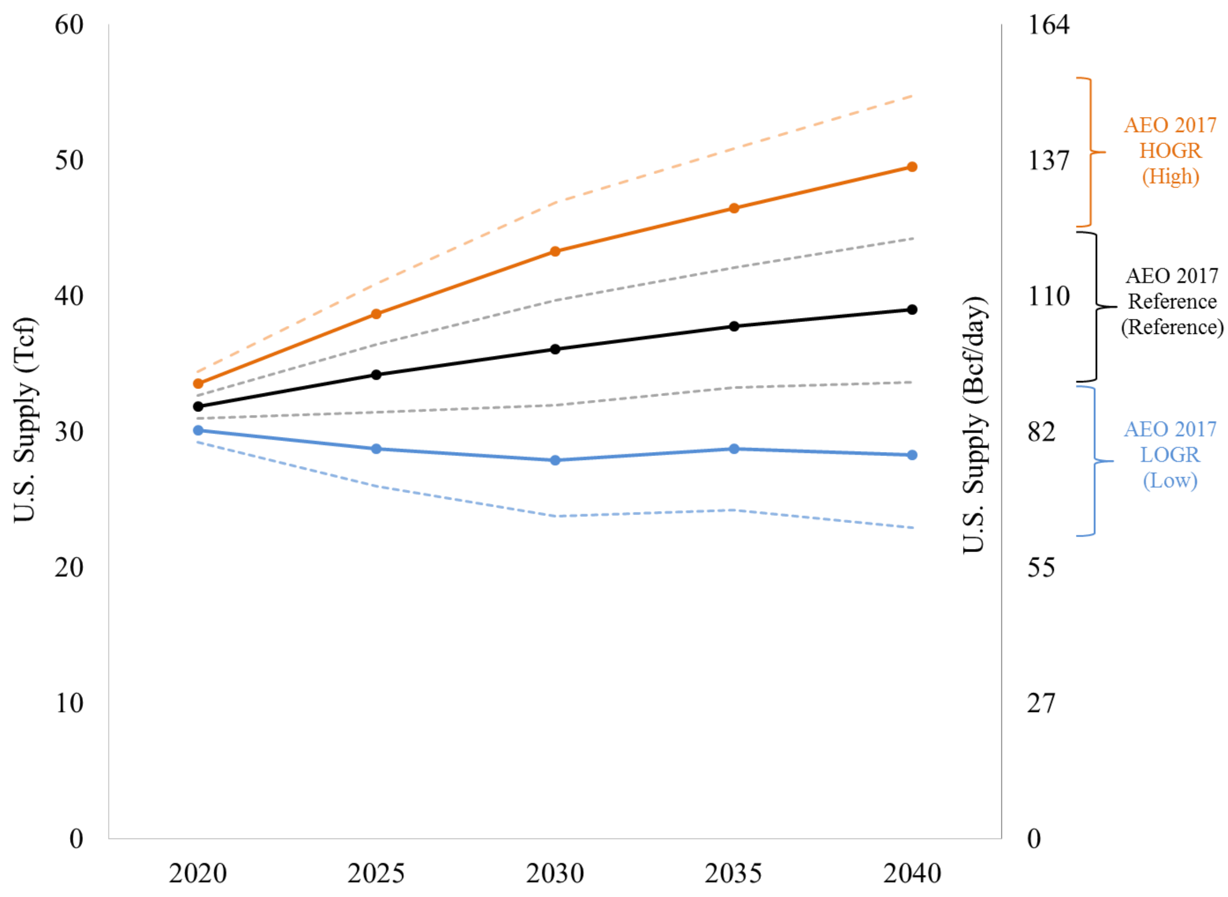
High_Ref_Low_Ref	AEO HOGR	AEO Reference Growth	Low Supply	IEO Reference	1.8%
High_Ref_Low_High	AEO HOGR	AEO Reference Growth	Low Supply	High Demand	2.0%
High_Ref_Low_Low	AEO HOGR	AEO Reference Growth	Low Supply	WEO 450	0.2%
High_High_Low_Ref	AEO HOGR	Robust Economic Growth	Low Supply	IEO Reference	0.5%
High_High_Low_High	AEO HOGR	Robust Economic Growth	Low Supply	High Demand	0.5%
High_High_Low_Low	AEO HOGR	Robust Economic Growth	Low Supply	WEO 450	0.1%
High_Low_Low_Ref	AEO HOGR	Renewables Mandate	Low Supply	IEO Reference	0.5%
High_Low_Low_High	AEO HOGR	Renewables Mandate	Low Supply	High Demand	0.5%
High_Low_Low_Low	AEO HOGR	Renewables Mandate	Low Supply	WEO 450	0.1%
Low_Ref_Low_Ref	AEO LOGR	AEO Reference Growth	Low Supply	IEO Reference	0.9%
Low_Ref_Low_High	AEO LOGR	AEO Reference Growth	Low Supply	High Demand	1.0%
Low_Ref_Low_Low	AEO LOGR	AEO Reference Growth	Low Supply	WEO 450	0.1%
Low_High_Low_Ref	AEO LOGR	Robust Economic Growth	Low Supply	IEO Reference	0.2%
Low_High_Low_High	AEO LOGR	Robust Economic Growth	Low Supply	High Demand	0.3%

Low_High_Low_Low	AEO LOGR	Robust Economic Growth	Low Supply	WEO 450	0.0%
Low_Low_Low_Ref	AEO LOGR	Renewables Mandate	Low Supply	IEO Reference	0.2%
Low_Low_Low_High	AEO LOGR	Renewables Mandate	Low Supply	High Demand	0.3%
Low_Low_Low_Low	AEO LOGR	Renewables Mandate	Low Supply	WEO 450	0.0%
				Total	**100%**

Table 22: Range of U.S. Natural Gas Supply (Tcf)66

Case		2020	2025	2030	2035	2040
AEO 2017, HOGR (High)	Upper Bound	34	41	47	51	55
	Central Estimate	34	39	43	46	49
	Lower Bound	33	36	40	42	44
AEO 2017, Reference (Reference)	Upper Bound	33	36	40	42	44
	Central Estimate	32	34	36	38	39
	Lower Bound	31	31	32	33	34
AEO 2017, LOGR (Low)	Upper Bound	31	31	32	33	34
	Central Estimate	30	29	28	29	28
	Lower Bound	29	26	24	24	23

Figure 29: Range of U.S. Natural Gas Supply



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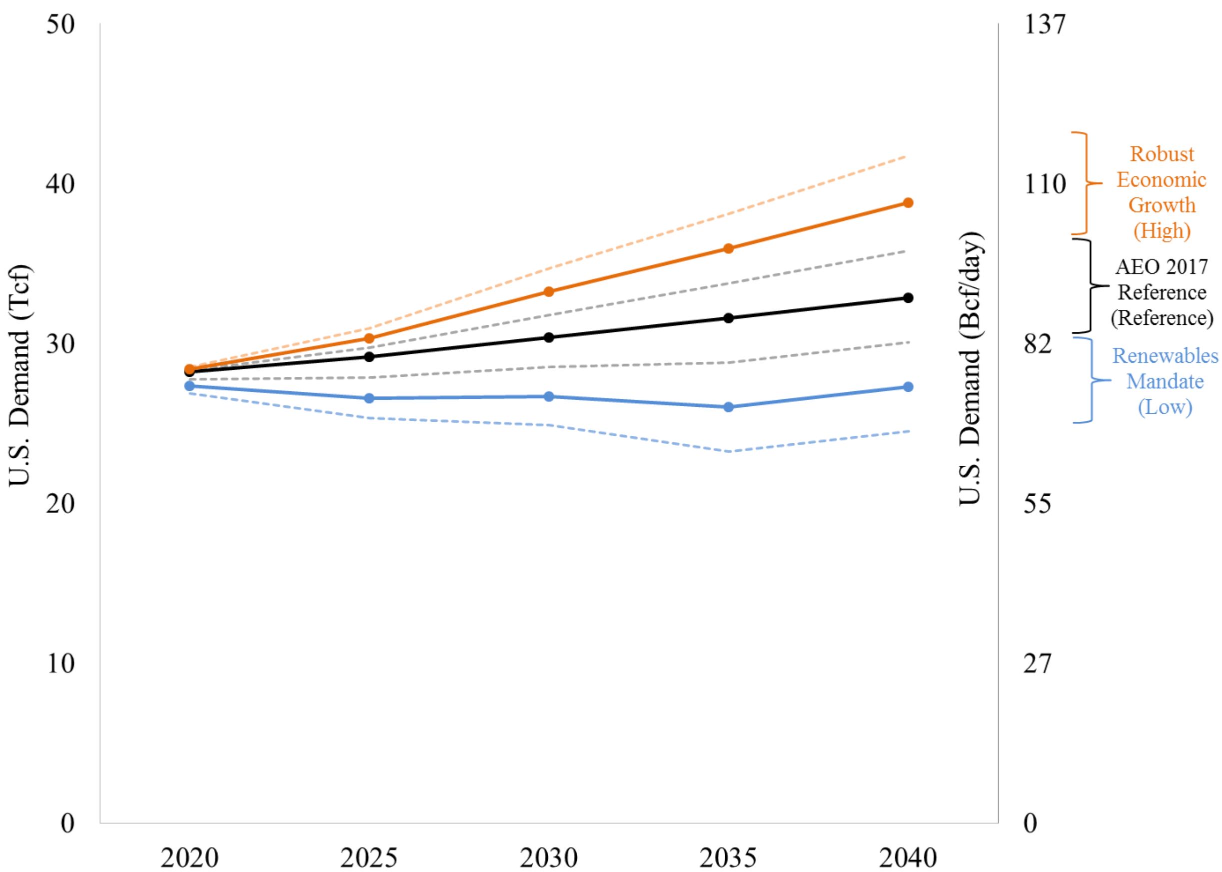
[66] U.S. Natural Gas Supply in 2016 was equal to 26.5 Tcf

Table 23: Range of U.S. Natural Gas Demand (Tcf)[67]

Case		2020	2025	2030	2035	2040
Robust Economic Growth (High)	Upper Bound	29	31	35	38	42
	Central Estimate	28	30	33	36	39
	Lower Bound	28	30	32	34	36
AEO 2017, Reference (Reference)	Upper Bound	28	30	32	34	36
	Central Estimate	28	29	30	32	33
	Lower Bound	28	28	29	29	30
Renewables Mandate (Low)	Upper Bound	28	28	29	29	30
	Central Estimate	27	27	27	26	27
	Lower Bound	27	25	25	23	25

Figure 30: Range of U.S. Natural Gas Demand

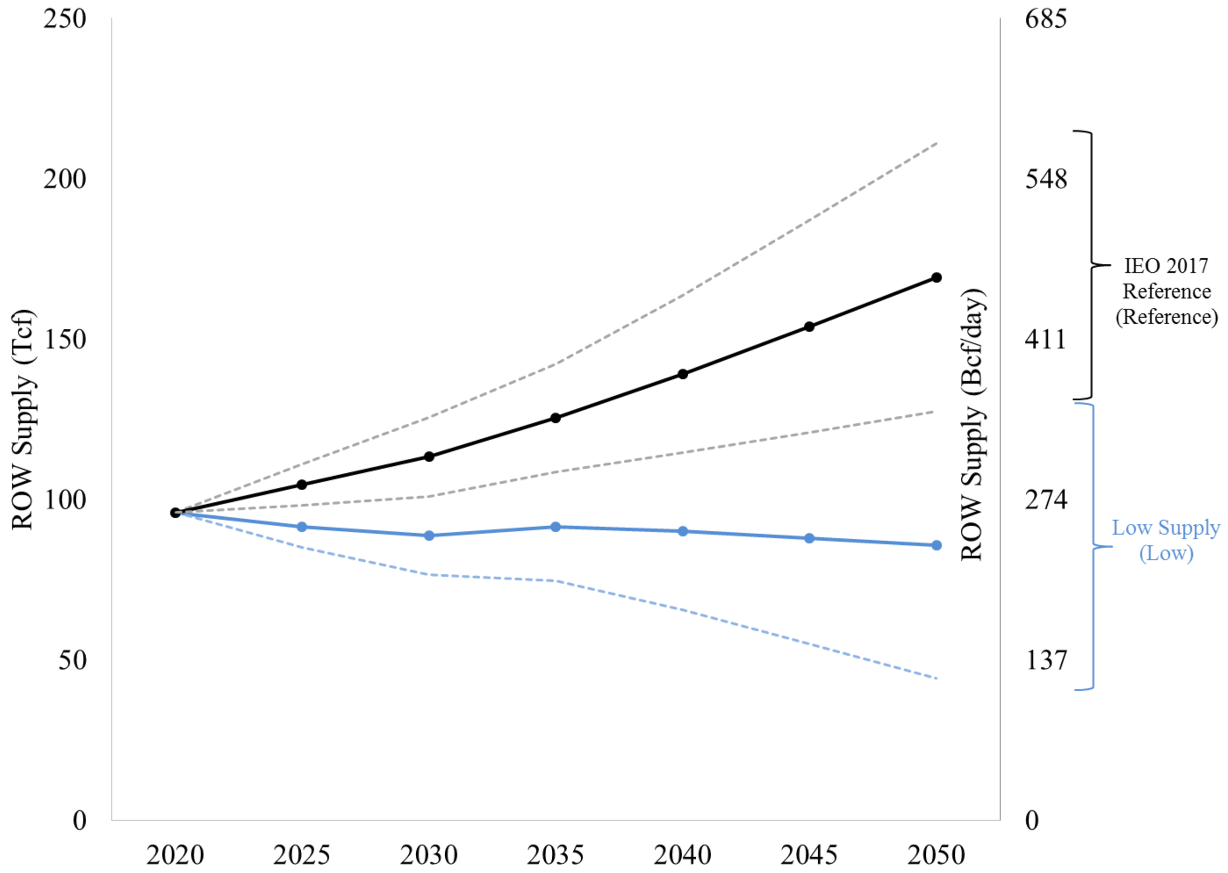


[67] U.S. Natural Gas Demand in 2016 was equal to 27.7 Tcf

Table 24: Range of ROW Natural Gas Supply (Tcf)[68]

Case		2020	2025	2030	2035	2040
IEO 2017, Reference (Reference)	Upper Bound	96	111	126	142	163
	Central Estimate	96	105	113	125	139
	Lower Bound	96	98	101	108	115
Low Supply (Low)	Upper Bound	96	98	101	108	115
	Central Estimate	96	91	89	91	90
	Lower Bound	96	85	76	75	66

Figure 31: Range of ROW Natural Gas Supply

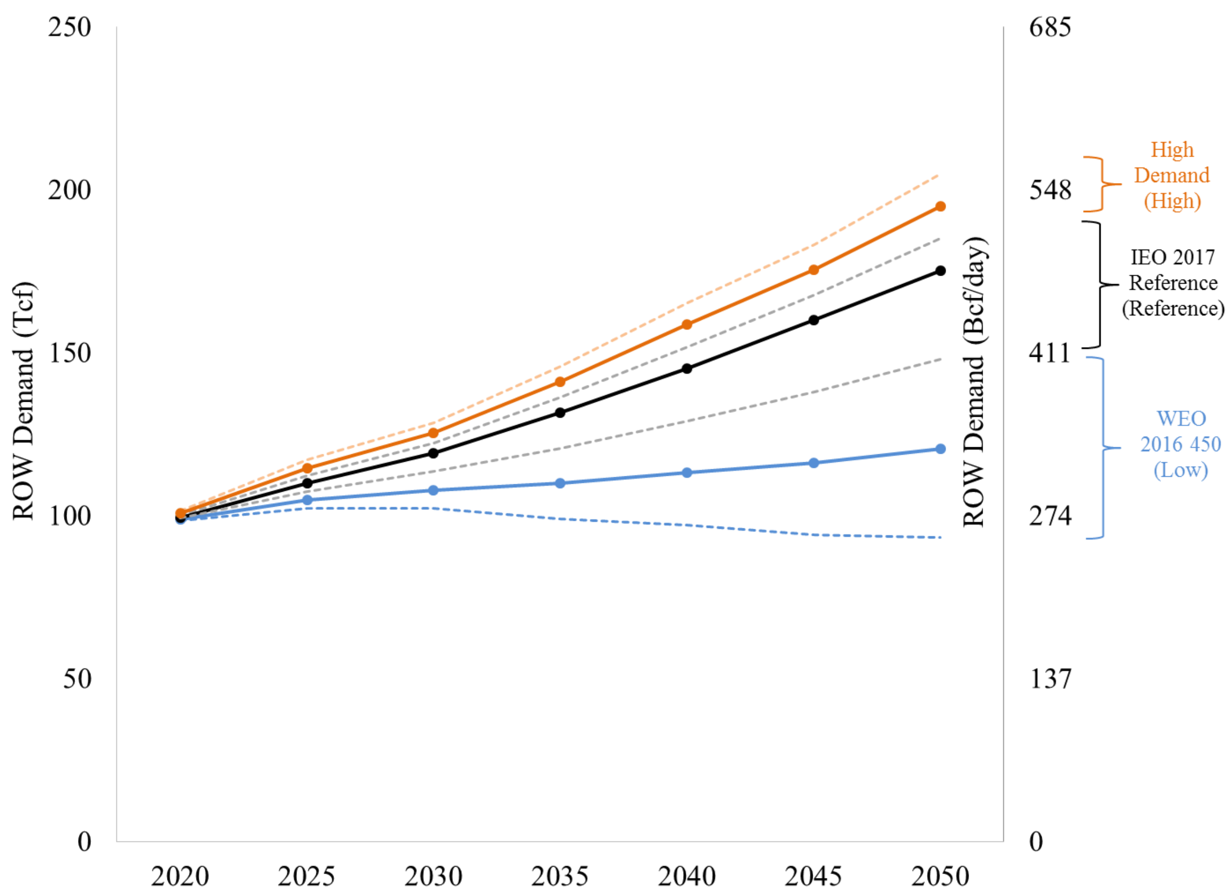


[68] ROW Natural Gas Supply in 2016 was equal to 96.4 Tcf

Table 25: Range of ROW Natural Gas Demand (Tcf)[69]

Case		2020	2025	2030	2035	2040
High Demand (High)	Upper Bound	103	124	138	160	186
	Central Estimate	102	119	131	151	172
	Lower Bound	101	115	125	141	159
IEO 2017, Reference (Reference)	Upper Bound	101	115	125	141	159
	Central Estimate	100	110	119	132	145
	Lower Bound	99	107	113	121	129
WEO 450ppm (Low)	Upper Bound	99	107	113	121	129
	Central Estimate	99	105	108	110	113
	Lower Bound	98	102	102	99	97

Figure 32: Range of ROW Natural Gas Demand

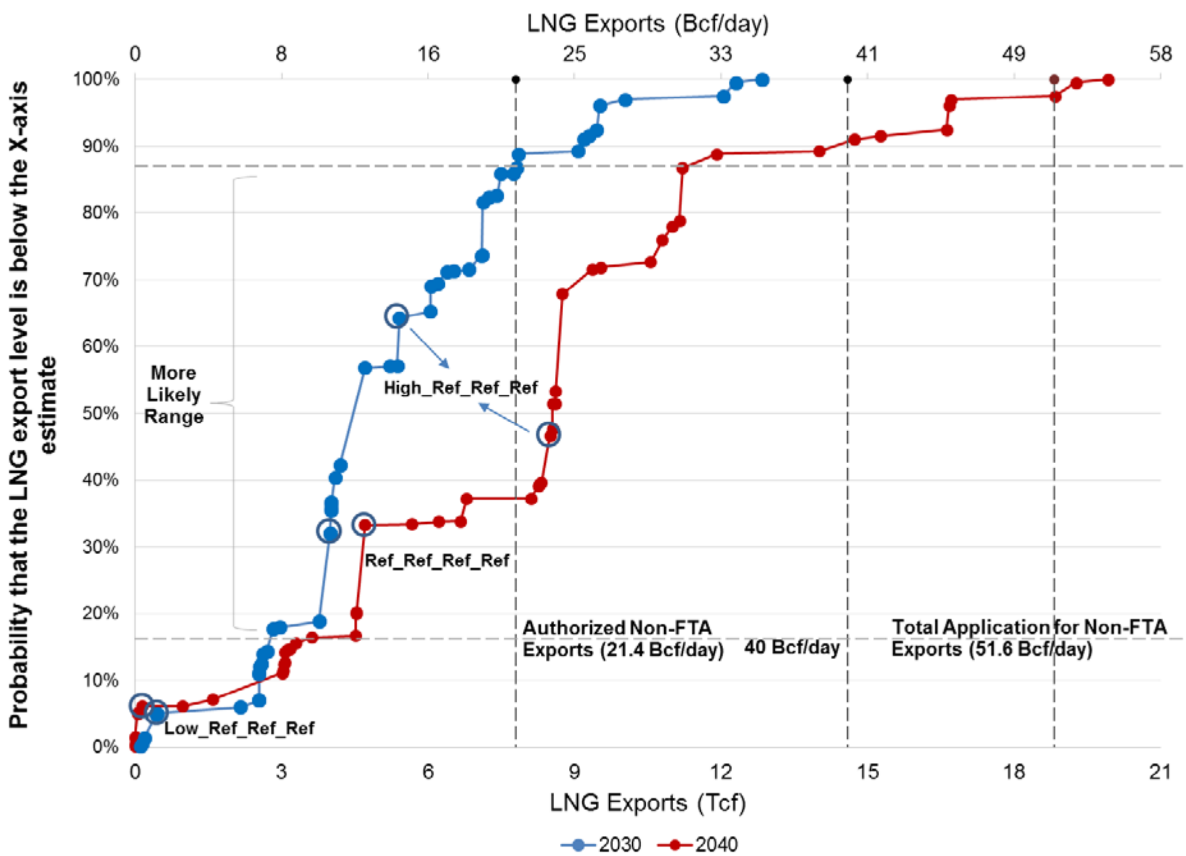


[69] ROW Natural Gas Demand in 2016 was equal to 97.8 Tcf

APPENDIX D. RESULTS FROM UNLIKELYCASES

Figure 33 compares levels of exports from the different scenarios (54 scenarios) constructed for this study to levels of exports for which DOE has received applications and authorized exports to Non-FTA countries (dashed lines). This discussion focuses on the red graph of the cumulative probabilities of export levels for 2040. The vertical axis shows the probability that exports will be less than the export volume indicated by the graph; thus, the probability that exports will exceed that level is 100% minus the plotted probability.

Figure 33: Cumulative Probabilities of LNG Export Levels



Non-FTA exports up to 21.4 Bcf/d have already been authorized by DOE, and this level of exports falls well within the one-standard deviation interval around the mean scenario.

The next step up in exports 40 Bcf/d, an arbitrary point of reference, is much less likely to be reached. The cumulative probability distribution indicates that there is a less than 10% chance of exports reaching 40 Bcf/d by 2040, and virtually no chance of reaching that level by 2030 based on the study assumptions of the domestic and international natural gas markets.

DOE has received applications for a total of 55.04 Bcf/d of exports to Non-FTA countries. Again, there is virtually no chance that this level of exports could be reached before 2040, and only a 2% chance that this level could be reached or exceeded by 2040.

The assumptions required to achieve either 40 or 55.04Bcf/d by 2040 represent highly unlikely sets of circumstances of economic and natural gas market conditions. The only cases in which exports could reach 55.04 Bcf/d in 2040 are ones in which the U.S has high oil and gas resources and technology, and the rest of the world has low natural gas production and high consumption.[70]

The U.S. supply assumption for this case is that the U.S. has abundant deposits of shale gas that can be extracted at costs lower than being experienced today, and that technology improves rapidly to keep those costs down while production grows. At the same time, to generate this scenario it is necessary to assume that no other country is so fortunate. In the rest of the world technology could stagnate and resources become unavailable for political and institutional reasons or because those resources are not amenable to the commercial application of horizontal drilling and large volume fracturing.

This combination of outcomes is assigned a low probability because transfer of oil production technology around the world is very much in the interest of multinational oil production and service companies and that technology should be adaptable to shales different than those in the U.S. over a period of more than 20 years. In order to reach export levels in this high range, at the same time that unlikely supply and demand assumptions are adopted, it is also necessary to assume that the rest of the world makes no effort to reduce greenhouse gas emissions to levels that would cut into the use of natural gas. These are the kinds of extreme assumptions that must be adopted to generate cases with LNG exports at the high end of this range.

Even to get above 40 Bcf/d of LNG exports, it is necessary to make the same assumptions about low natural gas supply in the rest of the world and, in most cases, to assume high world natural gas demand as well.

This study examined the natural gas market and macroeconomic implications of such a highly unlikely case in a scenario that reached 54.6 Bcf/d of exports in 2040. This was the High_Ref_Low_High scenario. The key finding of this case is that the economic performance of the U.S., in terms of GDP growth and personal consumption, was better than in any case with lower export levels and the same U.S. supply assumption. This positive outcome is due to the huge benefit that the U.S. gets from having access to low-cost natural gas along with the world's most advanced technology, and the increasing revenues that the U.S. gains when global demand for LNG increases.

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[70] Recall that all scenarios assume that applications are made and approved to cover the market-determined level of exports, even if those export levels exceed total volumes in current applications.

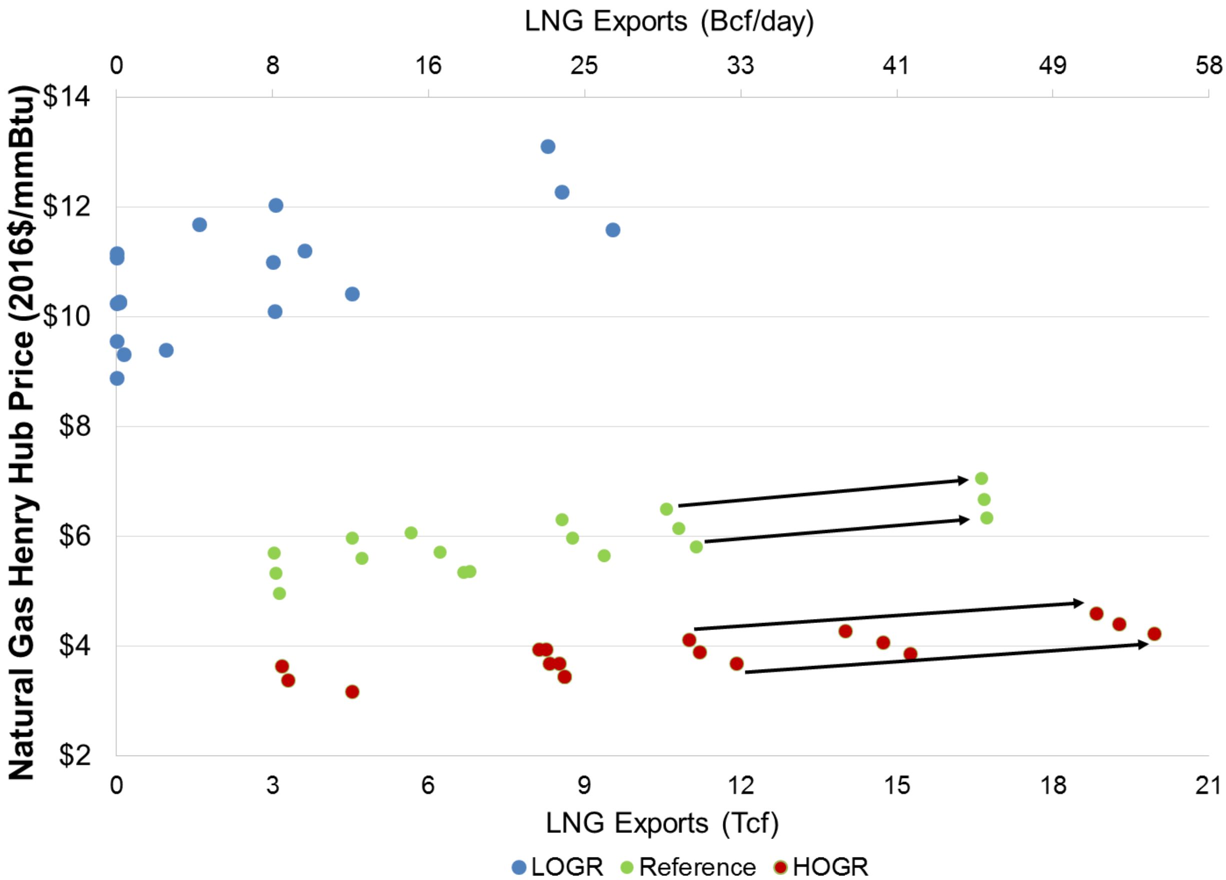
As Table 26 shows, macroeconomic impacts for the high U.S. supply and reference U.S. demand scenarios demonstrate that higher LNG exports lead to higher macroeconomic impacts.

Table 26: Macroeconomic Impacts for High U.S. Supply and Reference U.S. Demand Scenarios in 2040

	High_Ref_Ref_Ref	High_Ref_Ref_High	High_Ref_Low_Ref	High_Ref_Low_High
LNG Exports (Bcf/day)	23.3	30.7	40.4	52.8
Gross Domestic Product (2016$ Billion)	$33,146	$33,159	$33,177	$33,207
Consumption (2016$ Billion)	$26,021	$26,022	$26,028	$26,034
Welfare (2016$ Billion)	$31,320	$31,323	$31,331	$31,340
Change in Gross Domestic Product from Baseline per Household (2016$/Household)	-	$91	$221	$433
Change in Consumption from Baseline per Household (2016$/Household)	-	$13	$52	$98
Change in Consumer Welfare from Baseline per Household (2016$/Household)	-	$24	$76	$141

Moreover, as Figure 34 shows, the U.S. has lower natural gas prices in these high export scenarios than it does in any scenarios with Ref or Low Oil and Gas Resource Assumptions, even those with exports at or below currently authorized levels of 21.4 Bcf/day (7.5 Tcf/yr).

Figure 34: U.S. LNG Prices Versus Exports for Different Supply Cases – All Scenarios



Indeed, going from the authorized level of exports to the maximum levels of these extreme scenarios would add less than $0.50/Mcf to the price of natural gas in the corresponding cases, because the only assumption that allows high levels of exports is that costs of production for natural gas are not only low but rise very slowly with cumulative extraction.

Recalling that there is a less than a 10% chance of exceeding 40 Bcf/day by 2040, the only scenarios in which U.S. natural gas supply can be set at Reference levels are ones in which ROW gas supplies are low and demand is high. But even in these cases, the difference in natural gas prices under Reference case supply assumptions for the U.S. is only about $0.25 higher in the highest export case than it is in corresponding cases with exports less than currently authorized levels.

APPENDIX E. DETAILED GNGM MODEL NATURAL GAS RESULTS FOR THE 54 SCENARIOS

Included in a separate spreadsheet “Appendix E_NERA GNGM Results.xlsx” attached with this report.

Appendix E
Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports
Global Natural Gas Model Results
22-May-18

Tab Name	Description
U.S. LNG Exports	LNG Exports from the U.S. for the 54 Scenarios reported in Bcf/day by model year
U.S. LNG Export Revenues	Revenues associated with LNG exports from the U.S. for the 54 Scenarios reported in 2016$ Billion by model year
U.S. Natural Gas Production	U.S. Natural Gas Domestic Production for the 54 Scenarios reported in Tcf by model year
U.S. Natural Gas Consumption	U.S. Natural Gas Domestic Consumption for the 54 Scenarios reported in Tcf by model year
Henry Hub Prices	U.S. Natural Gas Henry Hub Prices for the 54 Scenarios reported in 2016$/mmBtu by model year
U.S. LNG Flows	U.S. LNG Flows by destination and model year for the 54 Scenarios reported in Bcf/day
U.S. Net Pipeline Exports	U.S. Net Pipeline Exports for the 54 Scenarios reported in Bcf/day by model year
Pipeline Trade_Mexico	U.S. Pipeline Exports to Mexico for the 54 Scenarios reported in Bcf/day by model year
Pipeline Trade_Canada	U.S. Pipeline Imports and Exports from and to Canada for the 54 Scenarios reported in Bcf/day by model year

	Scenario				U.S. LNG Exports (Bcf/day)						
	US Supply	**US Demand**	**ROW Supply**	**ROW Demand**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
High_Low_Low_High	High	Low	Low	High	10.8	25.2	35.2	45.7	54.6	63.3	69.3
High_Low_Low_Ref	High	Low	Low	Ref	9.7	17.6	25.5	30.8	41.8	50.9	57.8
High_Low_Low_Low	High	Low	Low	Low	9.7	16.1	21.2	21.8	23.6	23.8	26.1
High_Ref_Low_High	High	Ref	Low	High	10.1	23.0	33.7	45.1	52.8	62.8	69.1
High_High_Low_High	High	High	Low	High	10.0	22.0	33.0	43.6	51.6	61.4	68.2
High_Ref_Low_Ref	High	Ref	Low	Ref	9.7	17.1	25.2	29.3	40.4	48.8	57.5
High_High_Low_Ref	High	High	Low	Ref	9.7	16.8	24.9	28.8	38.4	46.8	57.0
High_Ref_Low_Low	High	Ref	Low	Low	9.7	14.3	20.3	21.3	22.8	23.5	24.1
High_High_Low_Low	High	High	Low	Low	9.7	14.1	19.5	20.7	22.2	22.8	23.8
High_Low_Ref_High	High	Low	Ref	High	8.0	14.2	21.5	28.9	32.6	34.0	31.8
High_Low_Ref_Ref	High	Low	Ref	Ref	7.9	12.6	17.5	21.9	23.6	23.8	24.0
High_Low_Ref_Low	High	Low	Ref	Low	7.9	10.5	11.0	12.4	12.4	11.3	8.6
High_Ref_Ref_High	High	Ref	Ref	High	7.9	14.2	19.5	27.6	30.7	33.0	31.4
High_High_Ref_High	High	High	Ref	High	7.9	14.0	19.4	25.4	30.1	33.0	29.2
High_Ref_Ref_Ref	High	Ref	Ref	Ref	7.9	12.1	14.8	21.3	23.3	23.8	23.9
High_High_Ref_Ref	High	High	Ref	Ref	7.9	11.8	11.5	17.7	22.6	22.8	22.8
High_Ref_Ref_Low	High	Ref	Ref	Low	7.9	10.0	11.0	11.6	9.0	8.6	8.4
High_High_Ref_Low	High	High	Ref	Low	7.9	10.0	11.0	9.6	8.7	8.4	8.2
Ref_Low_Low_High	Ref	Low	Low	High	9.7	19.4	27.5	35.6	45.8	49.8	57.8
Ref_Low_Low_Ref	Ref	Low	Low	Ref	8.3	14.8	21.4	25.3	30.5	36.8	45.5
Ref_Low_Low_Low	Ref	Low	Low	Low	8.3	13.2	17.9	16.2	18.3	19.1	19.4
Ref_Ref_Low_High	Ref	Ref	Low	High	9.2	18.7	26.1	34.6	45.7	48.5	57.7
Ref_High_Low_High	Ref	High	Low	High	9.0	18.4	25.9	33.0	45.5	47.6	57.6
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	8.2	13.6	20.5	24.6	29.6	34.3	44.4
Ref_High_Low_Ref	Ref	High	Low	Ref	8.2	13.6	19.9	22.3	28.9	30.2	42.1
Ref_Ref_Low_Low	Ref	Ref	Low	Low	8.2	12.8	17.0	12.8	17.0	16.5	15.8
Ref_High_Low_Low	Ref	High	Low	Low	8.2	12.6	14.7	12.4	15.5	12.4	12.9
Ref_Low_Ref_High	Ref	Low	Ref	High	7.4	12.8	16.6	22.0	25.7	27.4	28.4
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	7.4	10.0	11.0	12.6	18.6	16.0	12.9
Ref_Low_Ref_Low	Ref	Low	Ref	Low	7.4	9.7	7.4	8.6	8.5	8.4	8.3
Ref_Ref_Ref_High	Ref	Ref	Ref	High	7.4	12.5	12.9	21.4	24.0	26.1	27.1
Ref_High_Ref_High	Ref	High	Ref	High	7.4	11.9	11.2	18.9	23.4	23.6	24.5
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	7.4	9.9	10.9	12.4	12.9	12.4	12.4
Ref_High_Ref_Ref	Ref	High	Ref	Ref	7.4	9.9	7.7	11.6	12.4	12.4	12.3
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	7.4	9.6	7.2	8.5	8.4	8.3	2.7
Ref_High_Ref_Low	Ref	High	Ref	Low	7.4	8.2	7.1	8.4	8.3	3.9	0.1
Low_Low_Low_High	Low	Low	Low	High	8.0	13.4	18.7	21.9	26.1	28.8	34.2
Low_Low_Low_Ref	Low	Low	Low	Ref	7.9	9.7	10.9	12.1	12.4	17.2	22.0
Low_Low_Low_Low	Low	Low	Low	Low	7.9	7.2	7.1	8.2	2.6	4.8	5.9
Low_Ref_Low_High	Low	Ref	Low	High	8.0	12.5	16.6	20.0	23.4	27.1	31.6
Low_High_Low_High	Low	High	Low	High	7.9	11.3	14.3	18.2	22.7	24.3	29.5
Low_Ref_Low_Ref	Low	Ref	Low	Ref	7.9	8.6	10.3	9.6	9.9	12.3	16.4
Low_High_Low_Ref	Low	High	Low	Ref	7.9	7.3	8.1	8.4	8.4	11.9	11.9
Low_Ref_Low_Low	Low	Ref	Low	Low	7.9	7.1	7.0	2.2	0.1	0.1	0.1
Low_High_Low_Low	Low	High	Low	Low	7.9	7.0	7.0	0.4	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	7.4	7.1	7.0	8.4	8.3	9.5	11.9
Low_Low_Ref_Ref	Low	Low	Ref	Ref	7.4	7.0	5.9	4.5	0.4	2.6	0.5
Low_Low_Ref_Low	Low	Low	Ref	Low	7.4	5.9	1.2	0.1	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	7.4	7.0	7.0	8.2	8.2	8.3	8.3
Low_High_Ref_High	Low	High	Ref	High	7.4	7.0	7.0	8.2	4.3	7.2	8.2
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	7.4	6.3	1.2	0.4	0.1	0.1	0.1
Low_High_Ref_Ref	Low	High	Ref	Ref	7.4	5.6	0.5	0.1	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	7.4	4.2	0.4	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	7.4	2.3	0.3	0.0	0.0	0.0	0.0

	Scenario				U.S. LNG Export Revenues (2016$ Billion)						
	US Supply	**US Demand**	**ROW Supply**	**ROW Demand**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
High_Low_Low_High	High	Low	Low	High	26	60	89	111	134	156	175
High_Low_Low_Ref	High	Low	Low	Ref	23	40	61	70	97	119	139
High_Low_Low_Low	High	Low	Low	Low	23	36	50	47	51	50	56
High_Ref_Low_High	High	Ref	Low	High	24	56	87	114	133	160	180
High_High_Low_High	High	High	Low	High	24	54	88	113	134	162	185
High_Ref_Low_Ref	High	Ref	Low	Ref	23	40	63	69	96	118	143
High_High_Low_Ref	High	High	Low	Ref	23	40	64	70	95	117	148
High_Ref_Low_Low	High	Ref	Low	Low	23	33	49	48	51	52	54
High_High_Low_Low	High	High	Low	Low	23	33	48	49	52	53	56
High_Low_Ref_High	High	Low	Ref	High	18	32	50	65	73	75	70
High_Low_Ref_Ref	High	Low	Ref	Ref	18	28	40	48	51	50	51
High_Low_Ref_Low	High	Low	Ref	Low	18	23	24	26	25	23	17
High_Ref_Ref_High	High	Ref	Ref	High	18	33	47	65	71	76	72
High_High_Ref_High	High	High	Ref	High	19	33	48	61	73	79	70
High_Ref_Ref_Ref	High	Ref	Ref	Ref	18	27	35	48	52	53	53
High_High_Ref_Ref	High	High	Ref	Ref	18	27	27	41	53	53	53
High_Ref_Ref_Low	High	Ref	Ref	Low	18	22	25	25	19	18	18
High_High_Ref_Low	High	High	Ref	Low	18	23	26	22	19	18	18
Ref_Low_Low_High	Ref	Low	Low	High	27	55	85	113	149	173	221
Ref_Low_Low_Ref	Ref	Low	Low	Ref	23	40	64	77	93	120	162
Ref_Low_Low_Low	Ref	Low	Low	Low	23	36	52	47	52	57	62
Ref_Ref_Low_High	Ref	Ref	Low	High	26	55	84	114	154	174	228
Ref_High_Low_High	Ref	High	Low	High	25	55	86	112	160	179	239
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	23	38	64	78	94	117	164
Ref_High_Low_Ref	Ref	High	Low	Ref	23	39	64	73	96	107	165
Ref_Ref_Low_Low	Ref	Ref	Low	Low	23	36	52	38	51	52	53
Ref_High_Low_Low	Ref	High	Low	Low	23	36	46	39	49	41	46
Ref_Low_Ref_High	Ref	Low	Ref	High	20	34	48	66	77	86	95
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	20	26	31	36	53	48	40
Ref_Low_Ref_Low	Ref	Low	Ref	Low	20	25	20	24	23	24	25
Ref_Ref_Ref_High	Ref	Ref	Ref	High	20	35	39	67	75	86	94
Ref_High_Ref_High	Ref	High	Ref	High	20	34	34	61	76	81	90
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	20	27	32	37	38	39	41
Ref_High_Ref_Ref	Ref	High	Ref	Ref	20	27	23	36	39	41	43
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	20	26	20	24	24	25	8
Ref_High_Ref_Low	Ref	High	Ref	Low	20	23	21	25	25	12	0
Low_Low_Low_High	Low	Low	Low	High	25	53	83	102	137	153	203
Low_Low_Low_Ref	Low	Low	Low	Ref	25	37	45	53	59	84	118
Low_Low_Low_Low	Low	Low	Low	Low	25	26	28	34	12	21	28
Low_Ref_Low_High	Low	Ref	Low	High	25	51	76	98	129	152	196
Low_High_Low_High	Low	High	Low	High	25	47	68	93	132	144	195
Low_Ref_Low_Ref	Low	Ref	Low	Ref	25	34	45	44	50	64	92
Low_High_Low_Ref	Low	High	Low	Ref	25	29	37	40	45	67	73
Low_Ref_Low_Low	Low	Ref	Low	Low	25	27	30	10	1	1	1
Low_High_Low_Low	Low	High	Low	Low	25	28	31	2	0	0	0
Low_Low_Ref_High	Low	Low	Ref	High	22	26	28	36	39	44	60
Low_Low_Ref_Ref	Low	Low	Ref	Ref	22	25	23	18	2	11	2
Low_Low_Ref_Low	Low	Low	Ref	Low	22	21	5	0	0	0	0
Low_Ref_Ref_High	Low	Ref	Ref	High	23	27	30	37	41	42	44
Low_High_Ref_High	Low	High	Ref	High	23	27	31	39	23	39	48
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	23	24	5	2	1	1	1
Low_High_Ref_Ref	Low	High	Ref	Ref	23	22	2	1	0	0	0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	23	16	1	0	0	0	0
Low_High_Ref_Low	Low	High	Ref	Low	23	9	1	0	0	0	0

	Scenario				Natural Gas Production (Tcf)						
	US Supply	US Demand	ROW Supply	ROW Demand	2020	2025	2030	2035	2040	2045	2050
High_Low_Low_High	High	Low	Low	High	33	40	45	50	55	60	65
High_Low_Low_Ref	High	Low	Low	Ref	33	37	42	45	50	55	60
High_Low_Low_Low	High	Low	Low	Low	33	37	40	41	43	45	48
High_Ref_Low_High	High	Ref	Low	High	34	41	47	53	59	65	69
High_High_Low_High	High	High	Low	High	34	42	49	56	63	69	76
High_Ref_Low_Ref	High	Ref	Low	Ref	33	39	44	48	54	59	65
High_High_Low_Ref	High	High	Low	Ref	34	40	46	51	58	64	71
High_Ref_Low_Low	High	Ref	Low	Low	33	38	42	45	47	50	53
High_High_Low_Low	High	High	Low	Low	34	39	44	48	52	55	59
High_Low_Ref_High	High	Low	Ref	High	32	36	40	44	47	50	52
High_Low_Ref_Ref	High	Low	Ref	Ref	32	35	38	41	44	45	48
High_Low_Ref_Low	High	Low	Ref	Low	32	35	36	38	39	40	42
High_Ref_Ref_High	High	Ref	Ref	High	32	38	42	47	51	54	56
High_High_Ref_High	High	High	Ref	High	33	39	44	49	55	59	63
High_Ref_Ref_Ref	High	Ref	Ref	Ref	32	37	40	44	48	50	53
High_High_Ref_Ref	High	High	Ref	Ref	32	38	42	47	52	55	59
High_Ref_Ref_Low	High	Ref	Ref	Low	32	36	39	41	42	44	46
High_High_Ref_Low	High	High	Ref	Low	32	37	41	43	47	49	53
Ref_Low_Low_High	Ref	Low	Low	High	31	35	38	41	45	48	53
Ref_Low_Low_Ref	Ref	Low	Low	Ref	31	33	36	38	40	43	47
Ref_Low_Low_Low	Ref	Low	Low	Low	31	32	34	34	35	36	38
Ref_Ref_Low_High	Ref	Ref	Low	High	32	36	40	44	50	52	57
Ref_High_Low_High	Ref	High	Low	High	32	37	42	47	54	58	64
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	31	35	38	41	44	47	51
Ref_High_Low_Ref	Ref	High	Low	Ref	32	35	40	43	48	51	58
Ref_Ref_Low_Low	Ref	Ref	Low	Low	31	34	37	37	39	40	41
Ref_High_Low_Low	Ref	High	Low	Low	31	35	38	40	43	44	47
Ref_Low_Ref_High	Ref	Low	Ref	High	30	32	34	36	38	40	41
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	30	31	32	33	35	35	36
Ref_Low_Ref_Low	Ref	Low	Ref	Low	30	31	31	31	31	31	32
Ref_Ref_Ref_High	Ref	Ref	Ref	High	31	34	36	40	42	44	45
Ref_High_Ref_High	Ref	High	Ref	High	31	35	37	42	46	48	51
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	31	33	35	36	38	39	40
Ref_High_Ref_Ref	Ref	High	Ref	Ref	31	34	36	39	42	44	47
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	31	33	33	34	35	36	35
Ref_High_Ref_Low	Ref	High	Ref	Low	31	33	35	37	39	40	41
Low_Low_Low_High	Low	Low	Low	High	29	28	29	30	30	31	33
Low_Low_Low_Ref	Low	Low	Low	Ref	29	27	26	26	25	26	27
Low_Low_Low_Low	Low	Low	Low	Low	29	26	25	24	22	21	21
Low_Ref_Low_High	Low	Ref	Low	High	30	30	31	32	33	34	36
Low_High_Low_High	Low	High	Low	High	30	30	32	34	37	38	41
Low_Ref_Low_Ref	Low	Ref	Low	Ref	30	29	29	29	29	29	30
Low_High_Low_Ref	Low	High	Low	Ref	30	29	30	31	32	34	35
Low_Ref_Low_Low	Low	Ref	Low	Low	30	28	27	26	25	24	24
Low_High_Low_Low	Low	High	Low	Low	30	29	29	28	28	29	30
Low_Low_Ref_High	Low	Low	Ref	High	28	26	25	25	24	24	24
Low_Low_Ref_Ref	Low	Low	Ref	Ref	28	26	24	23	21	21	20
Low_Low_Ref_Low	Low	Low	Ref	Low	28	25	23	22	20	19	18
Low_Ref_Ref_High	Low	Ref	Ref	High	29	28	27	28	28	27	27
Low_High_Ref_High	Low	High	Ref	High	29	29	29	31	31	32	33
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	29	27	26	26	25	24	24
Low_High_Ref_Ref	Low	High	Ref	Ref	29	28	27	28	28	29	29
Low_Ref_Ref_Low	Low	Ref	Ref	Low	29	27	25	24	22	21	20
Low_High_Ref_Low	Low	High	Ref	Low	29	27	26	26	25	25	26

	Scenario				Natural Gas Consumption (Tcf)						
	US Supply	**US Demand**	**ROW Supply**	**ROW Demand**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
High_Low_Low_High	High	Low	Low	High	28	28	29	29	31	32	34
High_Low_Low_Ref	High	Low	Low	Ref	28	29	29	30	31	32	34
High_Low_Low_Low	High	Low	Low	Low	28	29	29	31	32	34	36
High_Ref_Low_High	High	Ref	Low	High	29	30	32	33	35	37	39
High_High_Low_High	High	High	Low	High	29	31	34	37	40	43	46
High_Ref_Low_Ref	High	Ref	Low	Ref	29	31	32	34	36	38	40
High_High_Low_Ref	High	High	Low	Ref	29	32	35	38	41	44	47
High_Ref_Low_Low	High	Ref	Low	Low	29	31	33	35	37	39	42
High_High_Low_Low	High	High	Low	Low	29	32	35	38	42	45	50
High_Low_Ref_High	High	Low	Ref	High	28	29	29	30	31	33	35
High_Low_Ref_Ref	High	Low	Ref	Ref	28	29	30	31	32	34	36
High_Low_Ref_Low	High	Low	Ref	Low	28	29	30	31	33	35	37
High_Ref_Ref_High	High	Ref	Ref	High	29	31	33	34	36	38	41
High_High_Ref_High	High	High	Ref	High	29	32	35	38	42	45	49
High_Ref_Ref_Ref	High	Ref	Ref	Ref	29	31	33	35	37	39	42
High_High_Ref_Ref	High	High	Ref	Ref	29	32	36	39	42	45	50
High_Ref_Ref_Low	High	Ref	Ref	Low	29	31	33	35	38	40	43
High_High_Ref_Low	High	High	Ref	Low	29	32	36	39	43	46	51
Ref_Low_Low_High	Ref	Low	Low	High	26	25	25	25	25	26	27
Ref_Low_Low_Ref	Ref	Low	Low	Ref	26	26	26	26	26	26	27
Ref_Low_Low_Low	Ref	Low	Low	Low	26	26	26	26	27	27	29
Ref_Ref_Low_High	Ref	Ref	Low	High	27	28	28	29	30	31	32
Ref_High_Low_High	Ref	High	Low	High	27	29	31	33	35	37	40
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	27	28	29	30	31	32	33
Ref_High_Low_Ref	Ref	High	Low	Ref	27	29	31	34	36	38	41
Ref_Ref_Low_Low	Ref	Ref	Low	Low	27	28	29	31	32	33	34
Ref_High_Low_Low	Ref	High	Low	Low	27	29	32	34	37	40	43
Ref_Low_Ref_High	Ref	Low	Ref	High	27	26	26	26	26	27	28
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	27	26	26	27	27	27	29
Ref_Low_Ref_Low	Ref	Low	Ref	Low	27	26	27	27	27	28	30
Ref_Ref_Ref_High	Ref	Ref	Ref	High	27	28	29	30	31	32	34
Ref_High_Ref_High	Ref	High	Ref	High	28	29	32	34	36	39	42
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	27	28	29	31	32	33	35
Ref_High_Ref_Ref	Ref	High	Ref	Ref	28	29	32	34	37	40	43
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	27	28	30	31	32	34	36
Ref_High_Ref_Low	Ref	High	Ref	Low	28	29	32	35	38	41	44
Low_Low_Low_High	Low	Low	Low	High	25	22	20	20	18	18	18
Low_Low_Low_Ref	Low	Low	Low	Ref	25	22	21	20	19	19	18
Low_Low_Low_Low	Low	Low	Low	Low	25	22	21	21	20	19	19
Low_Ref_Low_High	Low	Ref	Low	High	26	24	23	24	23	23	23
Low_High_Low_High	Low	High	Low	High	26	25	26	27	28	30	31
Low_Ref_Low_Ref	Low	Ref	Low	Ref	26	24	24	24	24	24	24
Low_High_Low_Ref	Low	High	Low	Ref	26	25	26	28	29	30	32
Low_Ref_Low_Low	Low	Ref	Low	Low	26	25	24	25	25	25	25
Low_High_Low_Low	Low	High	Low	Low	26	26	27	29	30	32	33
Low_Low_Ref_High	Low	Low	Ref	High	25	22	21	20	19	19	19
Low_Low_Ref_Ref	Low	Low	Ref	Ref	25	23	21	21	20	19	20
Low_Low_Ref_Low	Low	Low	Ref	Low	25	23	22	21	20	20	20
Low_Ref_Ref_High	Low	Ref	Ref	High	26	25	24	24	24	25	24
Low_High_Ref_High	Low	High	Ref	High	26	26	27	28	30	31	32
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	26	25	25	25	25	25	25
Low_High_Ref_Ref	Low	High	Ref	Ref	26	26	27	29	30	32	33
Low_Ref_Ref_Low	Low	Ref	Ref	Low	26	25	25	25	25	26	26
Low_High_Ref_Low	Low	High	Ref	Low	26	26	28	29	31	33	34

	Scenario				Natural Gas Henry Hub Prices (2016$/mmBtu)						
	US Supply	**US Demand**	**ROW Supply**	**ROW Demand**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
High_Low_Low_High	High	Low	Low	High	4.0	4.1	4.4	4.2	4.2	4.3	4.4
High_Low_Low_Ref	High	Low	Low	Ref	4.0	3.8	4.1	3.8	3.9	3.9	4.1
High_Low_Low_Low	High	Low	Low	Low	4.0	3.7	3.9	3.5	3.4	3.3	3.4
High_Ref_Low_High	High	Ref	Low	High	4.1	4.2	4.6	4.4	4.4	4.5	4.7
High_High_Low_High	High	High	Low	High	4.1	4.3	4.8	4.6	4.6	4.7	4.9
High_Ref_Low_Ref	High	Ref	Low	Ref	4.1	4.0	4.3	4.0	4.1	4.1	4.3
High_High_Low_Ref	High	High	Low	Ref	4.1	4.1	4.5	4.2	4.3	4.4	4.6
High_Ref_Low_Low	High	Ref	Low	Low	4.1	3.8	4.2	3.8	3.7	3.6	3.6
High_High_Low_Low	High	High	Low	Low	4.1	3.9	4.3	4.0	3.9	3.9	4.0
High_Low_Ref_High	High	Low	Ref	High	3.8	3.6	3.9	3.7	3.7	3.6	3.6
High_Low_Ref_Ref	High	Low	Ref	Ref	3.8	3.5	3.8	3.5	3.5	3.4	3.4
High_Low_Ref_Low	High	Low	Ref	Low	3.8	3.5	3.6	3.3	3.2	3.1	3.0
High_Ref_Ref_High	High	Ref	Ref	High	3.9	3.8	4.1	4.0	3.9	3.8	3.8
High_High_Ref_High	High	High	Ref	High	3.9	3.9	4.3	4.1	4.1	4.1	4.1
High_Ref_Ref_Ref	High	Ref	Ref	Ref	3.9	3.7	4.0	3.8	3.7	3.6	3.6
High_High_Ref_Ref	High	High	Ref	Ref	3.9	3.8	4.1	3.9	3.9	3.9	4.0
High_Ref_Ref_Low	High	Ref	Ref	Low	3.9	3.6	3.8	3.5	3.4	3.3	3.3
High_High_Ref_Low	High	High	Ref	Low	3.9	3.7	4.0	3.7	3.6	3.6	3.6
Ref_Low_Low_High	Ref	Low	Low	High	5.1	5.2	6.0	6.1	6.3	6.9	7.9
Ref_Low_Low_Ref	Ref	Low	Low	Ref	5.0	5.0	5.7	5.8	5.8	6.4	7.2
Ref_Low_Low_Low	Ref	Low	Low	Low	5.0	4.9	5.5	5.4	5.4	5.7	6.2
Ref_Ref_Low_High	Ref	Ref	Low	High	5.2	5.5	6.3	6.5	6.7	7.2	8.2
Ref_High_Low_High	Ref	High	Low	High	5.2	5.6	6.5	6.8	7.1	7.7	8.7
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	5.1	5.2	6.0	6.1	6.2	6.7	7.5
Ref_High_Low_Ref	Ref	High	Low	Ref	5.1	5.3	6.2	6.4	6.5	7.1	8.1
Ref_Ref_Low_Low	Ref	Ref	Low	Low	5.1	5.1	5.8	5.6	5.7	6.1	6.6
Ref_High_Low_Low	Ref	High	Low	Low	5.1	5.3	6.0	6.0	6.1	6.5	7.2
Ref_Low_Ref_High	Ref	Low	Ref	High	4.8	4.9	5.4	5.6	5.7	6.1	6.6
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	4.8	4.7	5.2	5.3	5.4	5.7	6.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	4.8	4.6	5.0	5.0	5.0	5.2	5.6
Ref_Ref_Ref_High	Ref	Ref	Ref	High	4.9	5.1	5.7	6.0	6.0	6.4	7.0
Ref_High_Ref_High	Ref	High	Ref	High	5.0	5.2	5.9	6.2	6.3	6.8	7.5
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	4.9	4.9	5.5	5.6	5.6	6.0	6.4
Ref_High_Ref_Ref	Ref	High	Ref	Ref	4.9	5.1	5.7	5.9	6.0	6.5	7.1
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	4.9	4.9	5.3	5.4	5.3	5.7	6.0
Ref_High_Ref_Low	Ref	High	Ref	Low	4.9	5.0	5.6	5.7	5.7	6.1	6.5
Low_Low_Low_High	Low	Low	Low	High	6.0	8.1	9.4	10.1	11.6	11.8	13.4
Low_Low_Low_Ref	Low	Low	Low	Ref	6.0	7.7	8.7	9.2	10.4	10.7	11.9
Low_Low_Low_Low	Low	Low	Low	Low	5.9	7.5	8.3	8.7	9.4	9.4	10.2
Low_Ref_Low_High	Low	Ref	Low	High	6.2	8.6	9.9	10.7	12.3	12.6	14.1
Low_High_Low_High	Low	High	Low	High	6.2	8.7	10.3	11.3	13.1	13.4	15.2
Low_Ref_Low_Ref	Low	Ref	Low	Ref	6.1	8.2	9.3	9.9	11.2	11.4	12.6
Low_High_Low_Ref	Low	High	Low	Ref	6.2	8.3	9.7	10.5	12.0	12.5	13.8
Low_Ref_Low_Low	Low	Ref	Low	Low	6.1	8.0	9.0	9.2	10.3	10.2	11.0
Low_High_Low_Low	Low	High	Low	Low	6.2	8.2	9.5	9.8	11.2	11.4	12.7
Low_Low_Ref_High	Low	Low	Ref	High	5.8	7.5	8.3	9.0	10.1	10.1	11.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	5.7	7.3	8.1	8.5	9.3	9.3	9.9
Low_Low_Ref_Low	Low	Low	Ref	Low	5.7	7.2	7.7	8.0	8.9	8.6	9.0
Low_Ref_Ref_High	Low	Ref	Ref	High	5.9	8.0	9.0	9.7	11.0	11.0	11.8
Low_High_Ref_High	Low	High	Ref	High	6.0	8.2	9.5	10.4	11.7	12.0	13.3
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	5.9	7.8	8.5	9.1	10.3	10.2	11.0
Low_High_Ref_Ref	Low	High	Ref	Ref	5.9	8.0	8.9	9.7	11.1	11.3	12.3
Low_Ref_Ref_Low	Low	Ref	Ref	Low	5.9	7.6	8.3	8.7	9.6	9.2	9.9
Low_High_Ref_Low	Low	High	Ref	Low	5.9	7.7	8.5	9.1	10.2	10.4	11.5

	Scenario				Destination	U.S LNG Exports (Bcf/day)						
	US Supply	US Demand	ROW Supply	ROW Demand		2020	2025	2030	2035	2040	2045	2050
High_Low_Low_High	High	Low	Low	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_High	High	Low	Low	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_High	High	Low	Low	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_High	High	Low	Low	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_High	High	Low	Low	High	ChinaIndia	7.4	12.2	1.8	18.1	25.0	32.5	35.9
High_Low_Low_High	High	Low	Low	High	CSAmer	0.0	0.0	0.0	0.0	0.0	1.3	1.9
High_Low_Low_High	High	Low	Low	High	Europe	3.4	7.8	15.6	15.5	19.6	23.5	29.9
High_Low_Low_High	High	Low	Low	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_High	High	Low	Low	High	KoreaJapan	0.0	5.2	17.7	12.1	10.0	6.0	0.8
High_Low_Low_High	High	Low	Low	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_High	High	Low	Low	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_High	High	Low	Low	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_High	High	Low	Low	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_High	High	Low	Low	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.8
High_Low_Low_High	High	Low	Low	High	Total	**10.8**	**25.2**	**35.2**	**45.7**	**54.6**	**63.3**	**69.3**
High_Low_Low_Ref	High	Low	Low	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	ChinaIndia	6.9	12.2	1.3	11.5	19.5	24.2	30.5
High_Low_Low_Ref	High	Low	Low	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.5	2.0
High_Low_Low_Ref	High	Low	Low	Ref	Europe	2.8	5.5	9.9	10.4	15.4	16.6	18.4
High_Low_Low_Ref	High	Low	Low	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	KoreaJapan	0.0	0.0	14.3	8.9	6.9	9.6	6.4
High_Low_Low_Ref	High	Low	Low	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.4
High_Low_Low_Ref	High	Low	Low	Ref	Total	**9.7**	**17.6**	**25.5**	**30.8**	**41.8**	**50.9**	**57.8**
High_Low_Low_Low	High	Low	Low	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	ChinaIndia	6.9	11.9	1.2	8.5	12.8	13.8	15.7
High_Low_Low_Low	High	Low	Low	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	Europe	2.8	4.1	9.4	8.9	10.8	10.0	10.1
High_Low_Low_Low	High	Low	Low	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	KoreaJapan	0.0	0.0	10.7	4.3	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Low_Low	High	Low	Low	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.3
High_Low_Low_Low	High	Low	Low	Low	Total	**9.7**	**16.1**	**21.2**	**21.8**	**23.6**	**23.8**	**26.1**
High_Ref_Low_High	High	Ref	Low	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_High	High	Ref	Low	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_High	High	Ref	Low	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_High	High	Ref	Low	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_High	High	Ref	Low	High	ChinaIndia	7.3	12.2	1.8	18.0	24.3	32.4	35.9
High_Ref_Low_High	High	Ref	Low	High	CSAmer	0.0	0.0	0.0	0.0	0.0	1.3	1.9
High_Ref_Low_High	High	Ref	Low	High	Europe	2.8	6.8	15.5	15.3	18.7	23.3	29.9
High_Ref_Low_High	High	Ref	Low	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_High	High	Ref	Low	High	KoreaJapan	0.0	4.1	16.4	11.8	9.7	5.8	0.8
High_Ref_Low_High	High	Ref	Low	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_High	High	Ref	Low	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_High	High	Ref	Low	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_High	High	Ref	Low	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_High	High	Ref	Low	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.7
High_Ref_Low_High	High	Ref	Low	High	Total	**10.1**	**23.0**	**33.7**	**45.1**	**52.8**	**62.8**	**69.1**
High_High_Low_High	High	High	Low	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_High	High	High	Low	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_High	High	High	Low	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_High	High	High	Low	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_High	High	High	Low	High	ChinaIndia	7.2	12.2	1.3	16.6	23.6	31.5	35.6
High_High_Low_High	High	High	Low	High	CSAmer	0.0	0.0	0.0	0.0	0.0	1.2	1.9
High_High_Low_High	High	High	Low	High	Europe	2.8	6.3	15.4	15.3	17.8	22.1	29.4
High_High_Low_High	High	High	Low	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_High	High	High	Low	High	KoreaJapan	0.0	3.5	16.3	11.7	10.3	6.6	0.6
High_High_Low_High	High	High	Low	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_High	High	High	Low	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_High	High	High	Low	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_High	High	High	Low	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_High	High	High	Low	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.6
High_High_Low_High	High	High	Low	High	Total	**10.0**	**22.0**	**33.0**	**43.6**	**51.6**	**61.4**	**68.2**
High_Ref_Low_Ref	High	Ref	Low	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Ref	High	Ref	Low	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Ref	High	Ref	Low	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Ref	High	Ref	Low	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Ref	High	Ref	Low	Ref	ChinaIndia	6.9	12.2	1.3	10.0	18.9	23.5	30.4
High_Ref_Low_Ref	High	Ref	Low	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.2	2.0
High_Ref_Low_Ref	High	Ref	Low	Ref	Europe	2.8	4.9	9.9	10.5	15.0	16.0	18.3
High_Ref_Low_Ref	High	Ref	Low	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Ref	High	Ref	Low	Ref	KoreaJapan	0.0	0.0	14.0	8.8	6.5	9.0	6.4
High_Ref_Low_Ref	High	Ref	Low	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Ref	High	Ref	Low	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Ref	High	Ref	Low	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Ref	High	Ref	Low	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Ref	High	Ref	Low	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.4
High_Ref_Low_Ref	High	Ref	Low	Ref	Total	**9.7**	**17.1**	**25.2**	**29.3**	**40.4**	**48.8**	**57.5**
High_High_Low_Ref	High	High	Low	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Ref	High	High	Low	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Ref	High	High	Low	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Ref	High	High	Low	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Ref	High	High	Low	Ref	ChinaIndia	6.9	12.2	1.2	9.7	18.1	22.8	29.7
High_High_Low_Ref	High	High	Low	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	1.7
High_High_Low_Ref	High	High	Low	Ref	Europe	2.8	4.7	9.8	10.5	14.3	15.4	17.6
High_High_Low_Ref	High	High	Low	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Ref	High	High	Low	Ref	KoreaJapan	0.0	0.0	13.8	8.6	5.9	8.6	7.6
High_High_Low_Ref	High	High	Low	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0

High_High_Low_Ref	High	High	Low	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Ref	High	High	Low	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Ref	High	High	Low	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Ref	High	High	Low	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.3
High_High_Low_Ref	High	High	Low	Ref	Total	**9.7**	**16.8**	**24.9**	**28.8**	**38.4**	**46.8**	**57.0**
High_Ref_Low_Low	High	Ref	Low	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	ChinaIndia	6.9	10.6	1.1	8.2	12.3	13.5	14.4
High_Ref_Low_Low	High	Ref	Low	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	Europe	2.8	3.7	9.1	8.9	10.5	10.0	9.4
High_Ref_Low_Low	High	Ref	Low	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	KoreaJapan	0.0	0.0	10.0	4.2	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Low_Low	High	Ref	Low	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.3
High_Ref_Low_Low	High	Ref	Low	Low	Total	**9.7**	**14.3**	**20.3**	**21.3**	**22.8**	**23.5**	**24.1**
High_High_Low_Low	High	High	Low	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	ChinaIndia	6.9	10.5	1.1	8.1	11.9	13.0	14.1
High_High_Low_Low	High	High	Low	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	Europe	2.8	3.6	8.6	8.9	10.3	9.9	9.4
High_High_Low_Low	High	High	Low	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	KoreaJapan	0.0	0.0	9.8	3.7	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Low_Low	High	High	Low	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.3
High_High_Low_Low	High	High	Low	Low	Total	**9.7**	**14.1**	**19.5**	**20.7**	**22.2**	**22.8**	**23.8**
High_Low_Ref_High	High	Low	Ref	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	ChinaIndia	5.6	11.1	1.2	9.2	16.2	18.4	18.7
High_Low_Ref_High	High	Low	Ref	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	Europe	2.4	3.2	6.8	8.9	13.2	12.1	11.7
High_Low_Ref_High	High	Low	Ref	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	KoreaJapan	0.0	0.0	13.5	10.8	3.3	3.4	1.2
High_Low_Ref_High	High	Low	Ref	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_High	High	Low	Ref	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.2
High_Low_Ref_High	High	Low	Ref	High	Total	**8.0**	**14.2**	**21.5**	**28.9**	**32.6**	**34.0**	**31.8**
High_Low_Ref_Ref	High	Low	Ref	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	ChinaIndia	5.6	9.2	0.9	7.6	12.8	13.8	13.9
High_Low_Ref_Ref	High	Low	Ref	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	Europe	2.4	3.5	6.6	8.6	10.6	9.9	8.9
High_Low_Ref_Ref	High	Low	Ref	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	KoreaJapan	0.0	0.0	10.0	5.7	0.2	0.1	0.9
High_Low_Ref_Ref	High	Low	Ref	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.2
High_Low_Ref_Ref	High	Low	Ref	Ref	Total	**7.9**	**12.6**	**17.5**	**21.9**	**23.6**	**23.8**	**24.0**
High_Low_Ref_Low	High	Low	Ref	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	ChinaIndia	5.5	7.0	0.7	8.1	5.1	5.1	4.1
High_Low_Ref_Low	High	Low	Ref	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	Europe	2.5	3.5	3.4	4.3	7.3	6.2	4.4
High_Low_Ref_Low	High	Low	Ref	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	KoreaJapan	0.0	0.0	6.9	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Low_Ref_Low	High	Low	Ref	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.1
High_Low_Ref_Low	High	Low	Ref	Low	Total	**7.9**	**10.5**	**11.0**	**12.4**	**12.4**	**11.3**	**8.6**
High_Ref_Ref_High	High	Ref	Ref	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	ChinaIndia	5.6	11.1	1.1	9.1	16.0	18.4	18.7
High_Ref_Ref_High	High	Ref	Ref	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	Europe	2.4	3.2	4.8	8.1	11.7	11.4	11.6
High_Ref_Ref_High	High	Ref	Ref	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	KoreaJapan	0.0	0.0	13.6	10.4	3.0	3.3	0.9
High_Ref_Ref_High	High	Ref	Ref	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_High	High	Ref	Ref	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.2
High_Ref_Ref_High	High	Ref	Ref	High	Total	**7.9**	**14.2**	**19.5**	**27.6**	**30.7**	**33.0**	**31.4**
High_High_Ref_High	High	High	Ref	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0

High_High_Ref_High	High	High	Ref	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_High	High	High	Ref	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_High	High	High	Ref	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_High	High	High	Ref	High	ChinaIndia	5.6	10.9	1.0	9.1	15.9	18.4	18.0
High_High_Ref_High	High	High	Ref	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_High	High	High	Ref	High	Europe	2.4	3.1	4.7	6.5	11.5	11.4	10.4
High_High_Ref_High	High	High	Ref	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_High	High	High	Ref	High	KoreaJapan	0.0	0.0	13.7	9.8	2.7	3.2	0.6
High_High_Ref_High	High	High	Ref	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_High	High	High	Ref	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_High	High	High	Ref	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_High	High	High	Ref	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_High	High	High	Ref	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.2
High_High_Ref_High	High	High	Ref	High	Total	**7.9**	**14.0**	**19.4**	**25.4**	**30.1**	**33.0**	**29.2**
High_Ref_Ref_Ref	High	Ref	Ref	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	ChinaIndia	5.5	8.7	0.9	7.7	12.7	13.8	13.9
High_Ref_Ref_Ref	High	Ref	Ref	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	Europe	2.4	3.4	4.3	8.0	10.6	9.9	8.9
High_Ref_Ref_Ref	High	Ref	Ref	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	KoreaJapan	0.0	0.0	9.5	5.6	0.0	0.1	0.9
High_Ref_Ref_Ref	High	Ref	Ref	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Ref	High	Ref	Ref	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.2
High_Ref_Ref_Ref	High	Ref	Ref	Ref	Total	**7.9**	**12.1**	**14.8**	**21.3**	**23.3**	**23.8**	**23.9**
High_High_Ref_Ref	High	High	Ref	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	ChinaIndia	5.5	8.4	0.9	7.6	12.3	13.3	13.3
High_High_Ref_Ref	High	High	Ref	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	Europe	2.5	3.4	1.3	4.7	10.3	9.5	8.5
High_High_Ref_Ref	High	High	Ref	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	KoreaJapan	0.0	0.0	9.3	5.3	0.0	0.0	0.9
High_High_Ref_Ref	High	High	Ref	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Ref	High	High	Ref	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.2
High_High_Ref_Ref	High	High	Ref	Ref	Total	**7.9**	**11.8**	**11.5**	**17.7**	**22.6**	**22.8**	**22.8**
High_Ref_Ref_Low	High	Ref	Ref	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	ChinaIndia	5.4	6.6	0.7	8.1	3.8	3.9	4.0
High_Ref_Ref_Low	High	Ref	Ref	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	Europe	2.6	3.5	3.4	3.5	5.2	4.7	4.4
High_Ref_Ref_Low	High	Ref	Ref	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	KoreaJapan	0.0	0.0	6.9	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_Ref_Ref_Low	High	Ref	Ref	Low	Total	**7.9**	**10.0**	**11.0**	**11.6**	**9.0**	**8.6**	**8.4**
High_High_Ref_Low	High	High	Ref	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	ChinaIndia	5.4	6.5	0.7	8.0	3.6	3.7	3.9
High_High_Ref_Low	High	High	Ref	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	Europe	2.6	3.4	3.4	1.6	5.1	4.7	4.3
High_High_Ref_Low	High	High	Ref	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	KoreaJapan	0.0	0.0	6.9	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
High_High_Ref_Low	High	High	Ref	Low	Total	**7.9**	**10.0**	**11.0**	**9.6**	**8.7**	**8.4**	**8.2**
Ref_Low_Low_High	Ref	Low	Low	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	ChinaIndia	6.9	12.2	2.1	7.9	22.1	30.0	41.7
Ref_Low_Low_High	Ref	Low	Low	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	Europe	2.8	5.7	15.7	16.8	13.8	7.2	5.5
Ref_Low_Low_High	Ref	Low	Low	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	KoreaJapan	0.0	1.5	9.7	10.8	9.8	12.6	10.6
Ref_Low_Low_High	Ref	Low	Low	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_High	Ref	Low	Low	High	Total	**9.7**	**19.4**	**27.5**	**35.6**	**45.8**	**49.8**	**57.8**
Ref_Low_Low_Ref	Ref	Low	Low	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	ChinaIndia	6.0	11.4	0.5	1.1	22.1	27.0	32.9
Ref_Low_Low_Ref	Ref	Low	Low	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	Europe	2.3	3.4	14.2	16.8	6.9	1.6	0.0

Ref_Low_Low_Ref	Ref	Low	Low	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	KoreaJapan	0.0	0.0	6.7	7.4	1.6	8.2	12.5
Ref_Low_Low_Ref	Ref	Low	Low	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	Total	**8.3**	**14.8**	**21.4**	**25.3**	**30.5**	**36.8**	**45.5**
Ref_Low_Low_Low	Ref	Low	Low	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	ChinaIndia	6.0	9.8	0.4	0.9	15.0	19.1	19.4
Ref_Low_Low_Low	Ref	Low	Low	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	Europe	2.3	3.4	14.0	15.3	3.3	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	KoreaJapan	0.0	0.0	3.4	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Low_Low	Ref	Low	Low	Low	Total	**8.3**	**13.2**	**17.9**	**16.2**	**18.3**	**19.1**	**19.4**
Ref_Ref_Low_High	Ref	Ref	Low	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	ChinaIndia	6.4	12.2	0.7	7.0	22.1	29.5	40.6
Ref_Ref_Low_High	Ref	Ref	Low	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	Europe	2.7	5.5	15.7	16.8	13.3	6.4	5.1
Ref_Ref_Low_High	Ref	Ref	Low	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	KoreaJapan	0.0	1.0	9.6	10.8	10.2	12.6	12.0
Ref_Ref_Low_High	Ref	Ref	Low	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_High	Ref	Ref	Low	High	Total	**9.2**	**18.7**	**26.1**	**34.6**	**45.7**	**48.5**	**57.7**
Ref_High_Low_High	Ref	High	Low	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	ChinaIndia	6.3	12.2	0.6	5.3	22.1	29.3	39.6
Ref_High_Low_High	Ref	High	Low	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	Europe	2.7	5.4	15.7	16.8	13.2	6.1	4.7
Ref_High_Low_High	Ref	High	Low	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	KoreaJapan	0.0	0.8	9.6	10.8	10.2	12.2	13.3
Ref_High_Low_High	Ref	High	Low	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_High	Ref	High	Low	High	Total	**9.0**	**18.4**	**25.9**	**33.0**	**45.5**	**47.6**	**57.6**
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	ChinaIndia	6.0	10.4	0.5	1.0	22.1	27.0	32.1
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	Europe	2.2	3.2	13.8	16.8	5.9	1.4	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	KoreaJapan	0.0	0.0	6.2	6.7	1.5	6.0	12.2
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	Total	**8.2**	**13.6**	**20.5**	**24.6**	**29.6**	**34.3**	**44.4**
Ref_High_Low_Ref	Ref	High	Low	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	ChinaIndia	6.0	10.4	0.4	0.9	22.1	27.0	30.4
Ref_High_Low_Ref	Ref	High	Low	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	Europe	2.2	3.2	13.5	15.4	5.3	1.1	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	KoreaJapan	0.0	0.0	5.9	5.9	1.5	2.1	11.8
Ref_High_Low_Ref	Ref	High	Low	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Ref	Ref	High	Low	Ref	Total	**8.2**	**13.6**	**19.9**	**22.3**	**28.9**	**30.2**	**42.1**
Ref_Ref_Low_Low	Ref	Ref	Low	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	ChinaIndia	6.0	9.5	0.4	0.8	13.8	16.5	15.8
Ref_Ref_Low_Low	Ref	Ref	Low	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	Europe	2.2	3.3	13.6	12.0	3.2	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	KoreaJapan	0.0	0.0	2.9	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Ref_Ref_Low_Low	Ref	Ref	Low	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	Total	**8.2**	**12.8**	**17.0**	**12.8**	**17.0**	**16.5**	**15.8**
Ref_High_Low_Low	Ref	High	Low	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	ChinaIndia	6.0	9.3	0.4	0.7	13.3	12.4	12.9
Ref_High_Low_Low	Ref	High	Low	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	Europe	2.2	3.3	11.6	11.7	2.2	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	KoreaJapan	0.0	0.0	2.7	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Low_Low	Ref	High	Low	Low	Total	**8.2**	**12.6**	**14.7**	**12.4**	**15.5**	**12.4**	**12.9**
Ref_Low_Ref_High	Ref	Low	Ref	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	ChinaIndia	6.0	9.7	0.4	0.9	22.1	24.2	22.8
Ref_Low_Ref_High	Ref	Low	Ref	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	Europe	1.5	3.1	10.8	15.3	2.5	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	KoreaJapan	0.0	0.0	5.4	5.8	1.0	3.2	5.6
Ref_Low_Ref_High	Ref	Low	Ref	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_High	Ref	Low	Ref	High	Total	**7.4**	**12.8**	**16.6**	**22.0**	**25.7**	**27.4**	**28.4**
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	ChinaIndia	6.0	6.8	0.4	0.7	15.9	16.0	11.2
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	Europe	1.4	3.2	8.7	11.9	2.7	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	KoreaJapan	0.0	0.0	1.9	0.0	0.0	0.0	1.7
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	Total	**7.4**	**10.0**	**11.0**	**12.6**	**18.6**	**16.0**	**12.9**
Ref_Low_Ref_Low	Ref	Low	Ref	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	ChinaIndia	6.0	6.2	0.3	0.5	8.3	8.4	8.3
Ref_Low_Ref_Low	Ref	Low	Ref	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	Europe	1.4	3.5	6.9	8.1	0.2	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	KoreaJapan	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Low_Ref_Low	Ref	Low	Ref	Low	Total	**7.4**	**9.7**	**7.4**	**8.6**	**8.5**	**8.4**	**8.3**
Ref_Ref_Ref_High	Ref	Ref	Ref	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	ChinaIndia	6.0	9.4	0.4	0.8	21.4	23.9	22.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	Europe	1.4	3.1	7.7	15.0	2.5	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	KoreaJapan	0.0	0.0	4.8	5.6	0.0	2.2	5.1
Ref_Ref_Ref_High	Ref	Ref	Ref	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	Total	**7.4**	**12.5**	**12.9**	**21.4**	**24.0**	**26.1**	**27.1**
Ref_High_Ref_High	Ref	High	Ref	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	ChinaIndia	6.0	9.0	0.4	0.8	20.9	23.5	20.0
Ref_High_Ref_High	Ref	High	Ref	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	Europe	1.4	2.9	6.4	13.1	2.5	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	KoreaJapan	0.0	0.0	4.4	4.9	0.0	0.1	4.5
Ref_High_Ref_High	Ref	High	Ref	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_High	Ref	High	Ref	High	Total	**7.4**	**11.9**	**11.2**	**18.9**	**23.4**	**23.6**	**24.5**
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	ChinaIndia	6.0	6.6	0.4	0.7	12.2	12.4	10.7
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	Europe	1.4	3.3	8.7	11.7	0.7	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	KoreaJapan	0.0	0.0	1.8	0.0	0.0	0.0	1.7
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	Total	**7.4**	**9.9**	**10.9**	**12.4**	**12.9**	**12.4**	**12.4**
Ref_High_Ref_Ref	Ref	High	Ref	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	ChinaIndia	6.0	6.6	0.3	0.6	12.1	12.4	10.7
Ref_High_Ref_Ref	Ref	High	Ref	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	Europe	1.4	3.3	6.0	10.9	0.3	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	KoreaJapan	0.0	0.0	1.5	0.0	0.0	0.0	1.7
Ref_High_Ref_Ref	Ref	High	Ref	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Ref	Ref	High	Ref	Ref	Total	**7.4**	**9.9**	**7.7**	**11.6**	**12.4**	**12.4**	**12.3**
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	ChinaIndia	6.0	6.2	0.2	0.3	8.1	8.3	2.7
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	Europe	1.4	3.4	6.8	8.1	0.2	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	KoreaJapan	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	Total	**7.4**	**9.6**	**7.2**	**8.5**	**8.4**	**8.3**	**2.7**
Ref_High_Ref_Low	Ref	High	Ref	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	ChinaIndia	6.0	6.2	0.1	0.2	8.1	3.9	0.1
Ref_High_Ref_Low	Ref	High	Ref	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	Europe	1.4	2.1	6.8	8.1	0.2	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	KoreaJapan	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	Total	**7.4**	**8.2**	**7.1**	**8.4**	**8.3**	**3.9**	**0.1**
Low_Low_Low_High	Low	Low	Low	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	ChinaIndia	0.1	0.4	0.0	0.0	0.0	6.1	10.3
Low_Low_Low_High	Low	Low	Low	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	Europe	0.5	0.3	10.2	11.4	4.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	KoreaJapan	7.3	12.7	8.5	10.5	22.1	22.7	23.9
Low_Low_Low_High	Low	Low	Low	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	Total	**8.0**	**13.4**	**18.7**	**21.9**	**26.1**	**28.8**	**34.2**
Low_Low_Low_Ref	Low	Low	Low	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	ChinaIndia	0.1	0.2	0.0	0.0	0.0	0.6	2.2
Low_Low_Low_Ref	Low	Low	Low	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	Europe	0.5	0.3	5.7	5.9	0.3	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	KoreaJapan	7.3	9.3	5.3	6.2	12.1	16.5	19.8
Low_Low_Low_Ref	Low	Low	Low	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Ref	Low	Low	Low	Ref	Total	**7.9**	**9.7**	**10.9**	**12.1**	**12.4**	**17.2**	**22.0**
Low_Low_Low_Low	Low	Low	Low	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	ChinaIndia	0.1	0.4	0.0	0.0	0.0	0.2	0.2
Low_Low_Low_Low	Low	Low	Low	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	Europe	0.5	0.0	4.2	6.1	0.2	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	KoreaJapan	7.3	6.8	2.9	2.1	2.4	4.6	5.7
Low_Low_Low_Low	Low	Low	Low	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Low_Low_Low_Low	Low	Low	Low	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Low_Low	Low	Low	Low	Low	Total	**7.9**	**7.2**	**7.1**	**8.2**	**2.6**	**4.8**	**5.9**
Low_Ref_Low_High	Low	Ref	Low	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	ChinaIndia	0.1	0.3	0.0	0.0	0.0	4.5	7.8
Low_Ref_Low_High	Low	Ref	Low	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	Europe	0.5	0.3	8.5	10.0	1.4	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	KoreaJapan	7.3	11.9	8.1	10.0	22.0	22.6	23.8
Low_Ref_Low_High	Low	Ref	Low	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_High	Low	Ref	Low	High	Total	**8.0**	**12.5**	**16.6**	**20.0**	**23.4**	**27.1**	**31.6**
Low_High_Low_High	Low	High	Low	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	ChinaIndia	0.1	0.3	0.0	0.0	0.0	1.7	5.8
Low_High_Low_High	Low	High	Low	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	Europe	0.5	0.3	6.9	9.4	0.6	0.0	0.0
Low_High_Low_High	Low	High	Low	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	KoreaJapan	7.3	10.6	7.4	8.8	22.0	22.6	23.7
Low_High_Low_High	Low	High	Low	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_High	Low	High	Low	High	Total	**7.9**	**11.3**	**14.3**	**18.2**	**22.7**	**24.3**	**29.5**
Low_Ref_Low_Ref	Low	Ref	Low	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	ChinaIndia	0.1	0.4	0.0	0.0	0.0	0.3	0.6
Low_Ref_Low_Ref	Low	Ref	Low	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	Europe	0.5	0.0	5.2	4.3	0.3	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	KoreaJapan	7.3	8.1	5.1	5.3	9.6	12.0	15.8
Low_Ref_Low_Ref	Low	Ref	Low	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Ref	Low	Ref	Low	Ref	Total	**7.9**	**8.6**	**10.3**	**9.6**	**9.9**	**12.3**	**16.4**
Low_High_Low_Ref	Low	High	Low	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	ChinaIndia	0.1	0.4	0.0	0.0	0.0	0.3	0.3
Low_High_Low_Ref	Low	High	Low	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	Europe	0.5	0.0	3.7	3.4	0.2	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	KoreaJapan	7.3	6.9	4.4	5.0	8.1	11.6	11.6
Low_High_Low_Ref	Low	High	Low	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Ref	Low	High	Low	Ref	Total	**7.9**	**7.3**	**8.1**	**8.4**	**8.4**	**11.9**	**11.9**
Low_Ref_Low_Low	Low	Ref	Low	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	ChinaIndia	0.1	0.3	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	Europe	0.5	0.0	4.1	0.8	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	KoreaJapan	7.3	6.8	2.9	1.4	0.1	0.1	0.1
Low_Ref_Low_Low	Low	Ref	Low	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Low_Low	Low	Ref	Low	Low	Total	**7.9**	**7.1**	**7.0**	**2.2**	**0.1**	**0.1**	**0.1**
Low_High_Low_Low	Low	High	Low	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	ChinaIndia	0.1	0.3	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	Europe	0.5	0.0	4.1	0.2	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	KoreaJapan	7.3	6.8	2.9	0.1	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Low_Low	Low	High	Low	Low	Total	**7.9**	**7.0**	**7.0**	**0.4**	**0.0**	**0.0**	**0.0**
Low_Low_Ref_High	Low	Low	Ref	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Low_Low_Ref_High	Low	Low	Ref	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	ChinaIndia	0.1	0.3	0.0	0.0	0.0	0.0	0.3
Low_Low_Ref_High	Low	Low	Ref	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	Europe	0.5	0.0	3.2	3.1	0.2	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	KoreaJapan	6.8	6.8	3.8	5.4	8.1	9.5	11.6
Low_Low_Ref_High	Low	Low	Ref	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	Total	**7.4**	**7.1**	**7.0**	**8.4**	**8.3**	**9.5**	**11.9**
Low_Low_Ref_Ref	Low	Low	Ref	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	ChinaIndia	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	Europe	0.5	0.2	4.1	2.1	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	KoreaJapan	6.8	6.8	1.8	2.4	0.4	2.6	0.5
Low_Low_Ref_Ref	Low	Low	Ref	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Ref	Low	Low	Ref	Ref	Total	**7.4**	**7.0**	**5.9**	**4.5**	**0.4**	**2.6**	**0.5**
Low_Low_Ref_Low	Low	Low	Ref	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	ChinaIndia	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	Europe	0.5	0.2	1.1	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	KoreaJapan	6.8	5.8	0.1	0.1	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Low_Ref_Low	Low	Low	Ref	Low	Total	**7.4**	**5.9**	**1.2**	**0.1**	**0.0**	**0.0**	**0.0**
Low_Ref_Ref_High	Low	Ref	Ref	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	ChinaIndia	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	Europe	0.5	0.0	3.1	2.9	0.2	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	KoreaJapan	6.8	6.8	3.8	5.3	8.0	8.3	8.3
Low_Ref_Ref_High	Low	Ref	Ref	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	Total	**7.4**	**7.0**	**7.0**	**8.2**	**8.2**	**8.3**	**8.3**
Low_High_Ref_High	Low	High	Ref	High	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	ChinaIndia	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	Europe	0.5	0.0	3.1	2.9	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	KoreaJapan	6.8	6.8	3.8	5.3	4.3	7.2	8.2
Low_High_Ref_High	Low	High	Ref	High	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_High	Low	High	Ref	High	Total	**7.4**	**7.0**	**7.0**	**8.2**	**4.3**	**7.2**	**8.2**
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	ChinaIndia	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	Europe	0.5	0.2	0.4	0.2	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	KoreaJapan	6.8	6.1	0.8	0.1	0.1	0.1	0.1
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	Total	**7.4**	**6.3**	**1.2**	**0.4**	**0.1**	**0.1**	**0.1**
Low_High_Ref_Ref	Low	High	Ref	Ref	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	ChinaIndia	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	Europe	0.5	0.0	0.4	0.0	0.0	0.0	0.0

Low_High_Ref_Ref	Low	High	Ref	Ref	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	KoreaJapan	6.8	5.5	0.1	0.1	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Ref	Low	High	Ref	Ref	Total	**7.4**	**5.6**	**0.5**	**0.1**	**0.0**	**0.0**	**0.0**
Low_Ref_Ref_Low	Low	Ref	Ref	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	ChinaIndia	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	Europe	0.5	0.0	0.4	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	KoreaJapan	6.8	4.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	Total	**7.4**	**4.2**	**0.4**	**0.0**	**0.0**	**0.0**	**0.0**
Low_High_Ref_Low	Low	High	Ref	Low	Africa	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	Alaska	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	CAN-E	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	CAN-W	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	ChinaIndia	0.1	0.2	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	CSAmer	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	Europe	0.5	0.0	0.3	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	FSU	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	KoreaJapan	6.8	2.1	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	Mexico	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	MidEast	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	Oceania	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	Sakhalin	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	SoutheastAsia	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	Total	**7.4**	**2.3**	**0.3**	**0.0**	**0.0**	**0.0**	**0.0**

	Scenario				U.S. Net Pipeline Exports (Bcf/day)						
	US Supply	**US Demand**	**ROW Supply**	**ROW Demand**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
High_Low_Low_High	High	Low	Low	High	4.3	7.1	9.6	9.5	12.5	13.4	14.9
High_Low_Low_Ref	High	Low	Low	Ref	4.0	6.6	8.7	9.6	10.1	10.0	12.0
High_Low_Low_Low	High	Low	Low	Low	3.9	6.0	7.5	7.4	7.7	7.8	8.1
High_Ref_Low_High	High	Ref	Low	High	4.0	6.4	8.5	8.3	11.4	13.0	14.5
High_High_Low_High	High	High	Low	High	3.9	5.9	7.5	7.6	9.3	10.7	13.8
High_Ref_Low_Ref	High	Ref	Low	Ref	3.6	5.6	7.5	8.2	8.3	8.9	11.5
High_High_Low_Ref	High	High	Low	Ref	3.5	5.2	6.6	6.9	7.0	6.8	8.2
High_Ref_Low_Low	High	Ref	Low	Low	3.5	5.2	6.4	5.8	5.9	5.7	6.1
High_High_Low_Low	High	High	Low	Low	3.4	4.8	5.5	4.5	4.2	3.4	3.5
High_Low_Ref_High	High	Low	Ref	High	2.6	6.5	7.8	9.3	10.9	11.4	13.7
High_Low_Ref_Ref	High	Low	Ref	Ref	2.2	5.2	6.5	7.2	7.9	8.5	8.7
High_Low_Ref_Low	High	Low	Ref	Low	2.1	4.8	5.6	5.3	4.8	4.0	3.3
High_Ref_Ref_High	High	Ref	Ref	High	2.1	5.3	6.6	7.3	8.5	8.6	11.5
High_High_Ref_High	High	High	Ref	High	2.0	4.8	5.4	5.9	6.1	5.5	8.3
High_Ref_Ref_Ref	High	Ref	Ref	Ref	1.7	4.1	5.3	5.3	5.5	5.8	5.9
High_High_Ref_Ref	High	High	Ref	Ref	1.6	3.6	4.6	4.2	3.3	2.9	3.0
High_Ref_Ref_Low	High	Ref	Ref	Low	1.6	3.6	4.1	3.5	3.0	1.7	0.6
High_High_Ref_Low	High	High	Ref	Low	1.5	3.1	2.9	2.1	0.9	-0.4	-2.2
Ref_Low_Low_High	Ref	Low	Low	High	3.9	6.1	7.9	7.6	8.9	9.7	13.3
Ref_Low_Low_Ref	Ref	Low	Low	Ref	3.7	5.4	6.8	7.0	7.7	7.5	7.6
Ref_Low_Low_Low	Ref	Low	Low	Low	3.6	4.8	5.6	5.0	4.7	4.4	4.9
Ref_Ref_Low_High	Ref	Ref	Low	High	3.6	5.1	6.6	6.8	7.6	8.1	10.8
Ref_High_Low_High	Ref	High	Low	High	3.5	4.6	5.5	5.2	7.1	7.7	8.3
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	3.3	4.5	5.5	5.3	5.8	6.3	6.0
Ref_High_Low_Ref	Ref	High	Low	Ref	3.3	3.9	4.5	4.1	3.7	4.2	4.9
Ref_Ref_Low_Low	Ref	Ref	Low	Low	3.2	3.8	4.3	3.8	2.9	2.4	3.2
Ref_High_Low_Low	Ref	High	Low	Low	3.1	3.3	3.5	2.2	1.0	0.4	0.5
Ref_Low_Ref_High	Ref	Low	Ref	High	2.2	4.9	6.2	6.7	7.3	7.4	8.1
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	1.8	4.0	5.3	5.6	4.8	5.3	5.8
Ref_Low_Ref_Low	Ref	Low	Ref	Low	1.7	3.2	4.1	3.0	1.9	-0.5	-1.4
Ref_Ref_Ref_High	Ref	Ref	Ref	High	1.7	3.7	5.1	4.6	4.9	4.5	5.1
Ref_High_Ref_High	Ref	High	Ref	High	1.6	3.2	4.0	3.1	2.2	1.3	0.9
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	1.3	2.6	3.4	3.4	3.1	2.8	2.7
Ref_High_Ref_Ref	Ref	High	Ref	Ref	1.2	2.1	2.6	1.6	0.4	-0.9	-2.0
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	1.2	1.9	2.4	0.9	-1.5	-3.6	-3.3
Ref_High_Ref_Low	Ref	High	Ref	Low	1.1	1.5	1.1	-2.2	-4.7	-6.1	-6.5
Low_Low_Low_High	Low	Low	Low	High	3.8	4.7	4.9	5.3	6.1	5.9	7.2
Low_Low_Low_Ref	Low	Low	Low	Ref	3.4	3.9	4.6	4.6	5.1	3.6	3.3
Low_Low_Low_Low	Low	Low	Low	Low	3.3	3.6	3.6	2.2	2.5	0.4	-0.4
Low_Ref_Low_High	Low	Ref	Low	High	3.4	3.5	3.5	3.2	3.4	2.0	3.4
Low_High_Low_High	Low	High	Low	High	3.3	3.2	2.5	1.4	0.4	-1.9	-2.1
Low_Ref_Low_Ref	Low	Ref	Low	Ref	3.0	2.8	2.8	2.7	2.5	1.0	0.7
Low_High_Low_Ref	Low	High	Low	Ref	2.9	2.5	1.8	0.7	-0.4	-3.2	-3.6
Low_Ref_Low_Low	Low	Ref	Low	Low	2.9	2.3	1.7	0.9	-0.1	-2.3	-2.9
Low_High_Low_Low	Low	High	Low	Low	2.8	1.7	0.3	-0.9	-4.2	-6.9	-7.6
Low_Low_Ref_High	Low	Low	Ref	High	1.7	3.7	4.2	4.9	5.4	4.0	3.2
Low_Low_Ref_Ref	Low	Low	Ref	Ref	1.3	2.3	2.6	3.2	3.8	2.0	1.8
Low_Low_Ref_Low	Low	Low	Ref	Low	1.2	1.7	2.0	1.1	-1.1	-2.1	-1.9
Low_Ref_Ref_High	Low	Ref	Ref	High	1.3	2.2	2.0	2.0	1.7	-0.4	-0.7
Low_High_Ref_High	Low	High	Ref	High	1.2	1.5	0.3	-0.5	-1.2	-5.3	-7.2
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	0.9	1.0	1.4	1.2	0.1	-2.0	-3.1
Low_High_Ref_Ref	Low	High	Ref	Ref	0.8	0.4	-0.1	-1.3	-5.3	-8.1	-9.2
Low_Ref_Ref_Low	Low	Ref	Ref	Low	0.8	0.6	-0.1	-1.9	-3.4	-4.2	-5.1
Low_High_Ref_Low	Low	High	Ref	Low	0.7	0.3	-2.4	-4.0	-5.7	-8.8	-11.1

	Scenario				Pipeline Exports to Mexico (Bcf/day)						
	US Supply	**US Demand**	**ROW Supply**	**ROW Demand**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
High_Low_Low_High	High	Low	Low	High	5.4	6.0	6.3	6.5	7.2	7.6	8.7
High_Low_Low_Ref	High	Low	Low	Ref	5.3	5.5	5.7	5.7	6.0	6.3	6.9
High_Low_Low_Low	High	Low	Low	Low	5.2	5.1	5.0	4.5	4.4	4.5	4.9
High_Ref_Low_High	High	Ref	Low	High	5.4	5.9	6.2	6.4	7.1	7.5	8.5
High_High_Low_High	High	High	Low	High	5.4	5.9	6.2	6.3	7.0	7.3	8.2
High_Ref_Low_Ref	High	Ref	Low	Ref	5.2	5.4	5.5	5.6	5.9	6.2	6.7
High_High_Low_Ref	High	High	Low	Ref	5.2	5.3	5.5	5.5	5.8	6.1	6.4
High_Ref_Low_Low	High	Ref	Low	Low	5.2	5.1	4.9	4.4	4.3	4.2	4.6
High_High_Low_Low	High	High	Low	Low	5.2	5.0	4.8	4.2	4.1	4.0	4.2
High_Low_Ref_High	High	Low	Ref	High	5.2	5.7	5.8	6.0	6.5	6.7	7.4
High_Low_Ref_Ref	High	Low	Ref	Ref	5.0	5.1	5.0	5.0	5.1	5.2	5.4
High_Low_Ref_Low	High	Low	Ref	Low	5.0	4.8	4.4	3.8	3.3	2.8	2.5
High_Ref_Ref_High	High	Ref	Ref	High	5.1	5.6	5.7	5.9	6.3	6.5	7.0
High_High_Ref_High	High	High	Ref	High	5.1	5.6	5.6	5.7	6.1	6.1	6.5
High_Ref_Ref_Ref	High	Ref	Ref	Ref	5.0	5.0	4.9	4.8	4.8	4.9	4.9
High_High_Ref_Ref	High	High	Ref	Ref	5.0	5.0	4.9	4.7	4.6	4.5	4.4
High_Ref_Ref_Low	High	Ref	Ref	Low	4.9	4.7	4.2	3.6	3.1	2.5	2.1
High_High_Ref_Low	High	High	Ref	Low	4.9	4.7	4.1	3.5	2.9	2.1	1.5
Ref_Low_Low_High	Ref	Low	Low	High	5.3	5.8	6.0	6.1	6.4	6.7	7.1
Ref_Low_Low_Ref	Ref	Low	Low	Ref	5.2	5.2	5.3	5.1	5.2	5.4	5.5
Ref_Low_Low_Low	Ref	Low	Low	Low	5.1	4.9	4.6	3.8	3.4	3.1	3.0
Ref_Ref_Low_High	Ref	Ref	Low	High	5.3	5.7	5.9	6.0	6.3	6.6	7.0
Ref_High_Low_High	Ref	High	Low	High	5.3	5.7	5.9	5.9	6.1	6.4	6.7
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	5.2	5.2	5.2	5.0	5.0	5.2	5.3
Ref_High_Low_Ref	Ref	High	Low	Ref	5.2	5.1	5.1	4.9	4.8	5.0	5.0
Ref_Ref_Low_Low	Ref	Ref	Low	Low	5.1	4.8	4.5	3.7	3.2	2.8	2.8
Ref_High_Low_Low	Ref	High	Low	Low	5.1	4.8	4.4	3.6	3.1	2.6	2.4
Ref_Low_Ref_High	Ref	Low	Ref	High	5.1	5.5	5.5	5.4	5.6	5.5	5.7
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	4.9	4.9	4.7	4.4	4.1	3.9	3.7
Ref_Low_Ref_Low	Ref	Low	Ref	Low	4.9	4.6	4.0	3.1	2.3	0.3	0.0
Ref_Ref_Ref_High	Ref	Ref	Ref	High	5.1	5.4	5.4	5.3	5.4	5.2	5.3
Ref_High_Ref_High	Ref	High	Ref	High	5.0	5.4	5.3	5.1	5.1	4.9	4.7
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	4.9	4.8	4.5	4.2	3.9	3.6	3.3
Ref_High_Ref_Ref	Ref	High	Ref	Ref	4.9	4.8	4.5	4.1	3.7	3.2	2.7
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	4.8	4.5	3.9	2.9	1.2	0.0	0.0
Ref_High_Ref_Low	Ref	High	Ref	Low	4.8	4.4	3.7	1.4	0.2	0.0	0.0
Low_Low_Low_High	Low	Low	Low	High	5.3	5.5	5.4	5.2	5.1	5.0	4.7
Low_Low_Low_Ref	Low	Low	Low	Ref	5.1	4.9	4.7	4.2	3.8	3.6	3.2
Low_Low_Low_Low	Low	Low	Low	Low	5.1	4.6	4.0	2.9	2.0	1.1	0.3
Low_Ref_Low_High	Low	Ref	Low	High	5.2	5.4	5.3	5.0	5.0	4.8	4.6
Low_High_Low_High	Low	High	Low	High	5.2	5.4	5.2	4.9	4.8	4.6	4.4
Low_Ref_Low_Ref	Low	Ref	Low	Ref	5.1	4.8	4.5	4.0	3.6	3.3	2.9
Low_High_Low_Ref	Low	High	Low	Ref	5.1	4.8	4.4	3.9	3.4	3.0	2.5
Low_Ref_Low_Low	Low	Ref	Low	Low	5.0	4.5	3.8	2.8	1.8	0.9	0.0
Low_High_Low_Low	Low	High	Low	Low	5.0	4.4	3.7	2.6	0.2	0.0	0.0
Low_Low_Ref_High	Low	Low	Ref	High	5.0	5.2	4.9	4.6	4.3	3.7	3.1
Low_Low_Ref_Ref	Low	Low	Ref	Ref	4.8	4.5	4.0	3.5	2.8	2.1	1.2
Low_Low_Ref_Low	Low	Low	Ref	Low	4.8	4.2	3.4	2.2	0.0	0.0	0.0
Low_Ref_Ref_High	Low	Ref	Ref	High	5.0	5.1	4.7	4.4	3.9	3.3	2.7
Low_High_Ref_High	Low	High	Ref	High	5.0	5.0	4.6	4.2	3.7	2.8	1.9
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	4.8	4.4	3.9	3.3	2.5	1.7	0.6
Low_High_Ref_Ref	Low	High	Ref	Ref	4.8	4.4	3.8	3.1	0.0	0.0	0.0
Low_Ref_Ref_Low	Low	Ref	Ref	Low	4.8	4.1	3.2	1.4	0.0	0.0	0.0
Low_High_Ref_Low	Low	High	Ref	Low	4.8	4.1	1.5	0.5	0.0	0.0	0.0

	Scenario				Pipeline Imports from Canada (Bcf/day)						
	US Supply	US Demand	ROW Supply	ROW Demand	2020	2025	2030	2035	2040	2045	2050
High_Low_Low_High	High	Low	Low	High	4.0	0.9	1.2	1.8	0.0	0.0	0.0
High_Low_Low_Ref	High	Low	Low	Ref	4.1	0.9	0.3	0.4	0.4	1.2	0.0
High_Low_Low_Low	High	Low	Low	Low	4.1	1.0	0.4	0.6	0.4	0.3	0.3
High_Ref_Low_High	High	Ref	Low	High	4.3	1.6	1.4	2.7	0.9	0.0	0.0
High_High_Low_High	High	High	Low	High	4.3	2.0	2.1	3.3	2.7	2.0	0.2
High_Ref_Low_Ref	High	Ref	Low	Ref	4.4	1.7	1.3	1.5	2.0	2.0	0.1
High_High_Low_Ref	High	High	Low	Ref	4.4	2.1	2.1	2.7	3.1	3.8	3.0
High_Ref_Low_Low	High	Ref	Low	Low	4.4	1.8	1.4	2.0	1.8	2.1	2.1
High_High_Low_Low	High	High	Low	Low	4.5	2.2	2.3	3.2	3.3	3.9	4.1
High_Low_Ref_High	High	Low	Ref	High	5.3	1.4	0.4	0.5	0.5	0.5	0.0
High_Low_Ref_Ref	High	Low	Ref	Ref	5.4	1.7	0.6	0.6	0.7	0.7	1.2
High_Low_Ref_Low	High	Low	Ref	Low	5.5	1.6	0.5	0.8	0.9	1.1	1.6
High_Ref_Ref_High	High	Ref	Ref	High	5.6	2.5	1.5	1.9	2.3	2.5	1.6
High_High_Ref_High	High	High	Ref	High	5.7	2.9	2.5	3.2	3.7	3.9	4.1
High_Ref_Ref_Ref	High	Ref	Ref	Ref	5.8	2.6	1.6	2.1	2.5	2.7	3.1
High_High_Ref_Ref	High	High	Ref	Ref	5.8	3.1	2.5	3.4	3.7	3.9	4.1
High_Ref_Ref_Low	High	Ref	Ref	Low	5.8	2.6	1.7	2.3	2.8	3.1	3.6
High_High_Ref_Low	High	High	Ref	Low	5.9	3.1	2.8	3.5	3.7	4.2	5.4
Ref_Low_Low_High	Ref	Low	Low	High	4.3	1.8	1.4	3.1	2.7	2.6	0.0
Ref_Low_Low_Ref	Ref	Low	Low	Ref	4.3	1.7	0.6	1.9	1.8	2.6	2.9
Ref_Low_Low_Low	Ref	Low	Low	Low	4.3	1.7	0.6	0.5	1.3	1.1	1.3
Ref_Ref_Low_High	Ref	Ref	Low	High	4.5	2.7	1.5	3.7	3.7	3.9	2.1
Ref_High_Low_High	Ref	High	Low	High	4.6	3.1	2.4	4.3	3.9	3.9	4.1
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	4.6	2.5	1.5	2.5	3.1	3.5	4.1
Ref_High_Low_Ref	Ref	High	Low	Ref	4.6	2.9	2.3	2.6	4.0	4.2	4.3
Ref_Ref_Low_Low	Ref	Ref	Low	Low	4.6	2.6	1.7	1.6	2.3	2.0	2.6
Ref_High_Low_Low	Ref	High	Low	Low	4.7	3.0	2.4	3.0	3.7	3.9	4.7
Ref_Low_Ref_High	Ref	Low	Ref	High	5.6	2.8	1.6	2.3	2.6	3.1	3.2
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	5.7	2.8	1.4	0.9	1.9	1.4	2.5
Ref_Low_Ref_Low	Ref	Low	Ref	Low	5.7	3.0	1.5	1.7	2.2	3.4	4.2
Ref_Ref_Ref_High	Ref	Ref	Ref	High	5.9	3.8	2.6	3.2	3.8	4.6	4.4
Ref_High_Ref_High	Ref	High	Ref	High	6.0	4.2	3.5	4.5	6.2	7.0	7.6
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	6.0	3.9	2.9	2.8	3.1	3.5	4.6
Ref_High_Ref_Ref	Ref	High	Ref	Ref	6.1	4.4	3.6	4.3	5.4	6.7	8.1
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	6.1	4.1	3.0	3.6	4.4	5.2	5.9
Ref_High_Ref_Low	Ref	High	Ref	Low	6.1	4.4	4.2	5.2	6.7	7.7	8.9
Low_Low_Low_High	Low	Low	Low	High	4.0	2.9	3.7	4.0	3.7	3.5	2.7
Low_Low_Low_Ref	Low	Low	Low	Ref	4.1	2.9	2.0	2.9	2.5	3.4	4.0
Low_Low_Low_Low	Low	Low	Low	Low	4.3	2.6	2.7	3.4	2.1	3.0	3.5
Low_Ref_Low_High	Low	Ref	Low	High	4.6	3.9	4.8	5.2	5.6	6.4	5.4
Low_High_Low_High	Low	High	Low	High	4.6	4.3	4.9	6.6	7.7	9.7	9.7
Low_Ref_Low_Ref	Low	Ref	Low	Ref	4.6	3.9	4.5	4.1	4.4	5.7	5.7
Low_High_Low_Ref	Low	High	Low	Ref	4.7	4.3	5.2	5.8	6.7	8.9	9.2
Low_Ref_Low_Low	Low	Ref	Low	Low	4.4	3.9	4.1	4.5	4.4	5.4	5.5
Low_High_Low_Low	Low	High	Low	Low	4.7	5.0	5.3	6.1	6.7	8.7	9.6
Low_Low_Ref_High	Low	Low	Ref	High	5.6	3.7	3.9	3.3	3.2	3.7	4.6
Low_Low_Ref_Ref	Low	Low	Ref	Ref	5.7	4.6	3.8	3.4	2.6	4.0	3.6
Low_Low_Ref_Low	Low	Low	Ref	Low	5.5	4.4	3.5	3.1	3.6	4.6	4.9
Low_Ref_Ref_High	Low	Ref	Ref	High	6.0	5.1	5.4	5.7	6.1	7.6	7.9
Low_High_Ref_High	Low	High	Ref	High	6.1	6.0	6.8	7.4	8.2	11.5	12.7
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	5.8	5.7	4.9	4.8	5.7	7.2	7.3
Low_High_Ref_Ref	Low	High	Ref	Ref	5.9	6.2	6.1	6.9	8.1	10.8	12.1
Low_Ref_Ref_Low	Low	Ref	Ref	Low	5.8	5.3	5.0	5.8	6.4	6.9	7.8
Low_High_Ref_Low	Low	High	Ref	Low	6.3	5.5	6.2	7.4	8.5	10.7	12.4

	Scenario				Pipeline Exports to Canada (Bcf/d)						
	US Supply	US Demand	ROW Supply	ROW Demand	2020	2025	2030	2035	2040	2045	2050
High_Low_Low_High	High	Low	Low	High	2.9	2.0	4.5	4.8	5.3	5.7	6.3
High_Low_Low_Ref	High	Low	Low	Ref	2.8	2.1	3.4	4.2	4.5	4.8	5.1
High_Low_Low_Low	High	Low	Low	Low	2.8	1.8	2.9	3.5	3.6	3.6	3.6
High_Ref_Low_High	High	Ref	Low	High	2.9	2.0	3.7	4.7	5.2	5.6	6.0
High_High_Low_High	High	High	Low	High	2.9	2.0	3.5	4.6	5.0	5.4	5.8
High_Ref_Low_Ref	High	Ref	Low	Ref	2.8	2.0	3.3	4.1	4.4	4.7	5.0
High_High_Low_Ref	High	High	Low	Ref	2.7	1.9	3.3	4.1	4.3	4.5	4.8
High_Ref_Low_Low	High	Ref	Low	Low	2.7	1.9	2.9	3.5	3.5	3.5	3.5
High_High_Low_Low	High	High	Low	Low	2.7	1.9	3.0	3.4	3.4	3.4	3.4
High_Low_Ref_High	High	Low	Ref	High	2.7	2.2	2.4	3.8	5.0	5.2	6.3
High_Low_Ref_Ref	High	Low	Ref	Ref	2.6	1.7	2.0	2.9	3.5	4.0	4.4
High_Low_Ref_Low	High	Low	Ref	Low	2.6	1.6	1.7	2.3	2.4	2.2	2.4
High_Ref_Ref_High	High	Ref	Ref	High	2.6	2.1	2.3	3.4	4.5	4.6	6.1
High_High_Ref_High	High	High	Ref	High	2.6	2.1	2.3	3.4	3.8	3.3	5.9
High_Ref_Ref_Ref	High	Ref	Ref	Ref	2.5	1.7	2.0	2.6	3.2	3.7	4.1
High_High_Ref_Ref	High	High	Ref	Ref	2.5	1.7	2.2	2.9	2.4	2.3	2.7
High_Ref_Ref_Low	High	Ref	Ref	Low	2.5	1.5	1.6	2.2	2.7	2.3	2.1
High_High_Ref_Low	High	High	Ref	Low	2.4	1.5	1.6	2.2	1.8	1.7	1.7
Ref_Low_Low_High	Ref	Low	Low	High	2.8	2.1	3.2	4.7	5.2	5.6	6.1
Ref_Low_Low_Ref	Ref	Low	Low	Ref	2.8	1.8	2.1	3.8	4.3	4.7	5.0
Ref_Low_Low_Low	Ref	Low	Low	Low	2.8	1.6	1.6	1.7	2.6	2.5	3.2
Ref_Ref_Low_High	Ref	Ref	Low	High	2.8	2.0	2.2	4.5	5.0	5.5	5.9
Ref_High_Low_High	Ref	High	Low	High	2.8	2.0	2.1	3.7	4.9	5.3	5.7
Ref_Ref_Low_Ref	Ref	Ref	Low	Ref	2.8	1.8	1.8	2.9	3.8	4.6	4.9
Ref_High_Low_Ref	Ref	High	Low	Ref	2.7	1.7	1.8	1.8	2.9	3.4	4.2
Ref_Ref_Low_Low	Ref	Ref	Low	Low	2.7	1.6	1.5	1.6	1.9	1.6	3.0
Ref_High_Low_Low	Ref	High	Low	Low	2.7	1.5	1.5	1.6	1.6	1.6	2.8
Ref_Low_Ref_High	Ref	Low	Ref	High	2.6	2.2	2.4	3.5	4.4	4.9	5.6
Ref_Low_Ref_Ref	Ref	Low	Ref	Ref	2.5	1.9	2.0	2.1	2.6	2.8	4.6
Ref_Low_Ref_Low	Ref	Low	Ref	Low	2.5	1.6	1.6	1.6	1.9	2.6	2.8
Ref_Ref_Ref_High	Ref	Ref	Ref	High	2.6	2.1	2.3	2.5	3.3	3.8	4.3

Ref_High_Ref_High	Ref	High	Ref	High	2.5	2.1	2.3	2.4	3.2	3.4	3.8
Ref_Ref_Ref_Ref	Ref	Ref	Ref	Ref	2.4	1.7	1.8	2.0	2.3	2.6	3.9
Ref_High_Ref_Ref	Ref	High	Ref	Ref	2.4	1.7	1.8	1.9	2.1	2.6	3.4
Ref_Ref_Ref_Low	Ref	Ref	Ref	Low	2.4	1.6	1.6	1.6	1.8	1.6	2.6
Ref_High_Ref_Low	Ref	High	Ref	Low	2.4	1.6	1.5	1.6	1.8	1.6	2.5
Low_Low_Low_High	Low	Low	Low	High	2.5	2.1	3.3	4.1	4.6	4.5	5.2
Low_Low_Low_Ref	Low	Low	Low	Ref	2.4	2.0	2.0	3.3	3.8	3.5	4.1
Low_Low_Low_Low	Low	Low	Low	Low	2.6	1.7	2.4	2.7	2.6	2.3	2.9
Low_Ref_Low_High	Low	Ref	Low	High	2.7	2.1	3.0	3.4	4.0	3.6	4.1
Low_High_Low_High	Low	High	Low	High	2.7	2.1	2.1	3.1	3.4	3.2	3.3
Low_Ref_Low_Ref	Low	Ref	Low	Ref	2.6	1.9	2.8	2.7	3.3	3.3	3.5
Low_High_Low_Ref	Low	High	Low	Ref	2.6	2.0	2.5	2.5	2.9	2.7	3.1
Low_Ref_Low_Low	Low	Ref	Low	Low	2.2	1.7	1.9	2.6	2.6	2.3	2.7
Low_High_Low_Low	Low	High	Low	Low	2.5	2.3	1.9	2.5	2.3	1.8	2.0
Low_Low_Ref_High	Low	Low	Ref	High	2.4	2.2	3.2	3.6	4.3	4.0	4.7
Low_Low_Ref_Ref	Low	Low	Ref	Ref	2.2	2.4	2.3	3.0	3.6	3.9	4.2
Low_Low_Ref_Low	Low	Low	Ref	Low	2.0	1.9	2.1	1.9	2.5	2.5	3.0
Low_Ref_Ref_High	Low	Ref	Ref	High	2.3	2.2	2.6	3.3	3.9	4.0	4.5
Low_High_Ref_High	Low	High	Ref	High	2.3	2.5	2.5	2.7	3.3	3.3	3.6
Low_Ref_Ref_Ref	Low	Ref	Ref	Ref	1.9	2.2	2.3	2.7	3.3	3.5	3.6
Low_High_Ref_Ref	Low	High	Ref	Ref	1.9	2.2	2.1	2.5	2.8	2.7	2.8
Low_Ref_Ref_Low	Low	Ref	Ref	Low	1.8	1.7	1.7	2.5	3.0	2.7	2.7
Low_High_Ref_Low	Low	High	Ref	Low	2.2	1.7	2.2	2.8	2.8	1.9	1.3

APPENDIX F. DETAILED NEWERA MODEL MACROECONOMIC RESULTS FOR THE 12 MACROECONOMIC SCENARIOS

Included in a separate spreadsheet “Appendix F_NERA NewERA Results.xlsx” attached with this report.

Appendix F
Macroeconomic Outcomes of Market Determined Levels of U.S. LNG Exports
NewERA Model Macroeconomic Results and Natural Gas Market Impacts for Selected Scenarios
22-May-18

Tab Name	Description
Ref_Ref_Ref_Ref	Key Macroeconomic Indicators and Natural Gas Market Impacts for the Ref_Ref_Ref_Ref Scenario
Ref_Ref_Low_Ref	Key Macroeconomic Indicators and Natural Gas Market Impacts for the Ref_Ref_Low_Ref Scenario
Ref_Ref_Low_High	Key Macroeconomic Indicators and Natural Gas Market Impacts for the Ref_Ref_Low_High Scenario
Ref_Ref_Ref_High	Key Macroeconomic Indicators and Natural Gas Market Impacts for the Ref_Ref_Ref_High Scenario
High_Ref_Ref_Ref	Key Macroeconomic Indicators and Natural Gas Market Impacts for the High_Ref_Ref_Ref Scenario
High_Ref_Low_Ref	Key Macroeconomic Indicators and Natural Gas Market Impacts for the High_Ref_Low_Ref Scenario
High_Ref_Low_High	Key Macroeconomic Indicators and Natural Gas Market Impacts for the High_Ref_Low_High Scenario
High_Ref_Ref_High	Key Macroeconomic Indicators and Natural Gas Market Impacts for the High_Ref_Ref_High Scenario
Low_Ref_Ref_Ref	Key Macroeconomic Indicators and Natural Gas Market Impacts for the Low_Ref_Ref_Ref Scenario
Low_Ref_Low_Ref	Key Macroeconomic Indicators and Natural Gas Market Impacts for the Low_Ref_Low_Ref Scenario
Low_Ref_Low_High	Key Macroeconomic Indicators and Natural Gas Market Impacts for the Low_Ref_Low_High Scenario

Scenario: Ref_Ref_Ref_Ref												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
Level Values												
Macro	Gross Domestic Product		Billion 2016$	$21,123	$23,665	$26,029	$28,856	$32,038	$35,436	$38,881	2.10%	2.05%
		Labor income	Billion 2016$	$10,554	$11,870	$13,117	$14,597	$16,271	$18,078	$19,944		
		Capital income	Billion 2016$	$4,260	$4,781	$5,236	$5,806	$6,435	$7,087	$7,715		
		Resource income	Billion 2016$	$60	$65	$72	$74	$77	$80	$83		
		Indirect taxes	Billion 2016$	$5,546	$6,235	$6,882	$7,655	$8,526	$9,461	$10,419		
		Net Transfers	Billion 2016$	$702	$714	$721	$725	$730	$729	$719		
	Consumption		Billion 2016$	$16,411	$18,389	$20,289	$22,577	$25,049	$27,756	$30,782		
	Investment		Billion 2016$	$3,102	$3,569	$3,895	$4,327	$4,887	$5,560	$6,232		
Natural Gas	Wellhead Price		2016$ per Mcf	$4.51	$4.61	$5.00	$5.16	$5.19	$5.51	$5.90		
	Production		Tcf	30.56	32.83	34.70	36.42	37.68	38.77	40.12		
	LNG Exports		Tcf	2.70	3.54	4.01	4.52	4.65	4.55	4.53		
	Pipeline Exports		Tcf	0.48	0.93	1.22	1.26	1.14	1.02	0.97		
	Total Demand		Tcf	27.38	28.36	29.48	30.66	31.89	33.20	34.61		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.22	0.22	0.23	0.24	0.26	0.27		
		Energy-intensive sectors	Tcf	0.89	0.99	1.03	1.09	1.17	1.24	1.33		
		Chemicals	Tcf	2.31	2.42	2.34	2.32	2.31	2.29	2.27		
		Iron and steel	Tcf	0.50	0.56	0.54	0.54	0.57	0.62	0.68		
		Electricity	Tcf	8.64	8.80	9.84	10.61	11.28	11.96	12.72		
		Manufacturing	Tcf	4.16	4.43	4.49	4.68	4.89	5.09	5.30		
		Refinery	Tcf	2.03	2.19	2.21	2.27	2.34	2.41	2.48		
		Services	Tcf	3.17	3.19	3.23	3.31	3.42	3.57	3.73		
		Transportation	Tcf	0.78	0.83	0.90	0.97	1.05	1.14	1.23		
		Residential	Tcf	4.70	4.74	4.69	4.65	4.61	4.62	4.61		

Scenario: Ref_Ref_Low_Ref												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
						Level Values						
Macro	Gross Domestic Product		Billion 2016$	$21,130	$23,678	$26,049	$28,883	$32,074	$35,485	$38,953	2.11%	2.06%
		Labor income	Billion 2016$	$10,551	$11,865	$13,110	$14,589	$16,262	$18,067	$19,929		
		Capital income	Billion 2016$	$4,261	$4,782	$5,240	$5,812	$6,443	$7,100	$7,735		
		Resource income	Billion 2016$	$63	$71	$82	$85	$91	$101	$114		
		Indirect taxes	Billion 2016$	$5,544	$6,233	$6,878	$7,651	$8,522	$9,457	$10,412		
		Net Transfers	Billion 2016$	$710	$726	$739	$746	$756	$762	$761		
	Consumption		Billion 2016$	$16,421	$18,398	$20,297	$22,584	$25,054	$27,757	$30,776		
	Investment		Billion 2016$	$3,103	$3,573	$3,898	$4,332	$4,897	$5,575	$6,250		
Natural Gas	Wellhead Price		2016$ per Mcf	$4.68	$4.87	$5.41	$5.60	$5.71	$6.20	$6.90		
	Production		Tcf	31.36	34.56	37.96	40.66	43.65	46.67	50.87		
	LNG Exports		Tcf	3.00	5.03	7.35	8.97	10.78	12.78	16.21		
	Pipeline Exports		Tcf	1.22	1.62	1.95	1.96	2.11	2.26	2.21		
	Total Demand		Tcf	27.17	27.97	28.79	29.89	30.93	31.86	32.75		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.21	0.22	0.23	0.24	0.25	0.25		
		Energy-intensive sectors	Tcf	0.88	0.97	1.00	1.06	1.13	1.19	1.25		
		Chemicals	Tcf	2.28	2.37	2.27	2.24	2.22	2.16	2.10		
		Iron and steel	Tcf	0.49	0.54	0.51	0.51	0.54	0.57	0.61		
		Electricity	Tcf	8.54	8.63	9.54	10.28	10.87	11.40	11.94		
		Manufacturing	Tcf	4.13	4.38	4.39	4.57	4.75	4.89	5.02		
		Refinery	Tcf	2.02	2.16	2.17	2.22	2.28	2.33	2.36		
		Services	Tcf	3.16	3.17	3.18	3.26	3.36	3.48	3.59		
		Transportation	Tcf	0.78	0.81	0.87	0.94	1.01	1.08	1.14		
		Residential	Tcf	4.69	4.71	4.64	4.59	4.54	4.52	4.47		

Scenario: Ref_Ref_Low_High												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
						Level Values						
Macro	Gross Domestic Product		Billion 2016$	$21,137	$23,691	$26,067	$28,909	$32,113	$35,528	$39,004	2.11%	2.06%
		Labor income	Billion 2016$	$10,550	$11,862	$13,106	$14,584	$16,256	$18,062	$19,925		
		Capital income	Billion 2016$	$4,261	$4,784	$5,244	$5,818	$6,453	$7,111	$7,750		
		Resource income	Billion 2016$	$65	$77	$89	$95	$106	$117	$136		
		Indirect taxes	Billion 2016$	$5,544	$6,231	$6,876	$7,649	$8,519	$9,454	$10,411		
		Net Transfers	Billion 2016$	$718	$738	$753	$764	$779	$784	$782		
	Consumption		Billion 2016$	$16,430	$18,407	$20,305	$22,590	$25,059	$27,761	$30,778		
	Investment		Billion 2016$	$3,105	$3,575	$3,902	$4,339	$4,902	$5,582	$6,259		
Natural Gas	Wellhead Price		2016$ per Mcf	$4.76	$5.10	$5.69	$5.95	$6.18	$6.69	$7.49		
	Production		Tcf	31.70	36.09	40.10	44.19	48.98	51.95	56.68		
	LNG Exports		Tcf	3.34	6.71	9.57	12.63	16.27	18.02	21.07		
	Pipeline Exports		Tcf	1.32	1.86	2.35	2.49	2.76	3.08	3.95		
	Total Demand		Tcf	27.08	27.64	28.38	29.34	30.26	31.20	32.06		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.21	0.21	0.22	0.23	0.24	0.25		
		Energy-intensive sectors	Tcf	0.87	0.96	0.98	1.03	1.10	1.16	1.22		
		Chemicals	Tcf	2.27	2.34	2.22	2.18	2.15	2.10	2.04		
		Iron and steel	Tcf	0.48	0.52	0.50	0.49	0.51	0.55	0.59		
		Electricity	Tcf	8.50	8.49	9.37	10.05	10.59	11.13	11.66		
		Manufacturing	Tcf	4.12	4.33	4.33	4.49	4.65	4.79	4.92		
		Refinery	Tcf	2.01	2.14	2.14	2.18	2.24	2.28	2.32		
		Services	Tcf	3.15	3.15	3.16	3.22	3.31	3.43	3.54		
		Transportation	Tcf	0.77	0.80	0.86	0.92	0.98	1.05	1.11		
		Residential	Tcf	4.69	4.69	4.61	4.55	4.49	4.47	4.42		

Scenario: Ref_Ref_Ref_High												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
						Level Values						
Macro	Gross Domestic Product		Billion 2016$	$21,124	$23,672	$26,037	$28,875	$32,060	$35,462	$38,909	2.11%	2.06%
		Labor income	Billion 2016$	$10,554	$11,867	$13,115	$14,591	$16,264	$18,070	$19,935		
		Capital income	Billion 2016$	$4,260	$4,781	$5,238	$5,811	$6,440	$7,094	$7,724		
		Resource income	Billion 2016$	$59	$69	$76	$82	$86	$92	$97		
		Indirect taxes	Billion 2016$	$5,546	$6,234	$6,881	$7,652	$8,523	$9,458	$10,415		
		Net Transfers	Billion 2016$	$706	$721	$728	$739	$746	$748	$739		
	Consumption		Billion 2016$	$16,416	$18,394	$20,294	$22,581	$25,050	$27,756	$30,779		
	Investment		Billion 2016$	$3,104	$3,570	$3,898	$4,332	$4,891	$5,565	$6,236		
Natural Gas	Wellhead Price		2016$ per Mcf	$4.49	$4.75	$5.17	$5.48	$5.54	$5.92	$6.38		
	Production		Tcf	30.53	33.76	36.02	39.49	41.60	43.39	45.24		
	LNG Exports		Tcf	2.70	4.34	5.10	7.83	8.73	9.47	9.89		
	Pipeline Exports		Tcf	0.63	1.31	1.77	1.68	1.75	1.68	1.87		
	Total Demand		Tcf	27.35	28.14	29.20	30.09	31.24	32.38	33.64		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.22	0.22	0.23	0.24	0.25	0.26		
		Energy-intensive sectors	Tcf	0.89	0.98	1.01	1.07	1.14	1.21	1.29		
		Chemicals	Tcf	2.30	2.40	2.31	2.26	2.25	2.21	2.18		
		Iron and steel	Tcf	0.50	0.55	0.53	0.52	0.55	0.59	0.64		
		Electricity	Tcf	8.63	8.71	9.72	10.37	11.00	11.62	12.31		
		Manufacturing	Tcf	4.15	4.40	4.45	4.60	4.80	4.97	5.16		
		Refinery	Tcf	2.03	2.17	2.19	2.23	2.30	2.36	2.42		
		Services	Tcf	3.17	3.18	3.21	3.27	3.38	3.52	3.66		
		Transportation	Tcf	0.78	0.82	0.89	0.95	1.02	1.11	1.18		
		Residential	Tcf	4.70	4.72	4.67	4.60	4.56	4.56	4.54		

Scenario: High_Ref_Ref_Ref												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
Level Values												
Macro	Gross Domestic Product		Billion 2016$	$21,292	$24,263	$26,752	$29,836	$33,146	$36,589	$39,807	2.24%	2.11%
		Labor income	Billion 2016$	$10,616	$12,155	$13,469	$15,074	$16,816	$18,639	$20,370		
		Capital income	Billion 2016$	$4,283	$4,890	$5,370	$6,001	$6,655	$7,328	$7,930		
		Resource income	Billion 2016$	$61	$72	$82	$87	$92	$94	$96		
		Indirect taxes	Billion 2016$	$5,578	$6,384	$7,064	$7,905	$8,811	$9,758	$10,650		
		Net Transfers	Billion 2016$	$752	$763	$768	$768	$771	$770	$762		
	Consumption		Billion 2016$	$16,274	$18,655	$20,786	$23,258	$26,021	$28,915	$31,790		
	Investment		Billion 2016$	$3,281	$3,770	$4,024	$4,578	$5,030	$5,583	$6,094		
Natural Gas	Wellhead Price		2016$ per Mcf	$3.56	$3.48	$3.59	$3.45	$3.39	$3.32	$3.31		
	Production		Tcf	32.33	36.87	40.48	44.40	47.42	49.93	52.58		
	LNG Exports		Tcf	2.90	4.33	5.59	7.77	8.43	8.67	8.74		
	Pipeline Exports		Tcf	0.63	1.44	1.87	1.95	2.03	2.10	2.15		
	Total Demand		Tcf	28.80	31.10	33.01	34.69	36.96	39.15	41.70		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.22	0.24	0.25	0.26	0.27	0.29		
		Energy-intensive sectors	Tcf	0.90	1.03	1.10	1.17	1.25	1.33	1.42		
		Chemicals	Tcf	2.33	2.51	2.51	2.49	2.48	2.45	2.43		
		Iron and steel	Tcf	0.51	0.58	0.58	0.58	0.61	0.66	0.73		
		Electricity	Tcf	9.85	10.87	12.12	13.33	14.94	16.45	18.22		
		Manufacturing	Tcf	4.20	4.60	4.81	5.02	5.25	5.45	5.67		
		Refinery	Tcf	2.05	2.27	2.37	2.43	2.52	2.58	2.66		
		Services	Tcf	3.22	3.31	3.40	3.50	3.63	3.80	3.98		
		Transportation	Tcf	0.81	0.91	1.02	1.12	1.24	1.36	1.50		
		Residential	Tcf	4.74	4.82	4.85	4.80	4.77	4.78	4.80		

Scenario: High_Ref_Low_Ref												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
							Level Values					
Macro	Gross Domestic Product		Billion 2016$	$21,299	$24,276	$26,770	$29,852	$33,177	$36,637	$39,870	2.24%	2.11%
		Labor income	Billion 2016$	$10,613	$12,150	$13,462	$15,069	$16,809	$18,630	$20,357		
		Capital income	Billion 2016$	$4,284	$4,892	$5,373	$6,004	$6,661	$7,338	$7,943		
		Resource income	Billion 2016$	$65	$77	$90	$94	$104	$112	$122		
		Indirect taxes	Billion 2016$	$5,576	$6,381	$7,060	$7,902	$8,808	$9,754	$10,643		
		Net Transfers	Billion 2016$	$761	$776	$785	$784	$796	$803	$804		
	Consumption		Billion 2016$	$16,282	$18,664	$20,794	$23,266	$26,028	$28,921	$31,791		
	Investment		Billion 2016$	$3,282	$3,772	$4,024	$4,580	$5,037	$5,592	$6,103		
Natural Gas	Wellhead Price		2016$ per Mcf	$3.73	$3.70	$3.89	$3.68	$3.73	$3.81	$3.97		
	Production		Tcf	33.38	38.88	43.81	47.61	53.37	58.52	64.18		
	LNG Exports		Tcf	3.55	6.28	9.00	10.71	14.60	17.82	20.99		
	Pipeline Exports		Tcf	1.33	2.05	2.68	2.99	3.06	3.35	4.19		
	Total Demand		Tcf	28.54	30.64	32.28	34.09	35.99	37.74	39.57		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.22	0.23	0.25	0.26	0.27	0.27		
		Energy-intensive sectors	Tcf	0.89	1.01	1.07	1.15	1.22	1.28	1.35		
		Chemicals	Tcf	2.30	2.46	2.44	2.43	2.39	2.33	2.25		
		Iron and steel	Tcf	0.49	0.55	0.55	0.55	0.58	0.61	0.66		
		Electricity	Tcf	9.71	10.64	11.77	13.04	14.45	15.73	17.10		
		Manufacturing	Tcf	4.17	4.54	4.72	4.94	5.13	5.28	5.42		
		Refinery	Tcf	2.04	2.24	2.33	2.40	2.47	2.52	2.55		
		Services	Tcf	3.21	3.29	3.36	3.46	3.57	3.72	3.87		
		Transportation	Tcf	0.80	0.89	0.99	1.10	1.20	1.30	1.40		
		Residential	Tcf	4.73	4.80	4.81	4.77	4.72	4.71	4.70		

Scenario: High_Ref_Low_High												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
Level Values												
Macro	Gross Domestic Product		Billion 2016$	$21,305	$24,290	$26,791	$29,886	$33,207	$36,667	$39,899	2.24%	2.11%
		Labor income	Billion 2016$	$10,612	$12,146	$13,457	$15,063	$16,803	$18,623	$20,352		
		Capital income	Billion 2016$	$4,284	$4,893	$5,376	$6,010	$6,667	$7,345	$7,950		
		Resource income	Billion 2016$	$66	$83	$99	$106	$116	$126	$135		
		Indirect taxes	Billion 2016$	$5,576	$6,379	$7,058	$7,899	$8,805	$9,750	$10,641		
		Net Transfers	Billion 2016$	$767	$788	$801	$807	$816	$824	$822		
	Consumption		Billion 2016$	$16,291	$18,672	$20,801	$23,273	$26,034	$28,928	$31,800		
	Investment		Billion 2016$	$3,283	$3,775	$4,027	$4,583	$5,037	$5,592	$6,102		
Natural Gas	Wellhead Price		2016$ per Mcf	$3.77	$3.90	$4.17	$4.04	$4.06	$4.14	$4.25		
	Production		Tcf	33.58	40.70	46.78	52.53	58.30	63.79	68.72		
	LNG Exports		Tcf	3.67	8.30	12.34	16.47	19.38	22.74	25.23		
	Pipeline Exports		Tcf	1.45	2.31	3.00	3.04	4.08	4.75	5.30		
	Total Demand		Tcf	28.50	30.25	31.74	33.39	35.30	36.92	38.93		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.22	0.23	0.24	0.25	0.26	0.27		
		Energy-intensive sectors	Tcf	0.88	0.99	1.05	1.12	1.19	1.25	1.32		
		Chemicals	Tcf	2.30	2.42	2.38	2.36	2.33	2.26	2.20		
		Iron and steel	Tcf	0.49	0.54	0.53	0.53	0.56	0.59	0.63		
		Electricity	Tcf	9.70	10.45	11.51	12.70	14.11	15.31	16.78		
		Manufacturing	Tcf	4.16	4.49	4.65	4.85	5.04	5.18	5.34		
		Refinery	Tcf	2.03	2.22	2.30	2.36	2.43	2.47	2.52		
		Services	Tcf	3.20	3.27	3.33	3.43	3.54	3.67	3.83		
		Transportation	Tcf	0.80	0.87	0.97	1.07	1.17	1.26	1.37		
		Residential	Tcf	4.73	4.78	4.78	4.73	4.68	4.67	4.66		

Scenario: High_Ref_Ref_High												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
Level Values												
Macro	Gross Domestic Product		Billion 2016$	$21,292	$24,268	$26,760	$29,847	$33,159	$36,603	$39,817	2.24%	2.11%
		Labor income	Billion 2016$	$10,616	$12,153	$13,466	$15,070	$16,812	$18,634	$20,363		
		Capital income	Billion 2016$	$4,283	$4,891	$5,371	$6,004	$6,658	$7,332	$7,933		
		Resource income	Billion 2016$	$61	$74	$86	$92	$98	$101	$103		
		Indirect taxes	Billion 2016$	$5,578	$6,382	$7,062	$7,903	$8,809	$9,755	$10,646		
		Net Transfers	Billion 2016$	$755	$768	$775	$778	$782	$782	$772		
	Consumption		Billion 2016$	$16,278	$18,659	$20,789	$23,261	$26,022	$28,917	$31,791		
	Investment		Billion 2016$	$3,283	$3,771	$4,025	$4,579	$5,031	$5,584	$6,094		
Natural Gas	Wellhead Price		2016$ per Mcf	$3.55	$3.58	$3.74	$3.62	$3.56	$3.51	$3.51		
	Production		Tcf	32.30	37.83	42.18	46.86	50.49	53.44	56.23		
	LNG Exports		Tcf	2.90	5.14	7.25	10.08	11.17	11.86	11.45		
	Pipeline Exports		Tcf	0.78	1.84	2.37	2.67	3.04	3.28	4.21		
	Total Demand		Tcf	28.77	30.88	32.64	34.24	36.43	38.49	40.80		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.22	0.24	0.25	0.26	0.27	0.28		
		Energy-intensive sectors	Tcf	0.90	1.02	1.09	1.15	1.23	1.31	1.39		
		Chemicals	Tcf	2.33	2.48	2.47	2.44	2.43	2.39	2.35		
		Iron and steel	Tcf	0.50	0.57	0.56	0.56	0.59	0.64	0.70		
		Electricity	Tcf	9.84	10.76	11.94	13.11	14.67	16.11	17.75		
		Manufacturing	Tcf	4.20	4.57	4.77	4.96	5.19	5.37	5.57		
		Refinery	Tcf	2.05	2.26	2.35	2.41	2.49	2.55	2.61		
		Services	Tcf	3.22	3.30	3.38	3.47	3.60	3.76	3.93		
		Transportation	Tcf	0.81	0.90	1.00	1.10	1.22	1.33	1.46		
		Residential	Tcf	4.74	4.81	4.83	4.78	4.75	4.75	4.76		

Scenario: Low_Ref_Ref_Ref												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
				Level Values								
Macro	Gross Domestic Product		Billion 2016$	$20,849	$23,344	$25,641	$28,514	$31,582	$34,950	$38,207	2.10%	2.04%
		Labor income	Billion 2016$	$10,435	$11,736	$12,959	$14,466	$16,081	$17,866	$19,625		
		Capital income	Billion 2016$	$4,210	$4,713	$5,154	$5,733	$6,341	$6,998	$7,599		
		Resource income	Billion 2016$	$62	$68	$68	$67	$70	$68	$68		
		Indirect taxes	Billion 2016$	$5,483	$6,162	$6,795	$7,583	$8,424	$9,351	$10,255		
		Net Transfers	Billion 2016$	$659	$664	$665	$665	$667	$667	$660		
	Consumption		Billion 2016$	$15,984	$18,060	$20,050	$22,382	$24,965	$27,670	$30,515		
	Investment		Billion 2016$	$3,150	$3,553	$3,827	$4,338	$4,749	$5,397	$5,954		
Natural Gas	Wellhead Price		2016$ per Mcf	$5.41	$6.99	$7.76	$8.31	$9.27	$9.48	$10.05		
	Production		Tcf	28.85	27.31	25.79	25.53	24.93	24.48	24.14		
	LNG Exports		Tcf	2.70	2.10	0.65	0.14	0.06	0.05	0.05		
	Pipeline Exports		Tcf	0.32	0.36	0.48	0.45	(0.02)	(0.68)	(1.13)		
	Total Demand		Tcf	25.86	24.86	24.69	24.96	24.90	25.13	25.24		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.21	0.21	0.22	0.23	0.24	0.25		
		Energy-intensive sectors	Tcf	0.88	0.94	0.96	1.02	1.09	1.15	1.22		
		Chemicals	Tcf	2.29	2.30	2.19	2.18	2.16	2.13	2.08		
		Iron and steel	Tcf	0.50	0.53	0.51	0.51	0.53	0.57	0.62		
		Electricity	Tcf	7.31	6.24	6.27	6.09	5.61	5.45	5.16		
		Manufacturing	Tcf	4.13	4.21	4.19	4.40	4.57	4.72	4.87		
		Refinery	Tcf	2.01	2.08	2.07	2.13	2.19	2.24	2.28		
		Services	Tcf	3.13	3.03	3.00	3.08	3.16	3.27	3.37		
		Transportation	Tcf	0.75	0.73	0.77	0.85	0.89	0.93	0.98		
		Residential	Tcf	4.67	4.60	4.52	4.49	4.46	4.43	4.40		

Scenario: Low_Ref_Low_Ref												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
Level Values												
Macro	Gross Domestic Product		Billion 2016$	$20,855	$23,357	$25,661	$28,537	$31,610	$34,986	$38,256	2.10%	2.04%
		Labor income	Billion 2016$	$10,432	$11,732	$12,949	$14,456	$16,070	$17,855	$19,610		
		Capital income	Billion 2016$	$4,211	$4,715	$5,160	$5,740	$6,351	$7,011	$7,617		
		Resource income	Billion 2016$	$66	$75	$81	$81	$85	$88	$96		
		Indirect taxes	Billion 2016$	$5,481	$6,160	$6,790	$7,578	$8,419	$9,346	$10,249		
		Net Transfers	Billion 2016$	$665	$674	$681	$682	$685	$687	$684		
	Consumption		Billion 2016$	$15,993	$18,067	$20,054	$22,385	$24,967	$27,669	$30,507		
	Investment		Billion 2016$	$3,154	$3,558	$3,828	$4,344	$4,756	$5,412	$5,971		
Natural Gas	Wellhead Price		2016$ per Mcf	$5.62	$7.39	$8.49	$9.05	$10.14	$10.58	$11.56		
	Production		Tcf	29.60	28.67	28.58	28.70	28.66	29.12	30.18		
	LNG Exports		Tcf	2.90	3.18	3.65	3.49	3.71	4.58	6.00		
	Pipeline Exports		Tcf	1.09	1.05	1.02	0.97	0.83	0.42	0.27		
	Total Demand		Tcf	25.65	24.50	23.98	24.27	24.13	24.12	23.86		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.20	0.20	0.21	0.22	0.23	0.23		
		Energy-intensive sectors	Tcf	0.87	0.92	0.93	0.99	1.05	1.10	1.14		
		Chemicals	Tcf	2.27	2.25	2.11	2.10	2.07	2.01	1.93		
		Iron and steel	Tcf	0.48	0.51	0.48	0.48	0.50	0.53	0.57		
		Electricity	Tcf	7.22	6.12	6.04	5.88	5.40	5.18	4.83		
		Manufacturing	Tcf	4.10	4.16	4.08	4.28	4.43	4.53	4.60		
		Refinery	Tcf	2.00	2.05	2.01	2.07	2.13	2.15	2.16		
		Services	Tcf	3.11	3.00	2.94	3.02	3.09	3.17	3.23		
		Transportation	Tcf	0.74	0.72	0.75	0.82	0.85	0.89	0.91		
		Residential	Tcf	4.66	4.57	4.46	4.42	4.38	4.32	4.25		

Scenario: Low_Ref_Low_High												
	Description		Units	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**CAGR (2020-2040)**	**CAGR (2020-2050)**
Level Values												
Macro	Gross Domestic Product		Billion 2016$	$20,862	$23,372	$25,684	$28,572	$31,654	$35,037	$38,320	2.11%	2.05%
		Labor income	Billion 2016$	$10,432	$11,728	$12,943	$14,449	$16,061	$17,844	$19,601		
		Capital income	Billion 2016$	$4,210	$4,717	$5,164	$5,750	$6,365	$7,027	$7,639		
		Resource income	Billion 2016$	$67	$83	$92	$96	$106	$112	$127		
		Indirect taxes	Billion 2016$	$5,481	$6,158	$6,787	$7,575	$8,415	$9,341	$10,245		
		Net Transfers	Billion 2016$	$673	$686	$697	$703	$708	$711	$709		
	Consumption		Billion 2016$	$16,006	$18,079	$20,064	$22,391	$24,970	$27,670	$30,507		
	Investment		Billion 2016$	$3,158	$3,562	$3,835	$4,352	$4,764	$5,422	$5,985		
Natural Gas	Wellhead Price		2016$ per Mcf	$5.65	$7.75	$9.04	$9.81	$11.11	$11.68	$12.90		
	Production		Tcf	29.70	29.93	30.69	32.06	33.08	34.11	35.83		
	LNG Exports		Tcf	2.90	4.55	6.01	7.31	8.56	9.94	11.55		
	Pipeline Exports		Tcf	1.24	1.28	1.26	1.18	1.15	0.86	1.22		
	Total Demand		Tcf	25.62	24.18	23.50	23.62	23.38	23.28	22.98		
	Sectoral Demand											
		Agriculture	Tcf	0.20	0.20	0.20	0.21	0.21	0.22	0.22		
		Energy-intensive sectors	Tcf	0.87	0.91	0.90	0.96	1.01	1.05	1.09		
		Chemicals	Tcf	2.26	2.21	2.05	2.02	1.99	1.92	1.84		
		Iron and steel	Tcf	0.48	0.50	0.46	0.45	0.48	0.50	0.53		
		Electricity	Tcf	7.21	6.01	5.88	5.69	5.20	4.97	4.63		
		Manufacturing	Tcf	4.09	4.10	4.00	4.16	4.29	4.37	4.43		
		Refinery	Tcf	2.00	2.03	1.98	2.02	2.06	2.08	2.08		
		Services	Tcf	3.11	2.98	2.90	2.96	3.02	3.09	3.14		
		Transportation	Tcf	0.74	0.71	0.73	0.79	0.82	0.85	0.87		
		Residential	Tcf	4.66	4.55	4.41	4.35	4.29	4.23	4.14		