U.S. Department of ENERGY | Office of Fossil Energy and Carbon Management

APPENDIX B: DOMESTIC ENERGY, ECONOMIC, AND GHG ASSESSMENT OF U.S. LNG EXPORTS

October 7, 2025

On December 20, 2024, DOE published a notice of availability of its study entitled, *2024 LNG Export Study: Energy, Economic, and Environmental Assessment of U.S. LNG Exports* 2024 LNG Export Study (2024 LNG Export Study, *see* 89 Fed. Reg. 104,132 and https://fossil.energy.gov/app/docketindex/docket/index/30). DOE prepared the 2024 LNG Export Study as a comprehensive update of DOE's prior studies evaluating exports of natural gas, including liquefied natural gas (LNG), under section 3 of the Natural Gas Act (NGA), 15 U.S.C. § 717b. Since issuing the 2024 LNG Export Study and the related Response to Comments on May 19, 2025 (*see* 90 Fed. Reg. 21,912), DOE has determined that the environmental analysis in the 2024 LNG Export Study is not required for DOE's decision on applications to export LNG to non-free trade agreement (non-FTA) countries under NGA section 3(a), 15 U.S.C. § 717b(a).

Specifically, DOE found that its review of an export application under the National Environmental Policy Act of 1969 (NEPA)—in particular, under categorical exclusion B5.7, *Export of natural gas and associated transportation by marine vessel*—considers all relevant environmental effects from the proposed export of LNG to non-FTA countries. The environmental portions of the 2024 LNG Export Study were not limited to marine transport effects considered under categorical exclusion B5.7, but rather included the integration of potential upstream and downstream environmental effects, which are not reasonably foreseeable environmental impacts of DOE's export authorizations. Accordingly, on August 4, 2025, in *Venture Global Calcasieu Pass, LLC*, DOE/FECM Order No. 4346-B (Docket No. 15-25-LNG), DOE explained that its discussion of the 2024 LNG Export Study would focus only on the economic analysis in the Study, as well as DOE's related findings on energy security. DOE further explained that this position is informed by and consistent with the Supreme Court's holdings in *Dep't of Transportation v. Public Citizen*, 541 U.S. 752 (2004), and *Seven County Infrastructure Coalition v. Eagle County, Colorado*, 605 U.S. __, 145 S.Ct. 1497 (2025), which make clear that "agencies are not required to analyze the effects of projects over which they do not exercise regulatory authority." *Seven Cnty. Infrastructure Coal.,* 605 U.S. __, 145 S.Ct. at 1516.

DOE thus reiterates that, in pending and future export application proceedings under NGA section 3(a), DOE will not consider the environmental analysis in the 2024 LNG Export Study or the related Response to Comments. For more discussion, *see*, *e.g.*, *Venture Global Calcasieu Pass, LLC*, DOE/FECM Order No. 4346-B, at 12-13, 15-16, 36-38. We note that, on October 3, 2025, in DOE/FECM Order No. 4346-C, DOE denied rehearing of Order No. 4346-B.

December 2024

U.S. Domestic Modeling Report Appendix

December 2024

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ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
AEO	Annual Energy Outlook
ANL	Argonne National Laboratory
Bcf, BCF	Billion cubic feet
Bcf/d	Billion cubic feet per day
BECCS	Bioenergy with carbon capture and storage
BIL	Bipartisan Infrastructure Law
Btu	British thermal unit
CAFE	Corporate Average Fuel Economy Standards
CCS	Carbon capture and storage
CCUS	Carbon capture, utilization, and storage
CDR	Carbon dioxide removal
CF_4	Tetrafluoromethane
CH_4	Methane
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
DAC	Direct air capture
DOE	Department of Energy
EIA	Energy Information Administration
EPA	Environmental Protection Agency
EJ	Exajoule (10^{18} joules)
FECM	Office of Fossil Energy and Carbon Management
FID	Final Investment Decision
GCAM	Global Change Analysis Model
GDP	Gross domestic product
GHG	Greenhouse gas
Gt	Gigaton
H_2	Hydrogen
HEIDM	Household Energy Impact Distribution Model
HMM	Hydrogen Market Module
IRA	Inflation Reduction Act
ITC	Investment tax credit
LNG	Liquefied natural gas
MAM	Macroeconomic Activity Module
Mcf	Million cubic feet
MJ	Megajoule
MMBtu	Million British thermal units
MMT	Million Metric Tons
NEMS	National Energy Modeling System
NERA	NERA Economic Consulting
NETL	National Energy Technology Laboratory
NREL	National Renewable Energy Laboratory
NG	Natural gas
NGA	Natural Gas Act
NGP	Natural gas processing
OGSM	Oil and Gas Supply Module
PNNL	Pacific Northwest National Laboratory
PTC	Production tax credit
PV	Photovoltaic
Tcf, TCF	Trillion cubic feet
Tg	Teragram (10^{12} grams)
U.S., USA	United States
yr	Year

FOREWORD

This multi-volume study of U.S. LNG exports serves to provide an updated understanding of the potential effects of U.S. LNG exports on the domestic economy, U.S. households and consumers; communities that live near locations where natural gas is produced or exported; domestic and international energy security, including effects on U.S. trading partners; and the environment and climate. Prior to this study, Department of Energy's (DOE's) most recent economic and environmental analyses of U.S. LNG exports were published in 2018 and 2019, respectively. At that time, U.S. LNG exports were just getting underway and our export capacity was 4 billion cubic feet per day (Bcf/d), less than one-third of what it is today. Since then, our world and the global natural gas sector have changed significantly: the U.S. has become the top global exporter of LNG; Russia has invaded Ukraine and used energy as a weapon to undermine European and global security; the impacts and costs of extreme weather and natural disasters fueled by climate change have increased dramatically; and the pace of the energy transition and technological innovation has itself accelerated.

These developments and others factor into a global energy system that is changing rapidly. The pace of change creates inherent uncertainty in projecting the potential pathways for U.S. LNG through 2050. Accordingly, several considerations should be borne in mind when interpreting this study and its results.

- Given the global scope and timeframe examined in this study, there should be recognition of the inherent uncertainty in conclusions, especially given their size relative to the overall global economy and energy system.
- This study is not intended to serve as a forecast of U.S. LNG exports and impacts. Rather, it is an exercise exploring alternative conditional scenarios of future U.S. LNG exports and examining their implications for global and U.S. energy systems, economic systems, and greenhouse gas (GHG) emissions. This type of scenario analysis is a well-established analytical approach for exploring complex relationships across a range of variables.
- The scenarios explored in this study span a range of U.S. LNG export outcomes. Each scenario relies on input assumptions regarding many domestic, international, economic, and non-economic factors, such as future socioeconomic development, technology and resource availability, technological advancement, and institutional change. A full uncertainty analysis encompassing all underlying factors is beyond the scope of this study.
- For the portions of this study that have modeled results, the study does not attach probabilities to any of the scenarios examined.

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) is responsible for authorizing exports of domestically produced natural gas, including liquefied natural gas (LNG), to foreign countries under section 3 of the Natural Gas Act (NGA), 15 U.S.C. § 717b. An application to export domestically produced natural gas to countries that have a free trade agreement (FTA) with the United States must be granted without delay or modification and is deemed to be consistent with the public interest by statute. For applications to export domestic natural gas to non-FTA countries, DOE must grant the application unless it finds that the proposed exportation will not be consistent with the public interest.

Since 2012, to inform its public interest determination, DOE's Office of Fossil Energy and Carbon Management (FECM) has commissioned multiple studies to help assess the various facets of the public interest that are affected by U.S. LNG exports. The purpose of the current study is to provide a comprehensive update to our understanding of how varying levels of U.S. LNG exports impact all these facets.

This Appendix covers the U.S. domestic analysis, including the impact of various U.S. LNG export levels on natural gas prices, energy-related CO_2 emissions, and Gross Domestic Product (GDP), as well as the distributional burden of increased energy prices on domestic U.S. consumers. The U.S. domestic analysis was conducted using the Energy Information Administration (EIA's) National Energy Modeling System (NEMS) run by OnLocation, Inc. and the Household Energy Impact Distribution Model (HEIDM) run by Industrial Economics, Inc. U.S. LNG export levels used in NEMS were harmonized to values derived from scenarios run by Pacific Northwest National Laboratory (PNNL) using the Global Change Analysis Model (GCAM)[1]. NEMS, which was used for the development of the Annual Energy Outlook (AEO) 2023, was used here to explore the implications of changes in North American LNG export levels on natural gas prices, the energy system, and the macro-economy within the United States. More specifically, changes in U.S. LNG exports, as well as changes in LNG exports from Canada and Mexico where the feed gas is sourced from U.S. Lower 48 (L48) natural gas producing basins were considered. Using the modeled changes in energy prices combined with population data, the HEIDM model provides information on the energy cost burden to consumers in scenarios with different U.S. LNG export levels.

The U.S. domestic analysis comprises six scenarios spanning a range of U.S. LNG export levels. These scenarios use only the LNG exports derived under the global *Defined Policies* assumptions discussed in the global analysis found in Appendix A, while varying the size of U.S. natural gas resources and technological improvements in natural gas extraction. Other scenarios used in the global analysis such as the *Commitments* or *Net Zero* 2050 had a more international focus and were not examined in the domestic context. The foundation of the domestic *Defined Policies* modeling is NEMS, but for this study, model improvements were implemented, such as a more comprehensive representation of the Inflation Reduction Act (IRA), the Bipartisan Infrastructure Law (BIL), U.S. Environmental Protection Agency (EPA) regulations on fuel economy, updates on the characterization of power generation technologies, and a more detailed representation of clean hydrogen production and demand.

[1] Appendix A: *Global Energy and Greenhouse Gas Implications of U.S. LNG Exports*

The key comparison in this study is between different LNG export levels considering the same assumptions on the domestic natural gas supply levels. LNG export levels start at 6 billion cubic feet/day (Bcf/d) in 2020, and in the *Model Resolved* scenarios, LNG exports reach 56.3 Bcf/d in 2050. While using the *Existing/FID Exports* assumptions, existing and final investment decision (FID)[2] levels of exports are capped at 23.7 Bcf/d. Each of these comparisons between export levels, is run under one of three alternative sets of supply assumptions: (1) *Defined Policies* with reference U.S. supply, which includes the reference assumptions around resource availability and technologies; (2) *Defined Policies High US Supply*, with a high U.S. natural gas resource base and technology improvement rate; and (3) *Defined Policies Low US Supply,* with a low U.S. natural gas resource base and technology improvements.

Key findings from this Appendix are:

1. The price of natural gas at the Henry Hub in Louisiana, a main trading hub for natural gas in the U.S., increases in scenarios where the export level is *Model Resolved* (i.e., based on modeled global demand and unconstrained U.S. LNG exports when compared with existing and FID levels of U.S. LNG exports).
    a. Across the *Defined Policies* with reference U.S. supply assumption, the 2050 Henry Hub natural gas price is projected to increase 31%, as U.S. LNG exports are increased in response to the modeled global demand level.
    b. Annual Henry Hub natural gas prices in *Defined Policies* at existing and FID levels of U.S. natural gas exports, with reference U.S. supply assumption, are lower than in the AEO 2023 with similar export levels, as improved modeling of the impacts of recent regulation and legislation lead to a decrease in U.S. natural gas consumption, primarily in the electric power generation sector.
2. Wholesale prices such as those at the Henry Hub are only one component of what end-use customers pay. As a result, the effects of exports on U.S. residential natural gas prices are more muted and projected to be 4% higher in 2050 in the *Model Resolved* scenario with a higher level of U.S. LNG exports compared with the existing and FID exports level scenario under the *Defined Policies* with reference U.S. supply assumption.
    a. Under the *Defined Policies Low US Supply*, residential gas prices are 7% higher in 2050 when exports increase from the existing and FID exports level to the *Model Resolved* export level. Residential gas prices are 3% higher when comparing the two export levels in the *Defined Policies High US Supply*. Across both export levels, in the *Defined Policies High US Supply* natural gas prices were lower than in the scenarios with reference assumption of U.S. supply resources.
    b. Industrial natural gas prices are projected to be 18% higher in 2050 when exports increase from the existing and FID exports level to the *Model Resolved* export level under the *Defined Policies* with reference U.S. supply assumption, while in *Defined Policies High US Supply* and *Defined Policies Low US Supply*, the prices are 18% and 22% higher, respectively.

[2] "The Final Investment Decision is the decision to make a final commitment to the project, including the financial commitment to award the EPC contract and the satisfaction of conditions precedent in the LNG SPA. This decision by the project partners requires (1) the prior completion of all necessary government agreements, including complete fiscal terms and passage into law of all required enabling legislation and land allocation and access; (2) financing commitments provided to the project by the lenders, including export credit agencies, multilateral development banks, commercial banks, and other lenders." (Global LNG Fundamentals, U.S.DOE, USEA).

3. Due to the configuration of NEMS, which modeled the GDP estimates, increases in LNG exports generally yield increases in GDP.[3] For the *Defined Policies* scenario with reference U.S. supply assumptions, increasing exports from existing and FID levels to *Model Resolved* levels results in a 0.2% increase in GDP in 2050 ($80 billion, $2022), cumulatively from 2020 to 2050, GDP increases ($410 billion, $2022 discounted at 3%).
4. Domestic energy-related carbon dioxide (CO_2) emissions for the *Defined Policies* and all supply assumptions increase about 1%-2% in 2050 in response to increased LNG exports from *Existing/FID Exports* to *Model Resolved* levels (with a CO_2 emissions increase of 23 MMT in *Defined Policies* with reference U.S. supply, 46 MMT in *Defined Policies High US Supply* and 40 MMT in *Defined Policies Low US Supply* in 2050), reflecting greater emissions associated with the production, transportation, and liquefaction of natural gas for export.
5. Under the *Defined Policies* scenario with the reference U.S. supply assumption, the estimated annual energy expenditure impacts across all socioeconomic levels and census divisions are:
    a. Up to a $46.52 per year average increase for natural gas expenditures at natural gas households (households identified in NEMS as using natural gas for space heating), with an average natural gas household expenditure impact of up to 0.24% of average annual income and 6.7% of average natural gas bills.
    b. Up to a $118.37 per year average increase for electricity expenditures across all households. The average household expenditure impacts are up to 0.5% of average annual income and 3.5% of average electricity bills.
    c. Up to a $122.54 per year average increase for natural gas plus electricity expenditure across all households, with average household expenditure impacts up to 0.50% of average annual income and 3.4% of natural gas and electricity bills.[4]

[3] NEMS includes a separate econometric model of the broader economy, which iteratively receives energy prices and energy-focused elements of the model and provides feedback on changes in macro-economic drivers of the energy markets, such as growth and changes to interest rates.

[4] This figure is lower than the combined natural gas and electricity expenditures as all values are up to the highest increases across regions and different regions have the highest natural gas and electricity expenditures, as discussed in the text below.

INTRODUCTION

A. Summary of analytical approach and tools

The purpose of this study is to examine some of the potential implications for global and U.S. greenhouse gas (GHG) emissions and economic impacts when considering a range of U.S. LNG export levels. This Appendix describes the U.S. domestic analysis, which OnLocation and Industrial Economics conducted using the NEMS model and HEIDM model. NEMS is a national energy-economic model of the United States. It projects supply, demand, prices, imports, and exports of major energy commodities based on drivers such as macroeconomic conditions, world energy markets, technology choices and costs, resource availability, and demographics. NEMS includes both cost minimization representative of competitive markets and behavioral representations of the energy market.

GCAM, developed and maintained at PNNL's Joint Global Change Research Institute, was used to establish pathways for potential increased LNG exports based on model resolved global demand. This global analysis is discussed in more detail in the accompanying volume "Appendix A: *Global Energy and Greenhouse Gas Implications of U.S. LNG Exports"*. Based on GCAM output for these pathways, NEMS was used to explore the implications of the changes in U.S. LNG export levels on domestic gas prices, the energy system, and the macro-economy within the United States. Using the changes in energy prices combined with household and income data, the HEIDM model provides information on the change in energy expenditures by income group, census division, and year. The model also estimates the corresponding changes in energy expenditure per household, both in absolute terms and as a percentage of annual household income, for each census division and income group.

B. Organization of the Appendix

This Appendix contains four major sections: an overview of the energy modeling, the results of the domestic analysis (in two sections), and a summary of results. In the overview, the analytical tools (NEMS and HEIDM) are described along with the scenarios analyzed. The next section describes the findings from modeling of the impacts of differing levels of U.S. LNG exports on the domestic economy. Increased LNG exports change the supply-demand equilibrium and change the price of natural gas. This section shows the impacts of increased U.S. LNG exports on the Henry Hub natural gas spot price, primary energy consumption, natural gas production and consumption, regional commodity natural gas prices by supply region, residential natural gas prices by census region, GDP, industrial output, regional economic impacts, and energy-related CO_2 emissions. The next section describes changes in energy burden and household energy expenditures by region and income group. The final sections provide a summary of key results and tabular representation of the data from the figures.

OVERVIEW OF NEW ENERGY AND ECONOMIC MODELING

A. Overview of models used and their limitations

Two analytic frameworks were used to analyze domestic economic and energy impacts: 1) the National Energy Modeling System, developed by the U.S. Energy Information Administration (EIA) and adapted for this study by OnLocation, and 2) the Household Energy Impact Distribution Model, developed by Industrial Economics (IEc). These frameworks and key assumptions are described below.

1. NEMS

NEMS is a national energy-economic model of the United States. It projects supply, demand, imports, and exports of major energy commodities based on drivers such as macroeconomic conditions, world energy markets, technology choices and costs, resource availability, and demographics. NEMS contains both cost minimization algorithms representative of competitive markets and behavioral representations, particularly of the demand side of the energy market.

NEMS includes four supply modules covering oil, natural gas, coal, and renewables. There are two conversion modules converting primary fuels into electricity and petroleum and other liquids into liquid fuel products, respectively. There are four demand modules covering the residential, commercial, industrial, and transportation sectors. Other modules include the macroeconomic module, emissions policy modules, and an integrating module that synthesizes the output across all other modules. NEMS solves iteratively to reach a general market equilibrium across the energy economy. EIA provides an archive of NEMS with source code and input sufficient to reproduce the reference and side scenarios comprising the Annual Energy Outlook (AEO).

The energy market is only a part of the total economy. Energy expenditures accounted for 6.7% of total nominal GDP in 2022.[5] The Macroeconomic Activity Module (MAM) in NEMS incorporates S&P Global's (formerly IHS Markit's) model of the U.S. economy, along with EIA's extensions of industrial output, employment, and models of regional economies to provide projections of economic drivers underpinning NEMS' energy supply, demand, and conversion modules and responds to changes in forecasted changes in energy prices and quantities. Because of its broad scope, the MAM has less detail on energy than the rest of NEMS and the linkages between the self-contained MAM and the rest of NEMS are necessarily aggregated. Therefore, evaluation of the impact of LNG export levels on the broader economy is necessarily more attenuated than specific metrics in the energy sector at which NEMS excels.

FECM24-NEMS is a variation of the NEMS model, based on OnLocation's version of EIA's NEMS, which was used in the development of AEO 2023. FECM24-NEMS includes numerous model improvements and updates reflecting changes in laws and regulations. FECM24-NEMS models the Inflation Reduction Act (IRA) based on FECM's interpretation of the policy. It includes major IRA energy-related provisions, including but not limited to extension of 45Q CO_2 storage credits, clean vehicle tax credits, energy efficient home tax credits and rebate programs, the clean energy Production Tax Credit and Investment Tax Credit, zero-emission nuclear credits, and hydrogen tax credits. Additional modeling updates include provisions from the Bipartisan Infrastructure Law (BIL), such as funding for carbon capture demonstration projects, CO_2 transportation and storage infrastructure, and updated Environmental Protection Agency (EPA)/National Highway Traffic Safety Administration (NHTSA) Corporate Average Fuel Economy (CAFE) standards.

FECM24-NEMS has the capability to endogenously derive the quantity of U.S. LNG exports over the forecast. However, the endogenous algorithm used by NEMS to calculate LNG exports was disabled for this study. Instead, U.S. LNG export levels were taken from the GCAM results. Two export levels were used. In the *Existing/FID Exports* scenarios, GCAM capped LNG exports at the levels attainable from the Existing and FID facilities known at the end of 2023. In the *Model-Resolved scenarios,* the LNG levels were determined by GCAM. This allowed the study team to use the insights from global energy modeling to inform domestic impacts of various export pathways.

[5] EIA, "Today in Energy", August 28, 2024, TIE

FECM24-NEMS represents several CO_2 mitigation technologies, including carbon capture and storage (CCS), direct air capture (DAC), bioenergy with carbon capture and storage (BECCS), and hydrogen production technologies that are part of the Hydrogen Market Module (HMM). Industrial carbon capture is a component of the Liquid Fuels Market Model (LFMM), which allows for the construction of new ethanol facilities with CCS. It also allows for existing hydrogen, ethanol, and natural gas processing (NGP) plants to retrofit a CCS capability. The model's representation of the cement industry has also been modified to include CCS opportunities. Industries have the option to send captured CO_2 to an enhanced oil recovery market for storage or to saline aquifers for dedicated storage. As scenarios considered in the domestic analysis do not include deep decarbonization pathways, such technologies did not play a major role in this appendix.

Total hydrogen demand was defined exogenously to be consistent with the updated demand trajectory from DOE Hydrogen and Fuel Cell Technologies Office (HFTO), including a floor on "clean" H_2 (defined as H_2 produced from renewables, nuclear, or CCS) of 10 MMT annually by 2050. Production of hydrogen to meet this demand was derived from the Hydrogen Market Module (HMM). The HMM is integrated into NEMS to produce hydrogen via conventional and low-carbon processes. The hydrogen production technologies available in the HMM include steam methane reformation, steam methane reformation with CCS, biomass gasification with CCS, and electrolysis.

A summary of changes OnLocation made to the version of NEMS used for AEO 2023 may be found in Table 1.

Table 1. FECM24-NEMS enhancements of AEO2023.

		FECM24-NEMS differences from AEO2023
Modules		
Macroeconomic		AEO2023 Reference case assumptions
Power	Technology Parameters	• ATB 2023 Moderate Case for wind, PV and CCS.
	Technology Growth Bounds	• Loosened to 35% per year (from 25% per year in AEO2023)
	Data Updates	• Revised EV load shapes with more daytime charging. • Coal retirements consistent with EPA NEEDS database (1/2024)
Transportation	LDV	• Harmonized vehicle prices to Argonne National Laboratory Autonomie 2023 (ANL23) Low case prices
	HDV	• Harmonized truck costs and fuel economy ratios to ANL23 Low case
Hydrogen		• New module for the production, consumption and transportation of hydrogen
Industrial	Carbon capture	• Additional carbon capture options which transport CO_2 to either saline aquifer storage or storage through enhanced oil recovery.

		FECM24-NEMS differences from AEO2023
Liquid Fuels	Carbon capture	• Opportunities to retrofit carbon capture and storage on ethanol, hydrogen and NGPL plants.
Relevant Policy Assumptions		
Bipartisan Infrastructure Law (BIL)	Carbon capture	• CO_2 pipeline and storage subsidies • CCS and advanced nuclear demonstration projects
Inflation Reduction Act	Transportation	• 30D credits for light-duty vehicles • 45W credits for electric and hydrogen fuel cell trucks • 45W exogenous shares for electric school buses based on Slowik et al. (2023)[6] • 70002 USPS Clean Fleets with exogenous minimum EV sales
	Power	• Clean Electricity Production Tax Credits and Investment Tax Credits • USDA rural coop program funding for solar, wind, and CCS
	Residential	• Equipment and shell tax credits • EPA GHG Reduction Fund subsidies for building retrofits and rooftop solar PV
	Commercial	• 40% ITC for renewable technologies through 2050 • 179D tax credits for energy-efficient commercial property • Zero Energy Building codes • EPA GHG Reduction Fund equipment subsidies
	Industrial	• Various manufacturing credits for CCS, steel, cement, and other GHG reductions (48C, 50161, and Low-Carbon Procurement Provisions)
	Cross-sectoral	• 45Z credits: in 2025 through 2027 based on lifecycle carbon intensities; includes SAF • 45V credits: simplified representation limited to clean hydrogen •Hydrogen demand reflects exogenous estimates from internal DOE analysis
Other Regulatory Provisions	Transportation	• Proposed NHTSA CAFE standards (2027 to 2032) and EPA GHG rule standards (2027 to 2032 and later) • State policies: Advanced Clean Cars II and Advanced Clean Trucks
	Power	• EPA Section 111(b) and 111(d) standards for existing and new coal and natural gas plants • EPA Section 110(a)(2)(D) "Good Neighbor" NOx Rule • DOE energy efficiency standards for distribution transformers • Updates on state RPS/CES programs and mandates for storage and offshore wind
	Residential	• Updated appliance standards

[6] Slowak et al., "Analyzing the Impact of the Inflation Reduction Act on Electric Vehicle Uptake in the United States", The International Council on Clean Transportation, Jan, 2023 at ICCT.

2. Household Energy Impact Distribution Model

Standard NEMS results include a considerable amount of data on energy consumption and intensity in the residential sector, as well as energy prices by region. However, these data lack sufficient detail to assess distributional changes by income level. As a result, the Household Energy Impact Distribution Model is used to complement NEMS and assess the distributional implications of changes in residential energy prices projected by NEMS. For a given scenario, HEIDM estimates the change in energy expenditures by income group (see Table 2 for income groups), census division, and year. The model also estimates the corresponding changes in energy expenditure per household, both in absolute terms and as a percentage of annual household income, for each census division and income group. To develop these estimates, HEIDM integrates outputs from NEMS with household-level data compiled from the U.S. Census Bureau's American Community Survey (ACS).[7] Figure 1 shows the specific data from the ACS and NEMS that form the basis of HEIDM's estimates of distributional impacts.

Table 2. Income groups represented in HEIDM

Income Group	Income ($2022)
1	Less than $30,000
2	$30,000 - $49,999
3	$50,000 - $69,999
4	$70,000 - $149,999
5	$150,000 or more

To allocate projected changes in energy expenditures as derived from NEMS to the income groups shown in Table 2, HEIDM relies on the ACS public use microdata 5-year sample for 2018-2022. Unlike summary level data from the ACS (e.g., by census tract or block group), the microdata file includes data for individual respondents, including their geographic location, annual income, annual natural gas expenditures, and annual expenditures on electricity. The dataset contains this level of detail for 7.5 million household respondents. This level of detail enables HEIDM to specify the distribution of natural gas and electricity expenditures across income groups for each census division in the U.S. and apply these distributions to the change in energy expenditures derived from NEMS. HEIDM assumes that the distributions derived from the ACS microdata will remain constant over the entire time horizon of the NEMS results, or until 2050.

[7] The ACS is an ongoing survey that collects data on the population and housing characteristics about communities in the U.S. More information on the ACS may be found at CENSUS - Programs Surveys

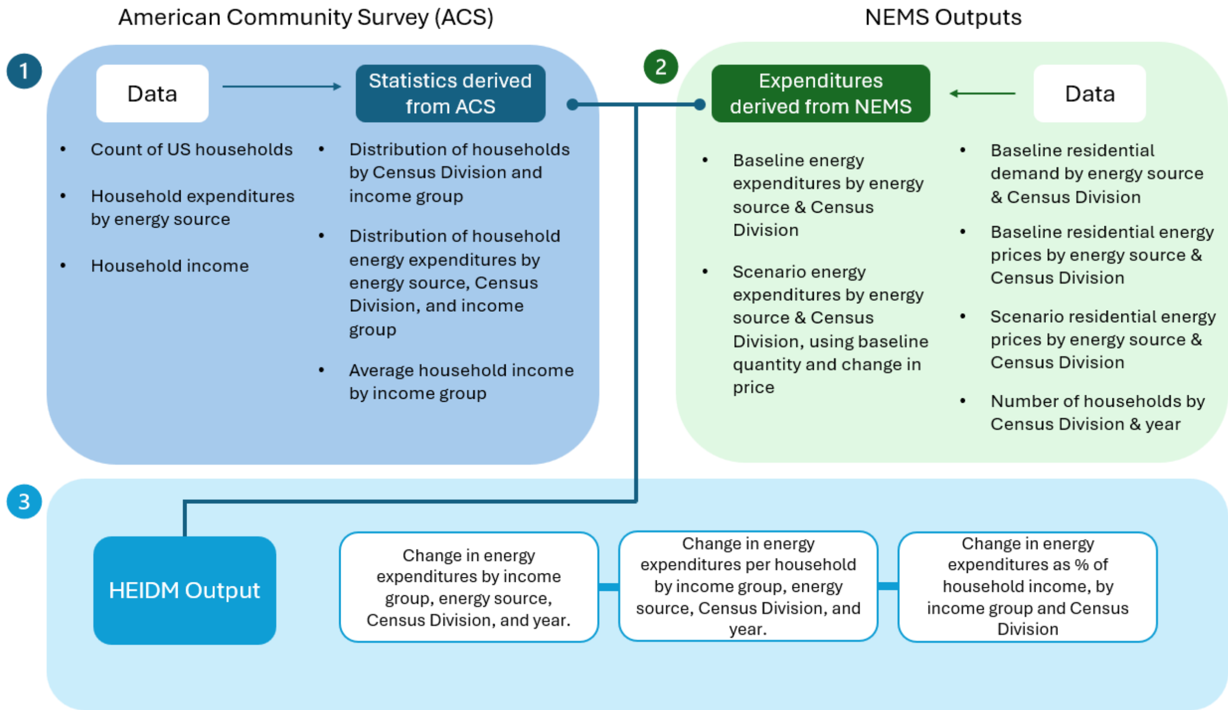


Figure 1. Overview of HEIDM

B. Interaction with Other Models

GCAM and NEMS are distinct models with different geographic scope, emphasis and solution approach. However, coordination between them is necessary as the modeling team used GCAM to determine a market equilibrium level of U.S. LNG exports given a set of globally defined policies. GCAM's levels of U.S. LNG exports were then used to develop exogenous U.S. LNG export pathways for the NEMS scenarios. Since GCAM models all of North America, including the United States, as one of its regions, the level of U.S. LNG exports depends upon the relative cost of producing U.S. natural gas compared with other producing regions in the world, as well as liquefaction and shipping costs. Therefore, consistency in the supply and demand of natural gas between the North American region of GCAM and that of NEMS is needed to support the market equilibrium level and set the NEMS results in the context of the global LNG market forecast. For this analysis, domestic supply and demand for natural gas were harmonized between NEMS and GCAM. Table 3 shows key provisions that are the same between the models.

Table 3. GCAM and NEMS parameter comparison

Parameter	Description
Electricity Technology	Both models harmonized to NREL's ATB 2023 Moderate for wind, solar and CCS technologies
Regulation	Both models implement EPA 111 (b) and (d), Section 45V and 45Q credits, other IRA and BIL sections
Residential Technology	Both models include updated efficiency standards through 2023
Natural Gas Sector	National level natural gas production and consumption differences verified across both models; LNG exports harmonized; historical producer prices aligned to Henry Hub prices from EIA
Transportation Technology	LDV vehicle prices in both models harmonized to ANL23 prices
Hydrogen deployment	Both models deploy 10 MMT of clean hydrogen by 2050 in the Defined Policies: Model Resolved scenario

Parameter	Description
Socioeconomic assumptions	Both models harmonized to AEO-2023 Reference scenario

To complete the domestic analysis, NEMS outputs are then transferred to HEIDM for domestic economic impact analysis. The NEMS data transferred to HEIDM includes regional residential gas and electricity prices and consumption, household formation, and personal income. These were combined with estimates of income distribution by household for other sources to provide energy burden and distributional analysis.

C. Description of scenarios

Using output on U.S. LNG export levels from GCAM, the U.S. domestic analysis explored one climate ambition assumption, with different assumptions about U.S. natural gas supply. Additionally, OnLocation analyzed two U.S. LNG export level assumptions derived from GCAM's analysis: one constrained to existing and under construction projects (*Existing/FID Exports*); and one based on GCAM's market equilibrium level of U.S. LNG exports (*Model Resolved*), yielding six different scenarios and sets of results. (Table 4).

Table 4. Definition of scenarios and assumptions

Climate Ambition Assumption	U.S. Supply Assumption	U.S. LNG Exports Level	Scenario, Abbreviated	Description	U.S. LNG Export Volumes (Bcf/d)
Defined Policies	*Reference*	*Model Resolved*	*DP: MR*	Incorporates U.S. policy assumptions (including the 2022 IRA), Assumes existing policies and measures, globally, LNG exports volume is determined by global market equilibrium from GCAM.	56.3 Bcf/d by 2050, based on GCAM
	Reference	*Existing/FID Exports*	*DP: ExFID*	All assumptions are consistent with *DP: MR*, LNG exports volume is capped as the existing and FID exports level.	Maximum of 23.7 Bcf/d
	High US Supply	*Model Resolved*	*DP Hi US Sup: MR*	Assumes policies consistent with *DP: MR*, Incorporates AEO23 assumptions for high U.S. supply, LNG exports volume is fixed as *DP: MR*.	56.3 Bcf/d by 2050, based on GCAM
	High US Supply	*Existing/FID Exports*	*DP Hi US Sup: ExFID*	All assumptions are consistent with *DP Hi US Sup: MR*, LNG exports volume is capped as the existing and FID exports level.	Maximum of 23.7 Bcf/d
	Low US Supply	*Model Resolved*	*DP Lo US Sup: MR*	Assumes policies consistent with *DP: MR*, Incorporates AEO23 assumptions for supply,	56.3 Bcf/d by 2050, based on GCAM

				LNG exports volume is fixed as *DP: MR*.	
	Low US Supply	*Existing/FID Exports*	*DP Lo US Sup: ExFID*	All assumptions are consistent with *DP Lo US Sup: MR*, LNG exports volume is capped as the existing and FID exports level.	Maximum of 23.7 Bcf/d

For this analysis, the endogenous algorithm used by NEMS to calculate LNG exports was disabled, while the level of U.S. LNG exports from the GCAM model was substituted exogenously for each of these scenarios. This allowed the model team to use the insights from the global energy analysis to analyze domestic impacts. All the NEMS scenarios include representations of current U.S. regulations, including the 2022 Inflation Reduction Act (IRA) and existing emission policies (as explained in the Section entitled NEMS). Across the modeling platforms, this state is called "*Defined Policies*" climate ambition assumption. For the first scenario in Table 4, under the *Defined Policies* climate ambition assumption (incorporating all related U.S. policy assumptions), GCAM determined the equilibrium level of U.S. LNG exports to be 56.3 Bcf/d by 2050. As the U.S. LNG export level is "resolved" (i.e., mathematically solved) by GCAM, this scenario is named "*Defined Policies: Model Resolved*"**.** While the global analysis includes additional policy scenarios with increased climate ambition (*Commitments* and *Net Zero 2050*, described in Appendix A), the domestic component of this study focuses on the *Defined Policies* scenario. This was done to focus the analysis on the effects of increasing natural gas exports while varying levels of oil and gas supply. Introducing additional potential impacts from changing policy and technology assumptions complicates model dynamics such that it is difficult to isolate the impacts of increasing LNG exports.

Under "*Defined Policies: Model Resolved,*" U.S. oil and natural gas supply is assumed to be at the reference level established for the EIA's AEO2023 that assumes rates of estimated ultimate recovery per well and of technological improvement. For the creation of U.S. high and low supply assumptions, OnLocation followed the assumptions used in AEO 2023 side cases for high and low oil and gas supply, where estimated ultimate recovery per well and rates of technological improvement are adjusted accordingly.[8]

The Low U.S. Supply assumption is 50% lower than the EIA's AEO 2023 reference estimates because of lower assumed estimated ultimate recovery (EUR) per well, and lower assumed rates of technological improvement (which reduce costs and increases well productivity). Under the High U.S. Supply assumption, supply levels are 50% higher than under the reference assumption. Although the scenarios *Defined Policies High US Supply: Model Resolved*, and *Defined Policies Low US Supply: Model Resolved* each represents a different state of the energy system than under the *Defined Policies: Model Resolved* with reference U.S. supply assumption, U.S. LNG export levels are assumed to remain constant, at the GCAM resolved export level of 56.3 Bcf/d by 2050, which provides data on the implications of incremental LNG exports under different U.S. supply conditions.

In addition to scenarios with *Model Resolved* U.S. LNG exports assumed, alternative scenarios are defined where U.S. LNG exports remain at levels equivalent to the sum of the expected U.S. LNG export capacity as of the end of 2023, based on historical utilization of the peak authorized

[8] Annual Energy Outlook 2023: Case Descriptions, U.S. Energy Information Administration, U.S. Energy Information Administration - EIA - Independent Statistics and Analysis

capacity of terminals operating, or under construction after having received a final investment decision (FID). This can be tracked in Table 5, which provides details on large-scale LNG export projects in North America that have been granted authorization by DOE to export or re-export U.S. natural gas to non-FTA countries under the Natural Gas Act. For the assumed climate ambition and associated U.S. supply assumptions (*Defined Policies; Defined Policies High US Supply;* and *Defined Policies Low US Supply*), the U.S. LNG export level is limited to 90% utilization of the peak authorized capacity. This represents a dynamic where expansion of U.S. LNG export facilities does not increase beyond the existing near-term capacity and provides a way to compare the implications of increasing beyond existing the U.S. LNG export level to the model resolved U.S. LNG export level by GCAM. The three alternative scenarios are "*Defined Policies: Existing/FID Exports,*" "*Defined Policies High US Supply: Existing/FID Exports,*" and "*Defined Policies Low US Supply: Existing/FID Exports*", where the assumptions are consistent with the three related *Model Resolved* scenarios, except that the U.S. LNG export level is constrained to a maximum of 23.7 Bcf/d in 2050, which is equal to 90% of current operating capacity (14.3 Bcf/d) plus the capacity of terminals under construction pursuant to an FID (12 Bcf/d), as of December 31, 2023.[9]

Table 5. North American large-scale LNG export projects with non-FTA export authority from DOE (as of December 2023)

NORTH AMERICAN LARGE-SCALE LNG EXPORT PROJECTS WITH NON-FTA EXPORT AUTHORITY FROM DOE						
		Volume (Bcf/d)				
	Project	**Authorized**	**Under Construction Pursuant to a final investment decision (FID)**	**Operating**	**Initial Operation (or est.)**	**Construction Status**
1	Sabine Pass | *Cameron, LA*	4.55	0	4.55	Feb. 2016	Operating
2	Cove Point LNG | *Calvert City, MD*	0.77	0	0.77	Mar. 2018	Operating
3	Cameron | *Hackberry, LA*	3.53	0	2.12	May 2019	3 trains operating
4	Corpus Christi | *Corpus Christi, TX*	3.99	1.59	2.4	Dec. 2018	3 trains operating Stage 3 Under construction
5	Elba Island | *Chatham County, GA*	0.36	0	0.36	Sep. 2019	Operating
6	Freeport | *Quintana Island, TX*	3.10	0	2.38	Sep. 2019	3 trains operating
7	Golden Pass| *Sabine Pass, TX*	2.57	2.57	0	Late 2025 (est.)	Under construction
8	Venture Global Calcasieu Pass | *Cameron, LA*	1.70	0	1.70	Mar. 2022	Operating

[9] Liquefied Natural Gas (LNG) Exports June 2024, U.S. Department of Energy, Fossil Energy and Carbon Management, FECM - LNG Exports

NORTH AMERICAN LARGE-SCALE LNG EXPORT PROJECTS WITH NON-FTA EXPORT AUTHORITY FROM DOE						
9	Lake Charles | *Lake Charles, LA*	2.33	0	0	N/A	Pending FID
10	Delfin | *Gulf of Mexico*	1.80	0	0	N/A	Pending FID
11	Port Arthur | *Port Arthur, TX*	1.91	1.91	0	2027 (est.)	Under construction
12	Driftwood | *Calcasieu Parish, LA*	3.88	0	0	N/A	Pending FID
13	Gulf LNG | *Jackson County, MS*	1.53	0	0	N/A	Pending FID
14	Venture Global Plaquemines | *Plaquemines Parish, LA*	3.40	3.40	0	Late-2024 (est.)	Under construction
15	Rio Grande LNG | *Brownsville, TX*	3.61	2.10	0	2027 (est.)	Under construction
16	Texas LNG | *Brownsville, TX*	0.56	0	0	N/A	Pending FID
17	Alaska LNG | *Kenai Peninsula, AK*	2.55	0	0	N/A	Pending FID
	U.S. TOTAL	42.14	11.57	14.28		
18	Pieridae Energy (USA) Ltd. | *Nova Scotia, Canada*	0.80	0	0	N/A	Pending FID
19	Mexico Pacific Limited| *Sonora, Mexico*	1.7	0	0	N/A	Pending FID
20	Energia Costa Azul | *Ensenada, Mexico*	2.18	0.44	0	2025 (est.)	Phase 1 Under construction Phase 2 FID Pending
21	Epcilon LNG | *Sonora, Mexico*	1.08	0	0	N/A	Pending FID
22	Vista Pacifico LNG | *Sinaloa, Mexico*	0.55	0	0	N/A	Pending FID
	NORTH AMERICA TOTAL	**48.45**[10]	**12.01**	**14.28**		

In the remainder of the report, abbreviated scenario names, as outlined in Table 4, will be used for clarity and conciseness.

DOMESTIC SUPPLY NEED AND U.S. ECONOMIC IMPACTS

A. Summary of the NEMS output for key scenarios

FECM24-NEMS was used to model U.S.-specific results for each of the two U.S. LNG export level assumptions within the climate policy ambition assumption and supply assumptions. That is to

[10] Approved amounts listed here do not include non-FTA authorizations issued to small-scale facilities, which brings the total to 48.6 Bcf/d. Additional small-scale authorizations issued specifically under DOE's Small-Scale Rule are not additive to the cumulative total.

say that for the scenarios considered in this study under *Defined Policies* climate ambition assumption, we compare NEMS outputs for *Model Resolved* with *Existing/FID Export* levels. This provides an opportunity to evaluate the impacts of increased U.S. LNG exports from Existing and FID levels to unconstrained levels that equilibrate global demand based on GCAM modeling. Note that all prices are reported in $2022 in the following sections.

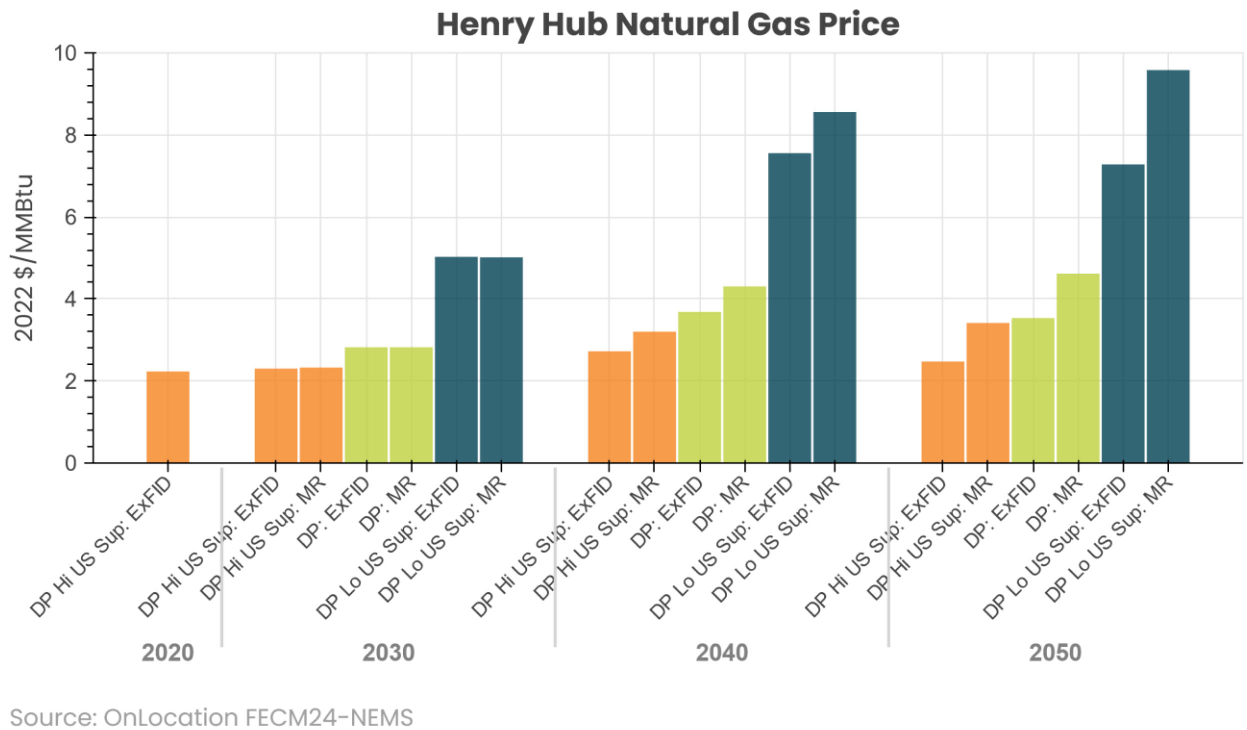
1. Henry Hub Natural Gas Price

All *Model Resolved* U.S. LNG export scenarios result in higher natural gas prices at the Henry Hub compared with their corresponding *Existing/FID Exports* scenarios due to the increased demand for U.S. natural gas production underpinning increased U.S. LNG exports.

Figure 2 plots the natural gas price at the Henry Hub in $2022/MMBtu over the projection period. The difference between natural gas prices is less than 1% between the *Model Resolved* U.S. LNG export scenarios and their corresponding *Existing/FID Exports* scenarios up to 2035, after which prices diverge by 30-40% through 2050, depending on the underlying supply assumptions.

In 2050, the Henry Hub natural gas price is 31% or $1.09/MMBtu higher in the *Defined Policies: Model Resolved* scenario compared with the *Defined Policies: Existing/FID Exports* scenario ($4.62/MMBtu versus $3.53/MMBtu), under reference U.S. supply assumption. Under the *High US Supply* assumption, the Henry Hub price in *Defined Policies High US Supply: Model Resolved* is 38% or $0.94/MMBtu higher in 2050 compared with the *Defined Policies High US Supply: Existing/FID Exports* ($3.41/MMBtu versus $2.47/MMBtu). The largest absolute difference in prices is found under the *Low US Supply* assumption. In these scenarios, the Henry Hub natural gas price ranges from $9.58/MMBtu in *Defined Policies Low US Supply: Model Resolved* versus $7.28/MMBtu in *Defined Policies Low US Supply: Existing/FID Exports.* As outlined in the section “Description of scenarios,” key differences between the *Defined Policies* (with reference U.S. supply), *Defined Policies High US Supply* and *Defined Policies Low US Supply* scenarios lie in the assumption about the U.S. resource base and rate of extraction technology improvement.[11]

[11] These assumptions are consistent with those used in AEO22023 and may be found at https://www.eia.gov/outlooks/aeo/assumptions/pdf/OGSM_Assumptions.pdf



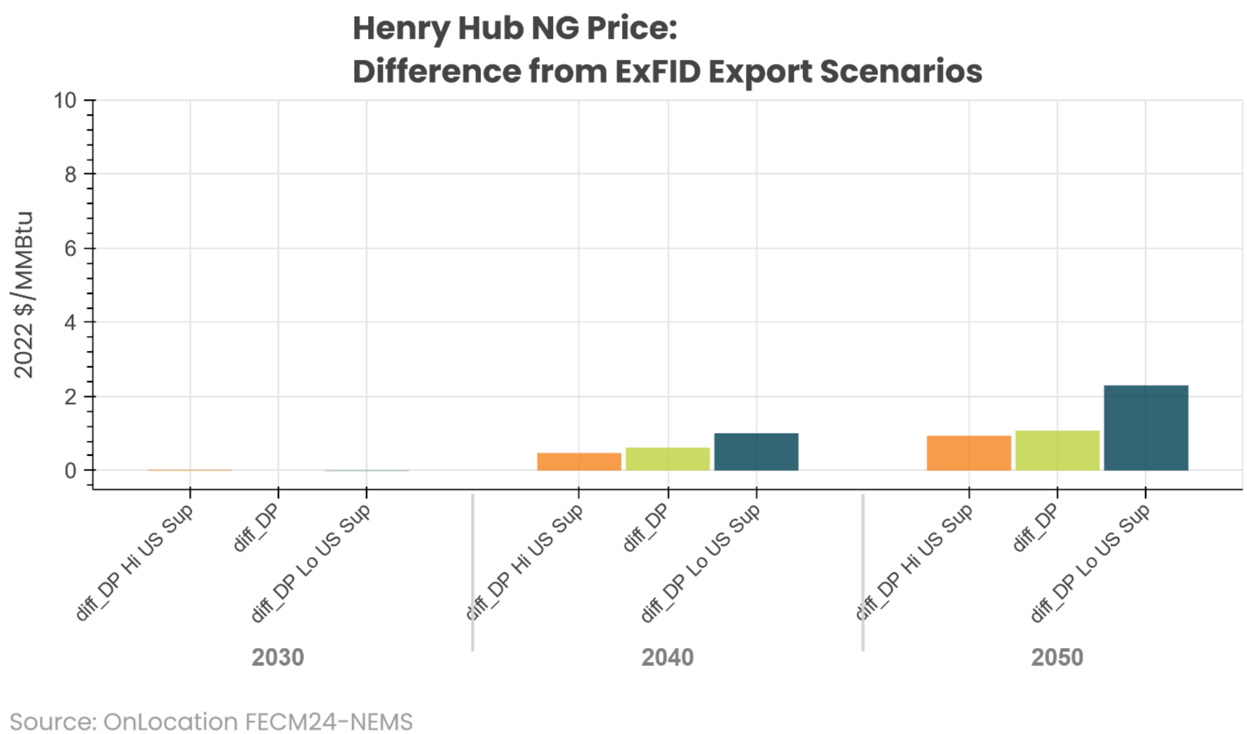


Figure 2. Henry Hub natural gas price, along with the difference between Model Resolved and Existing/FID Exports scenarios for each supply assumption

(The prefix "diff_" refers to the difference between the *Model Resolved* scenarios and the *Existing/FID Exports* scenarios).

2. Primary energy consumption

Figure 3 shows U.S. primary energy consumption by fuel through 2050 across all scenarios. In 2020, U.S. primary energy consumption was approximately 97.7 Exajoules (EJ), and it is forecast to increase through 2050 in all scenarios, where the highest energy consumption is seen in the *Defined Policies High US Supply* scenarios (121.4 EJ for *Defined Policies High US Supply: Model Resolved;* and 119.7 EJ for *Defined Policies High US Supply: Existing/FID Exports* in 2050), supported by high U.S. oil and natural gas supply availability. The lowest primary energy consumption is seen in the *Defined Policies Low US Supply* scenarios (at 109.6 EJ in 2050 for *Defined Policies Low US Supply: Model Resolved,* and 107.6 EJ for *Defined Policies Low US Supply: Existing/FID Exports*), where there is lower U.S. oil and natural gas supply availability. Primary energy consumption is disaggregated into fossil fuels (coal, petroleum/oil, and natural gas) and non-fossil fuels (renewable energy sources and nuclear energy). By 2050 coal consumption, which is almost entirely used for electricity production, is nearly eliminated in all scenarios (<1 EJ in all scenarios). Petroleum/other consumption[12] in 2050 varies from a high of 33.3 EJ in the *Defined Policies High US Supply: Model Resolved* scenario to 27.8 EJ in the *Defined Policies Low US Supply: Model Resolved* scenario, while clean energy/ (non-fossil fuel) varies from 49.2 EJ in *Defined Policies High US Supply: Model Resolved* to 56.4 EJ in *Defined Policies Low US Supply: Model Resolved*.

Across all scenarios, increased U.S. LNG exports result in an increase in total energy consumption by up to 2.5%. By 2050, all scenarios with the *Model Resolved* U.S. LNG export levels have higher energy consumption compared to their corresponding *Existing/FID Exports* levels with *Defined Policies: Model Resolved, Defined Policies High US Supply: Model Resolved*, and *Defined Policies Low US Supply: Model Resolved* seeing a 2.5%, 1.4%, and 1.9% increase respectively above their *Existing/FID Exports* counterparts.

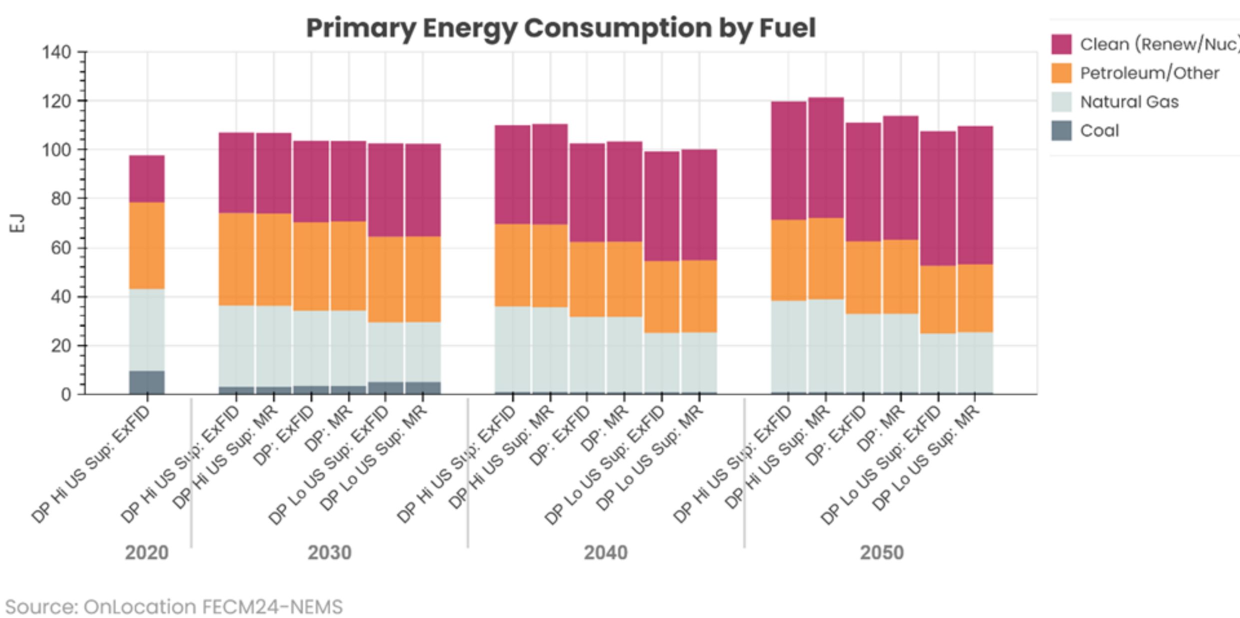


Figure 3. Primary energy consumption for all scenarios (each combination of supply and exports assumptions)

[12] Includes aviation gasoline, petroleum coke, asphalt, road oil, lubricants, still gas, and miscellaneous petroleum products.

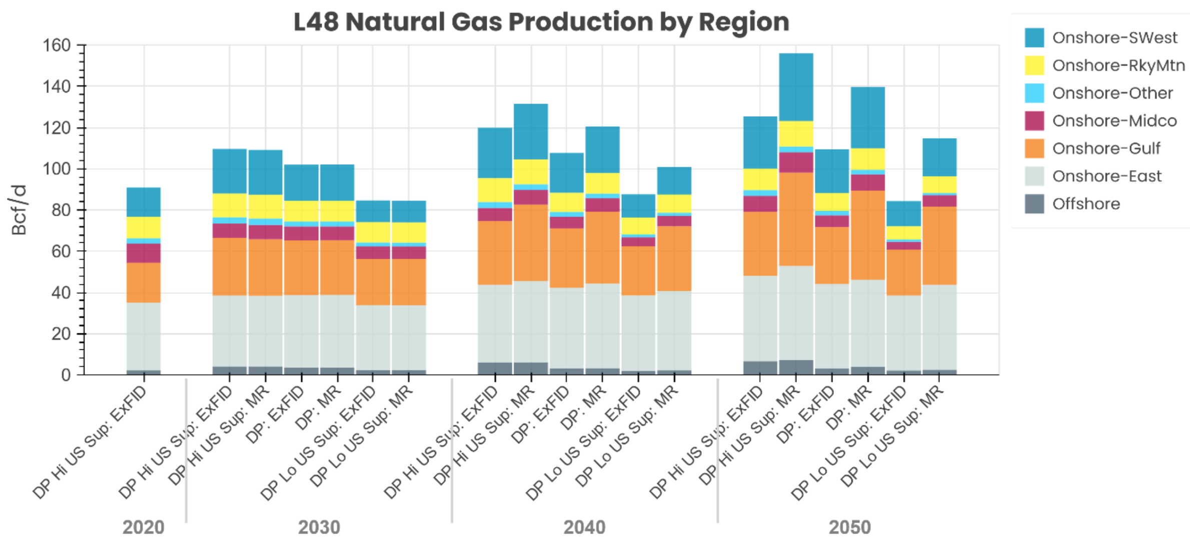
3. Natural gas production and consumption

U.S. natural gas production increases in each *Model Resolved* LNG export scenario compared with the corresponding scenario with *Existing/FID Exports* volumes to maintain projected export volumes. U.S. natural gas consumption, which does not include gas for export, on the other hand, is relatively unchanged across *Model Resolved* compared to *Existing/FID Exports* for each of the *Defined Policies* (with reference U.S. supply), *Defined Policies High US Supply*, and *Defined Policies Low US Supply* scenarios. In these scenarios the increased natural gas consumed in the production, transportation and liquefaction of U.S. LNG for export is roughly balanced by the higher prices causing decreased consumption in other sectors. This is explained further below.

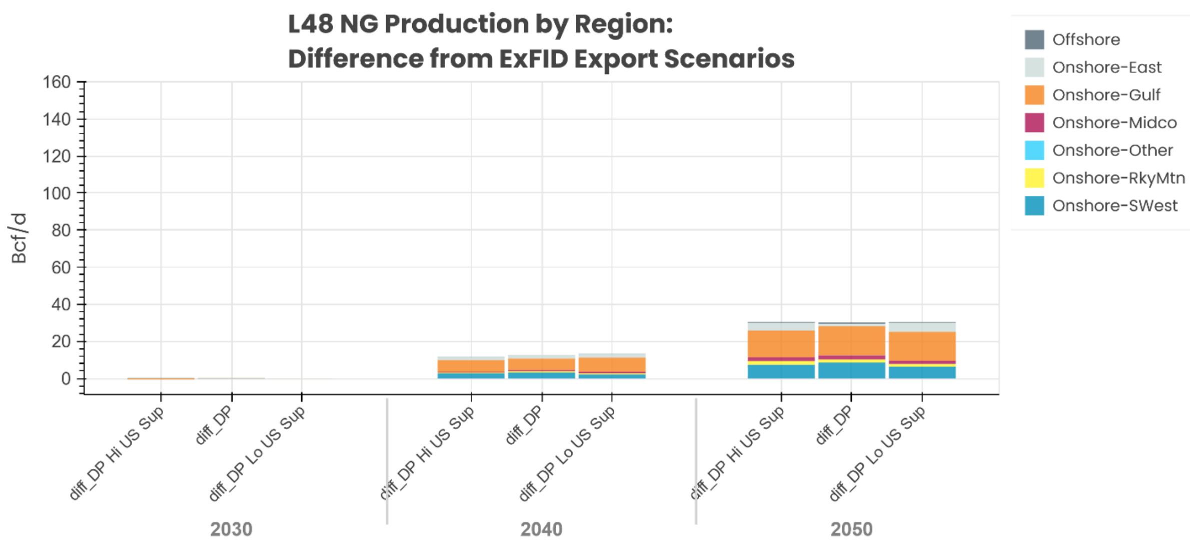
Figure 4 plots Lower 48 (onshore and offshore) natural gas production for all scenarios. From a starting point of 91.9 Bcf/day of natural gas produced in 2020, production changes over time, following a path correlated with natural gas consumption and the LNG export trajectory for each scenario.

Natural gas production remains the same to 2035, between the *Model Resolved* and *Existing/FID Exports,* for each scenario (reaching around 107 Bcf/d for *Defined Policies: Model Resolved* and *Defined Policies: Existing/FID Exports*, 115 Bcf/d for *Defined Policies High US Supply: Model Resolved,* and *Defined Policies High US Supply: Existing/FID Exports*, and 89 Bcf/d for *Defined Policies Low US Supply: Model Resolved* and *Defined Policies Low US Supply: Existing/FID Exports*). The gap then increases from 2035 through 2050, following the increased U.S. LNG export levels in the *Model Resolved* scenarios. For the *Defined Policies* scenarios with reference U.S. supply assumption, *Model Resolved* has 30.2 Bcf/d higher production than *Existing/FID Exports* in 2050 (with production quantities of 140.8 Bcf/d in *Defined Policies: Model Resolved* versus 110.6 Bcf/d in *Defined Policies: Existing/FID Exports*). Under both the *Defined Policies High US Supply* and *Defined Policies Low US Supply*, the *Model Resolved* scenarios have 30.5 Bcf/d higher production than the corresponding *Existing/FID* Exports scenarios, with production quantities of 157.2 Bcf/d in *Defined Policies High US Supply: Model Resolved* compared to 126.7 Bcf/d in *Defined Policies High US Supply: Existing/FID Exports,* and 115.8 Bcf/d in *Defined Policies Low US Supply: Model Resolved* compared to 85.3 Bcf/d in *Defined Policies Low US Supply: Existing/FID Exports*).

Regionally (see Figure 5 for the map of supply regions), the difference in U.S. produced natural gas between *Model Resolved* and *Existing/FID Exports* scenarios is sourced mainly from producing basins in the Gulf Coast and Southwest modeled regions, as U.S. LNG export facilities are mostly located in Texas and Louisiana (as is represented in NEMS). Accordingly, the required natural gas for higher LNG exports is supplied primarily from nearby onshore production regions, including the Gulf Coast and Southwest.



Source: OnLocation FECM24-NEMS



Source: OnLocation FECM24-NEMS

Figure 4. Lower 48 natural gas regional production, along with the difference between Model Resolved and Existing/FID Exports scenarios for each supply assumption

(The prefix "diff_" refers to the difference of the *Model Resolved* scenarios from the *Existing/FID Exports* scenarios).

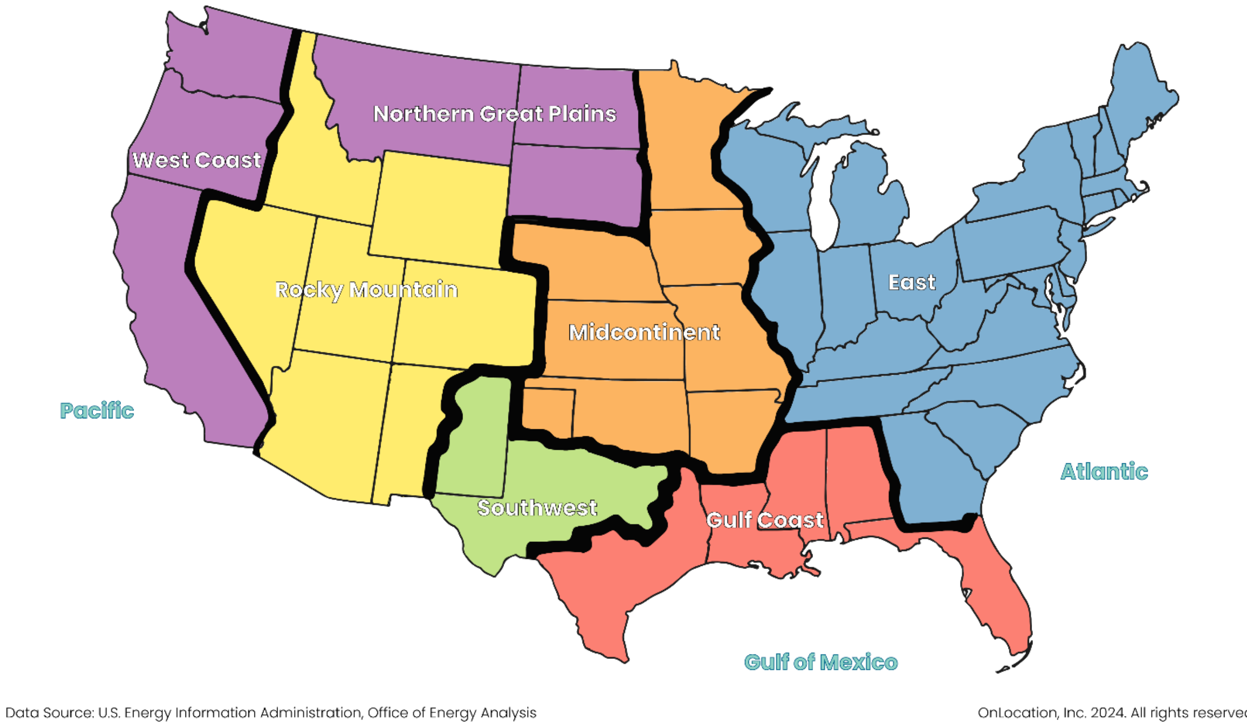


Figure 5. Natural gas supply regions

Figure 6 shows U.S. natural consumption by sector. Total natural gas consumption is very similar between LNG export levels assumptions (*Model Resolved* or *Existing/FID Exports)*, and regardless of supply assumptions (*Defined Policies* with reference U.S. supply*, Defined Policies High US Supply*, and *Defined Policies Low US Supply*), such that the difference between *Model Resolved* and *Existing/FID Exports* is well below 0.5 Tcf in 2050. Although domestic U.S. natural gas consumption does not change appreciably in response to the higher natural gas prices driven by higher U.S. LNG exports,[13] in the *Model Resolved* scenarios there are shifts in consumption behavior on a sector-by-sector basis. Higher U.S. LNG exports in the *Model Resolved* scenarios result in higher consumption in the industrial sector, and lower consumption in the electric power generation sector when compared to their corresponding *Existing/FID Exports* scenarios.

Comparing the *Model Resolved* to their corresponding *Existing/FID Exports* scenarios, Increased consumption in the industrial sector results from increased natural gas demand for gas liquefaction (required for LNG exports), as well as the lease and plant fuel (consumed at natural gas production facilities) needed to support higher LNG exports. For the *Defined Policies* scenarios with reference U.S. supply assumption, increased LNG exports from *Existing/FID Exports* to *Model Resolved* result in a 20% (0.46 Tcf) increase in lease and plant fuel consumption, and a 130% (0.89 Tcf) increase in natural gas consumption for gas liquefaction in 2050. Excluding these two subsectors, natural gas consumption in other industrial subsectors decreases by 0.5% (0.05 Tcf) in 2050.

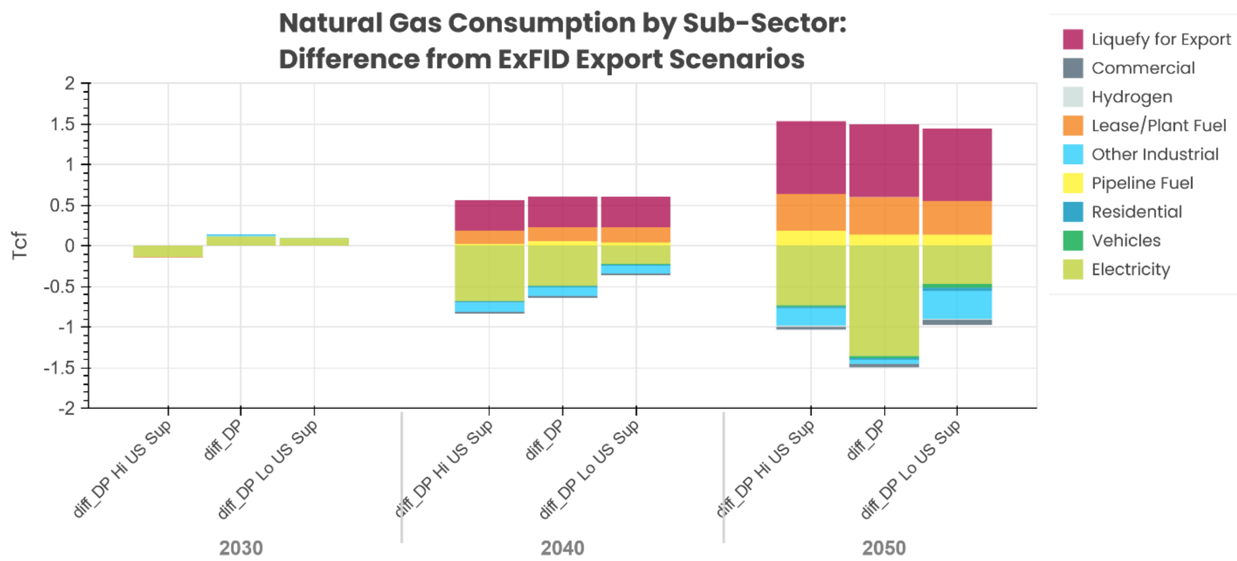
Increased consumption in the transportation sector results from increased natural gas (pipeline fuel) transportation to LNG facilities to support increased LNG exports. On the other hand, higher natural gas prices in the *Model Resolved* scenarios reduce consumption of natural gas in the

[13] While domestic consumption does not appreciably change, production increases to meet total demand.

electric power generation sector. Figure 7 shows details of natural gas demand changes in various sub-sectors in response to higher LNG export levels in the *Model Resolved* scenarios compared to *Existing/FID Exports* scenarios. In particular, the high natural gas prices in the *Defined Policies Low US Supply* scenarios accelerate the transition to clean energy generation by adding renewables and nuclear generation, while reducing nuclear retirements, relative to the *Defined Policies* (with reference U.S. supply) scenarios. Across all the natural gas supply assumption scenarios, increased U.S. LNG exports lead to natural gas consumption increases in subsectors that are involved in production and transportation of LNG; while consumption decreases in other subsectors in response to higher natural gas prices relative to their corresponding to *Existing/FID Exports* scenario.

Figure 6. Sectoral natural gas consumption, along with the difference between Model Resolved and Existing/FID Exports scenarios for each supply assumption

(The prefix "diff_" refers to the difference of the *Model Resolved* scenarios from the *Existing/FID Exports* scenarios).



Source: OnLocation FECM24-NEMS

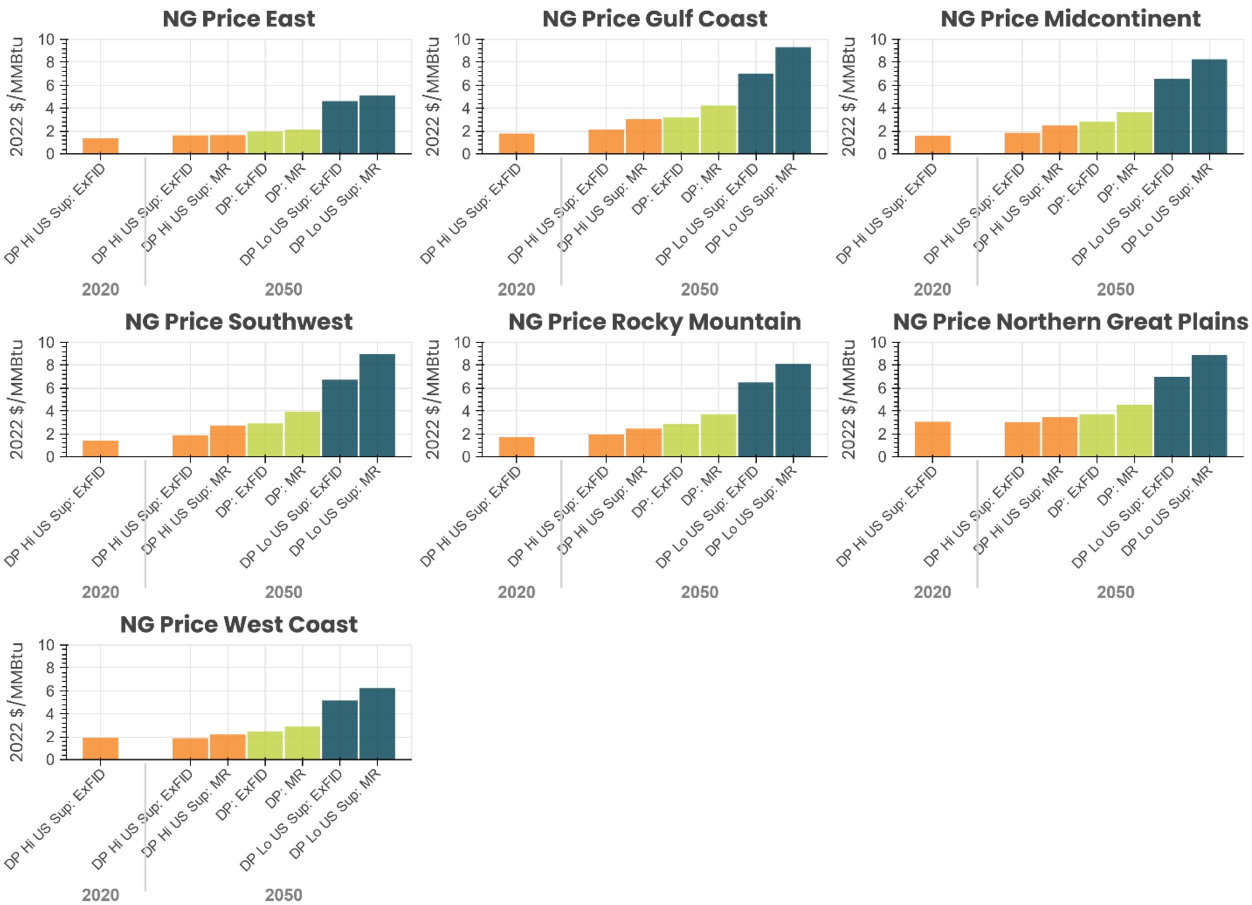
Figure 7. Differences in natural gas consumption by sub-sector between Model Resolved and Existing/FID Exports scenarios for each supply assumption

(The prefix "diff_" refers to the difference of the *Model Resolved* scenarios from the *Existing/FID Exports* scenarios). (Note that natural gas demand for "Liquefy for Export" only addresses the gas used for liquefaction operations and does not account for the volume of gas exported.)

4. Natural gas prices by Gas Supply Region

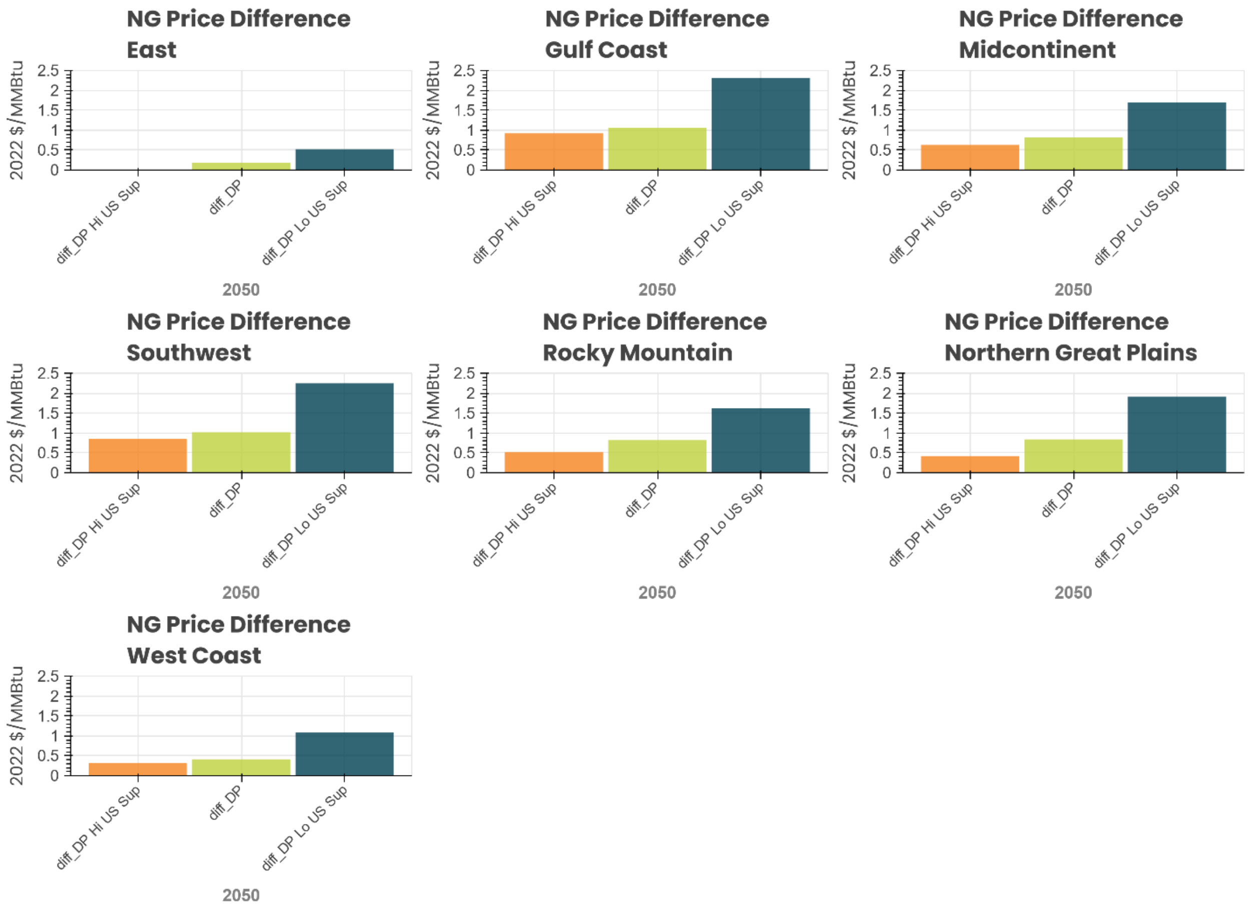
Figure 8 and Figure 9 show wellhead natural gas prices for U.S. Lower 48 natural gas supply regions for all scenarios with the *Defined Policies* climate ambition in 2050.

The difference in Lower 48 natural gas prices between *Model Resolved* and *Existing/FID* Exports scenarios is highest in the Gulf Coast and Southwest regions, which are close to U.S. LNG export facilities. As these regions are the primary suppliers of natural gas required for higher U.S. LNG exports, these are the regions with the largest price impacts. The difference in the natural gas price in the Gulf Coast region between *Model Resolved* and *Existing/FID* LNG Exports is highest in *Defined Policies Low US Supply* scenarios, where the price difference reaches $2.31/MMBtu in 2050, compared with the price difference of $1.05/MMBtu in the *Defined Policies* (with reference U.S. supply) scenarios and $0.92/MMBtu in the *Defined Policies High US Supply* scenarios.



Source: OnLocation FECM24-NEMS

Figure 8. Regional natural gas prices for all scenarios (each combination of supply and exports assumptions)



Source: OnLocation FECM24-NEMS

Figure 9. Differences in regional natural gas prices between Model Resolved and Existing/FID Exports scenarios for each supply assumption in 2050

(The prefix "diff_" refers to the difference of the *Model Resolved* scenarios from the *Existing/FID Exports* scenarios).

5. Delivered natural gas prices

Table 6 summarizes changes to delivered natural gas prices by sector in 2050, in response to increased LNG exports from *Existing/FID Exports* to *Model Resolved* levels. Across all U.S. supply assumptions, the increase in U.S. LNG exports from existing and FID levels leads to increases to delivered natural gas prices in all economic sectors, with the difference in natural gas price being highest in the *Defined Policies Low US Supply* scenarios.

Table 6. Changes in delivered natural gas prices with increased U.S. LNG exports in 2050

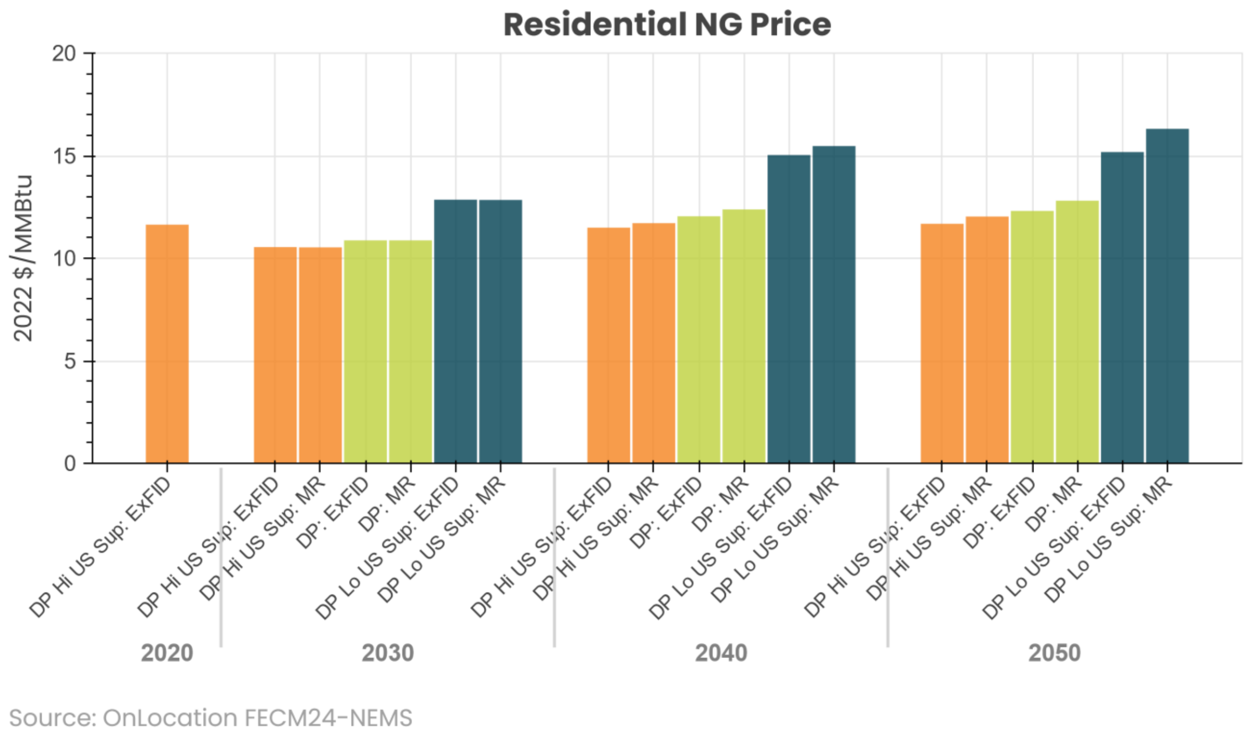
Scenarios	Change in Delivered Natural Gas Prices ($/MMBtu)				
	Power	Industrial	Residential	Commercial	Transportation
Defined Policies (with reference U.S. supply)	0.64	0.78	0.50	0.48	0.76
Defined Policies High US Supply	0.46	0.64	0.36	0.35	0.51
Defined Policies Low US Supply	1.25	1.67	1.13	1.10	2.39

Figure 10 shows average domestic residential natural gas prices, comparing *Model Resolved* to *Existing/FID Exports* scenarios, across all supply assumptions under the *Defined Policies* climate ambition.

The difference in the average national natural gas price, between the *Model Resolved* and *Existing/FID Exports* assumptions, is highest in the *Defined Policies Low US Supply* scenarios, where the difference (*Defined Policies Low US Supply: Model Resolved* versus *Defined Policies Low US Supply: Existing/FID Exports***)** reaches $1.13/MMBtu in 2050,compared to a price difference of $0.50/MMBtu for the *Defined Policies* (with reference U.S. supply) scenarios (*Defined Policies: Model Resolved* versus *Defined Policies: Existing/FID Exports*) and $0.36/MMBtu for the *Defined Policies High US Supply* scenarios (*Defined Policies High US Supply: Model Resolved* versus *Defined Policies High US Supply: Existing/FID Exports*).

The percentage difference in regional residential gas prices between the *Model Resolved* and *Existing/FID Exports* scenarios is lower than the percentage difference in the wellhead natural gas prices in the corresponding natural gas supply regions. As the commodity price is only a portion of the delivered gas price for the residential sector, changes in the commodity price in supply regions yield smaller proportional changes in the overall gas price for the residential sector. Additionally, there is wide variability at key natural gas pricing hubs across the U.S., due to geographic location, unique or seasonal weather conditions, proximity to energy supplies, and other factors such as infrastructure availability.[14] In 2050, the residential delivered natural gas price (national average) increases in the *Model Resolved* scenarios (compared to their corresponding *Existing/FID Exports*) by 4% in the *Defined Policies* with reference U.S. supply scenarios, 3.1% in the *Defined Policies High US* Supply scenarios, and 7.5% in the *Defined Policies Low US Supply* scenarios. The difference in Henry Hub gas prices for the *Model Resolved* scenarios compared to their corresponding *Existing/FID Exports* is 30.6% for *Defined Policies* (with reference U.S. supply assumption), 38% for *Defined Policies High US Supply*, and 31.6% for *Defined Policies Low US Supply* Scenarios.

[14] EIA," Today in Energy, "October 23, 2024, TIE



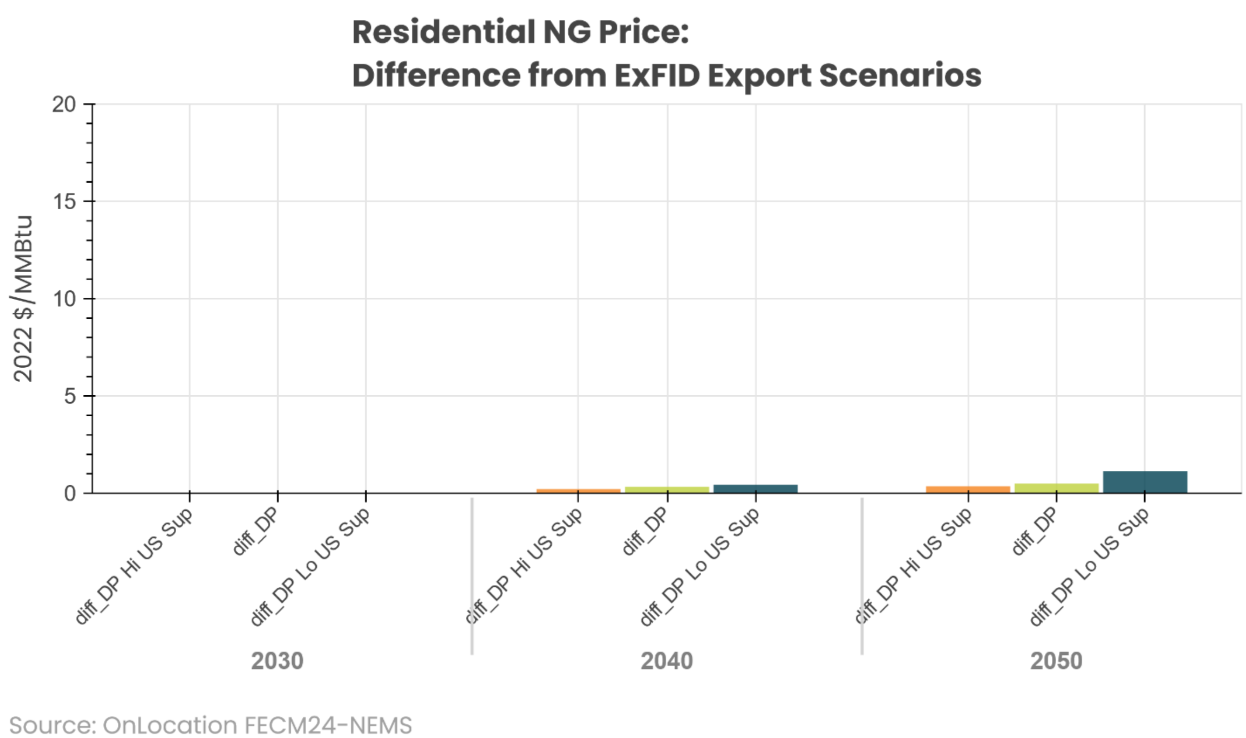


Figure 10. Residential natural gas prices, along with the difference between Model Resolved and Existing/FID Exports scenarios for each supply assumption

(The prefix “diff_” refers to the difference of the *Model Resolved* scenarios from the *Existing/FID Exports* scenarios).

From the regional perspective, residential gas prices generally reflect regional commodity prices. Figure 11 and Figure 12 show residential natural gas prices and the differences between the *Model Resolved* and *Existing/FID Exports* scenarios in 2050 for the different census regions (see Figure 13 for details on census divisions). The residential natural gas price difference between the *Model Resolved* and *Existing/FID Exports* scenarios for the assumed climate ambition and underlying supply assumptions, (*Defined Policies* with reference U.S. supply assumption*, Defined Policies High US Supply,* and *Defined Policies Low US Supply*) is higher in regions near the Gulf Coast and Southwest natural gas supply regions.

In 2050, in the West South Central region, the residential delivered gas price for the scenario, *Defined Policies: Model Resolved* with reference U.S. supply assumption, is $0.89/MMBtu, or 6.7% higher than for *Defined Policies: Existing/FID Exports*. For *Defined Policies High US Supply* scenarios, it is $0.75/MMBtu, or 5.9% higher in *Defined Policies High US Supply: Model Resolved* versus *Defined Policies High US Supply: Existing/FID Exports*, while for the *Defined Policies Low US Supply* scenarios, it is $2.07/MMBtu, or 12.3% higher in *Defined Policies Low US Supply: Model Resolved* versus *Defined Policies Low US Supply: Existing/FID Exports.* Regions including the Middle Atlantic and Northeast are less impacted than regions near the Gulf Coast and Southwest, due to the modest effect of U.S. LNG exports on Marcellus formation production, and the relatively flat shape of the Appalachian basin’s supply curve.

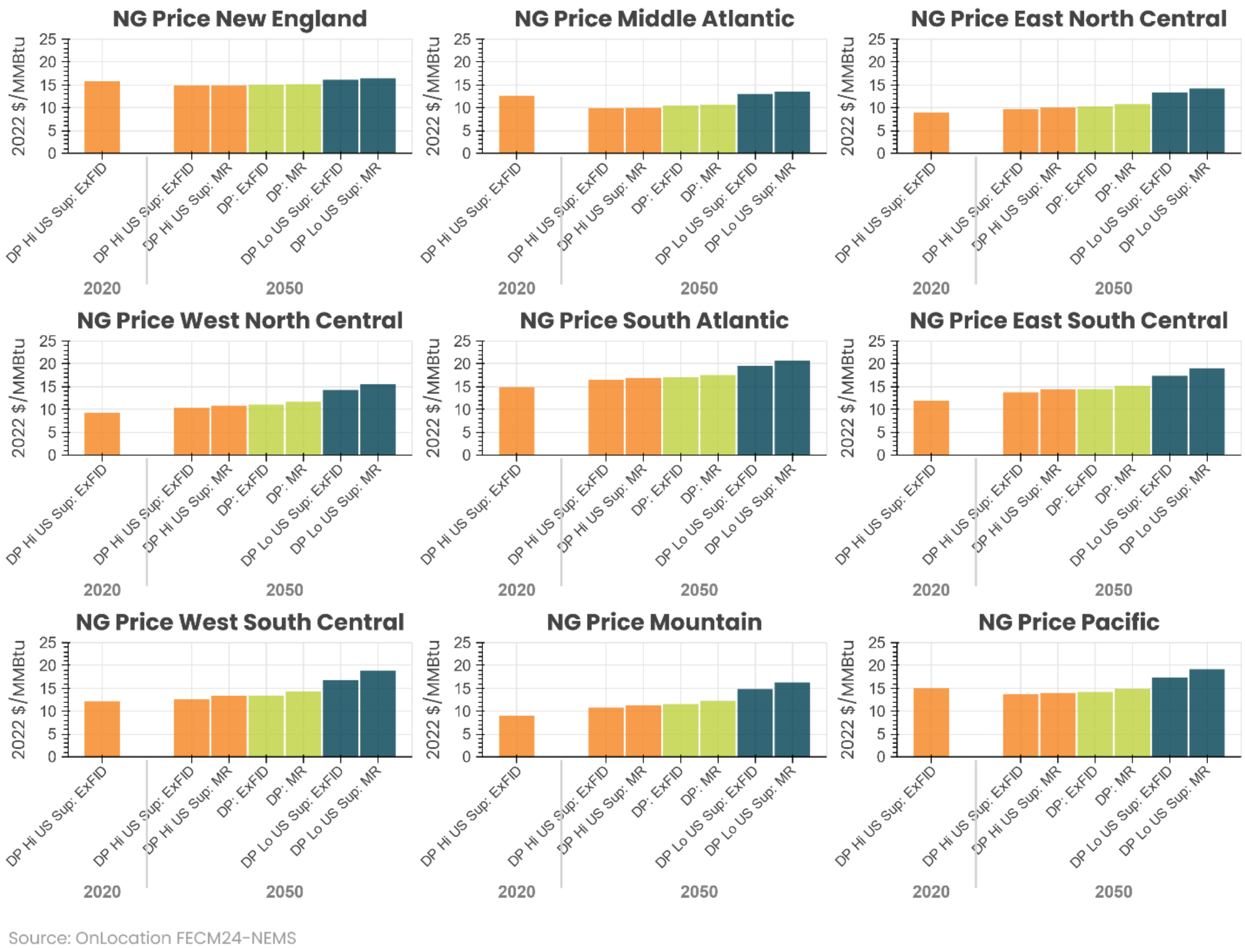


Figure 11. Regional residential natural gas prices for all scenarios (each combination of supply and exports assumptions)

Figure 12. Differences in regional residential natural gas prices between Model Resolved and Existing/FID Exports scenarios under each supply assumption in 2050

(The prefix “diff_” refers to the difference of the *Model Resolved* scenarios from the *Existing/FID Exports* scenarios).

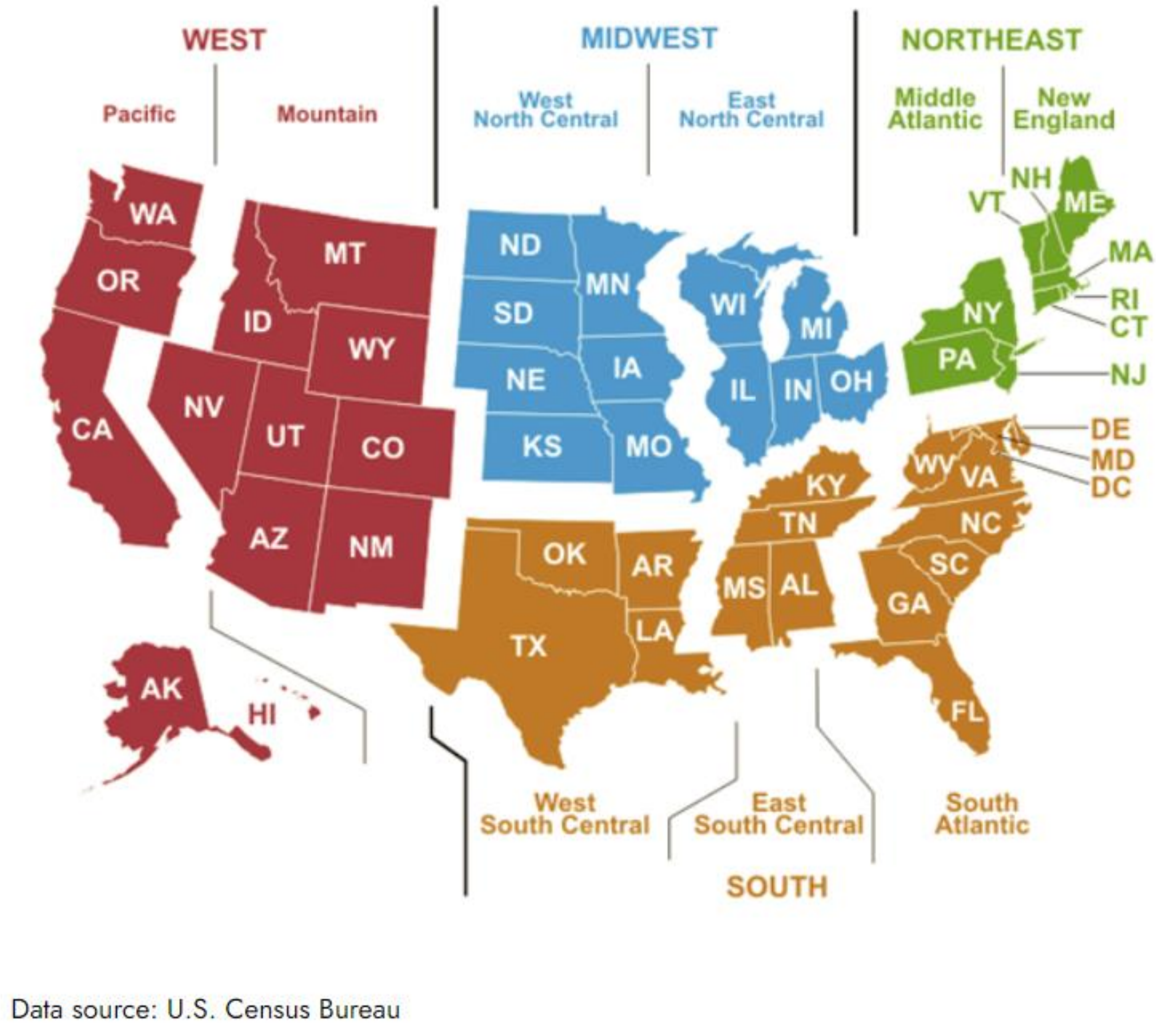


Figure 13. U.S. census divisions and regions (Data source: U.S. Census Bureau)

6. GDP

While NEMS contains rich details about the energy system, a separate Macroeconomic Activity Module (MAM) provides projections of economic drivers underpinning NEMS' energy supply, demand, and conversion modules. The MAM incorporates S&P Global's (formerly IHS Markit) model of the U.S. economy, along with EIA's extensions of industrial output, employment, and models of regional economies. The S&P Global module is modified to include EIA's key assumptions, such as world oil price, and yields a baseline trajectory of the economy. NEMS does not endogenously determine activity with the exception of the following energy-related industries: real output of oil and natural gas extraction and support activities; real output of petroleum refining; and real output of electric and gas utilities.

The S&P Global model provides feedback from changes in underlying energy prices through changes in demand for the rest of the NEMS modules, but in an aggregate sense. The model provides consumption levels for 23 categories of consumer demand. Using these data, EIA's Industrial Output model estimates the real value of shipments of 58 industrial and service sectors consistent with the economic expenditures from the S&P Global model. The equations in the model translate macroeconomic estimates from S&P Global's model of the U.S. economy into demand by industry for the rest of NEMS. Underlying economic drivers for energy services (such as housing starts, personal income, commercial floor space, and transportation metrics), which impact the demand for energy in the residential, commercial, and transportation sectors, are derived from these MAM outputs.

In particular, the Industrial Demand Module (IDM) takes outputs of 48 sectors (41 manufacturing, seven non-manufacturing) defined by three- and four-digit NAICS codes and combines them into 21 sectors. These are:

- Seven energy-intensive manufacturing industries (the eighth, petroleum refining, is modeled separately),
- Eight non-energy intensive manufacturing industries, and
- Six non-manufacturing industries.

For these sectors, the IDM determines energy and feedstock requirements for domestic production. Quantities produced are independent of changes in energy prices introduced by the other NEMS modules outside of the MAM, but they are determined solely through requirements from the MAM.

Liquid fuels are handled in a separate module, the LFMM. While technological change governs energy use, the quantity of production is taken from the other modules.

Within a NEMS scenario, feedback from the other NEMS modules to the MAM includes the following energy-related metrics:

- Production of energy, including coal, natural gas, petroleum, biomass, and other fuels,
- Trade in energy, including net exports of coal, petroleum, natural gas, and biofuels,
- Total and end-use demand for energy, including sales of electricity,
- Consumer spending on energy, disaggregated to fuel oil motor fuels, electricity, natural gas, and highway consumption of gasoline,
- Energy prices including a price index for consumer prices and wholesale prices, and
- Industrial production indices for oil and gas extraction and coal mining.

These inputs are used to develop a modified view of economic activity.

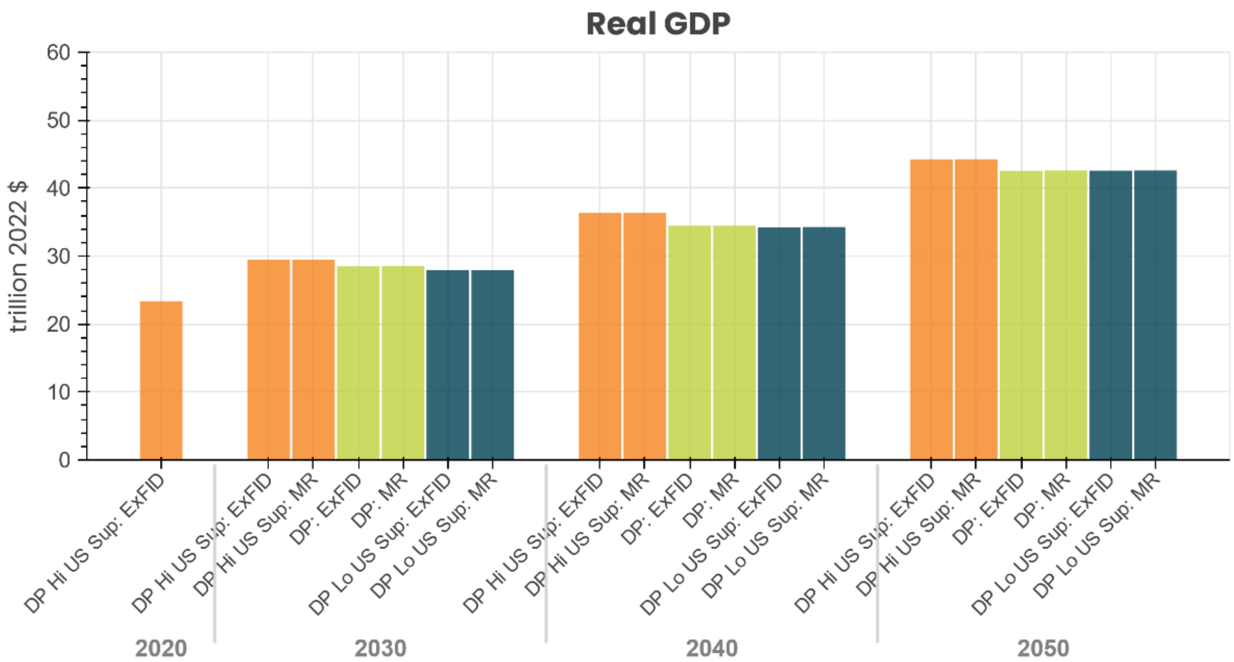
In general, the MAM does not use energy prices to determine the quantity of inputs to the NEMS modules at the industry level. Changes in energy prices may change expenditures, but only at the aggregate consumption level in the MAM as described above. Since the S&P Global tool is not an energy-specific model, relative prices of imports and exports are also at an aggregate level, i.e. not at the specific industry level. This means that import competition for specific industries is not well represented. Therefore, price impacts of increased energy costs are attenuated across multiple aggregations. Finally, since the MAM does not track individual projects, U.S. GDP estimates do not include economic activity associated with specific export facilities, and thus the impacts are approximate.

Figure 14 shows the impact of increased U.S. LNG exports on U.S. GDP. In 2050, the difference in U.S. GDP between the *Defined Policies: Model Resolved* and *Defined Policies: Existing/FID Exports* scenarios, with reference supply, is projected to be approximately $80 billion (0.2%), inclusive of the limitations in NEMS-MAM articulated above. This is the largest difference across all supply assumptions. By 2050, the incremental increase in U.S. GDP due to increased U.S. LNG exports under the *Defined Policies Low US Supply* and *Defined Policies High US Supply* scenarios is $24 billion (0.06%) and $11 billion (0.02%), respectively, inclusive of the limitations in NEMS-MAM articulated above. Table 7 shows the GDP difference in 2050 and cumulative differences in GDP (discounted at 3%) over the study period between the *Model Resolved* and the *Existing/FID Exports* scenarios under the *Defined Policies* (with reference U.S. supply), *Defined Policies High US Supply* and *Defined Policies Low US Supply* scenarios. The largest change is projected to occur in the *Defined Policies* scenario with reference U.S. supply; the cumulative difference in U.S. GDP between the *Defined Policies: Model Resolved* and *Defined Policies: Existing/FID Exports* scenarios is projected at $410 billion, inclusive of the limitations in NEMS-MAM articulated above.

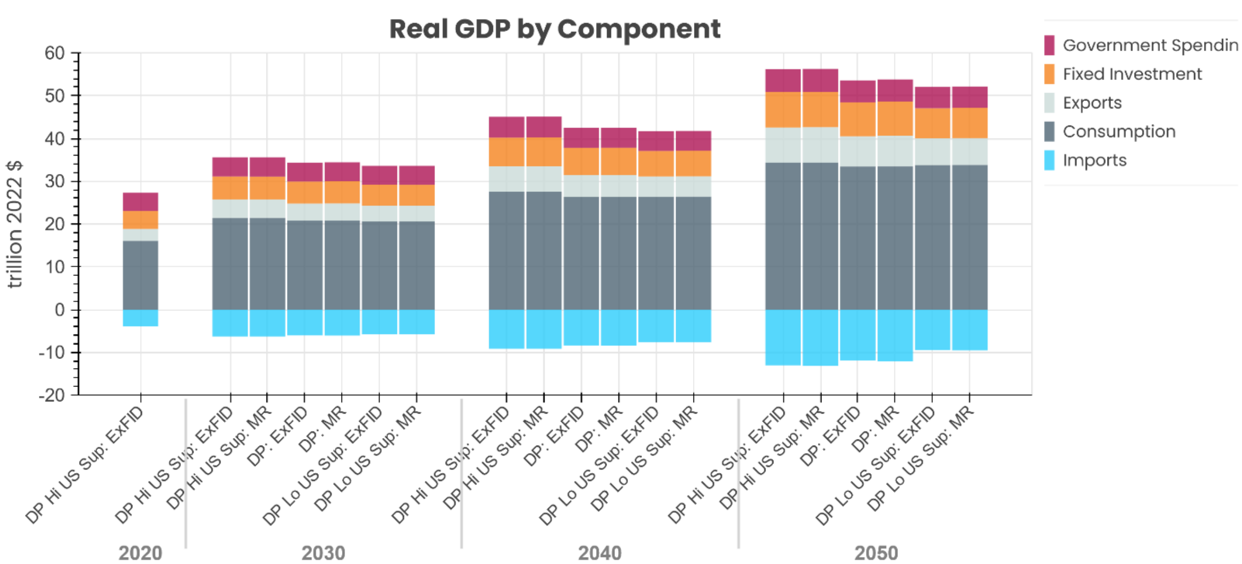
Overall, U.S. GDP is higher in the *Defined Policies High US Supply* scenarios (almost 4% higher U.S. GDP in *Defined Policies High US Supply: Model Resolved*, compared to *Defined Policies: Model Resolved* in 2050) reflecting an exogenous additional resource endowment and technological improvement. Comparatively, the response is relatively muted for the *Defined Policies Low US Supply* scenarios (a reduction of less than 0.1% in the *Defined Policies Low US Supply: Model Resolved* scenario relative to *Defined Policies: Model Resolved)*.

GDP comprises four components: consumption, investments, net trade (exports less imports) and government expenditures. Figure 15 shows changes in the components of GDP comparing *Model Resolved* to *Existing/FID Exports* scenarios under each supply assumption. The majority of the impact from increasing U.S. LNG exports is reflected in the net export component of GDP; however, both import and export components of GDP increase as incremental LNG exports are modeled.[15]

[15] Arithmetically, the total change in components due to increased LNG exports in Figure 15 does not sum to the overall increase in real GDP shown in Figure 14. This is a natural consequence of how chain-weighted GDP components are calculated. There are two major ways to calculate real GDP: fixed weight and chained weight. Fixed weight uses quantities for each year weighted by a base year set of prices. Chain weights use a geometric average of prices from this year and the previous year. Components of GDP are calculated separately than overall GDP. Therefore, outside of the base year, chain weights do not sum to the total GDP by design.



Source: OnLocation FECM24-NEMS



Source: OnLocation FECM24-NEMS

Figure 14. Real GDP (total average and by component) for all scenarios (each combination of supply and exports assumptions)

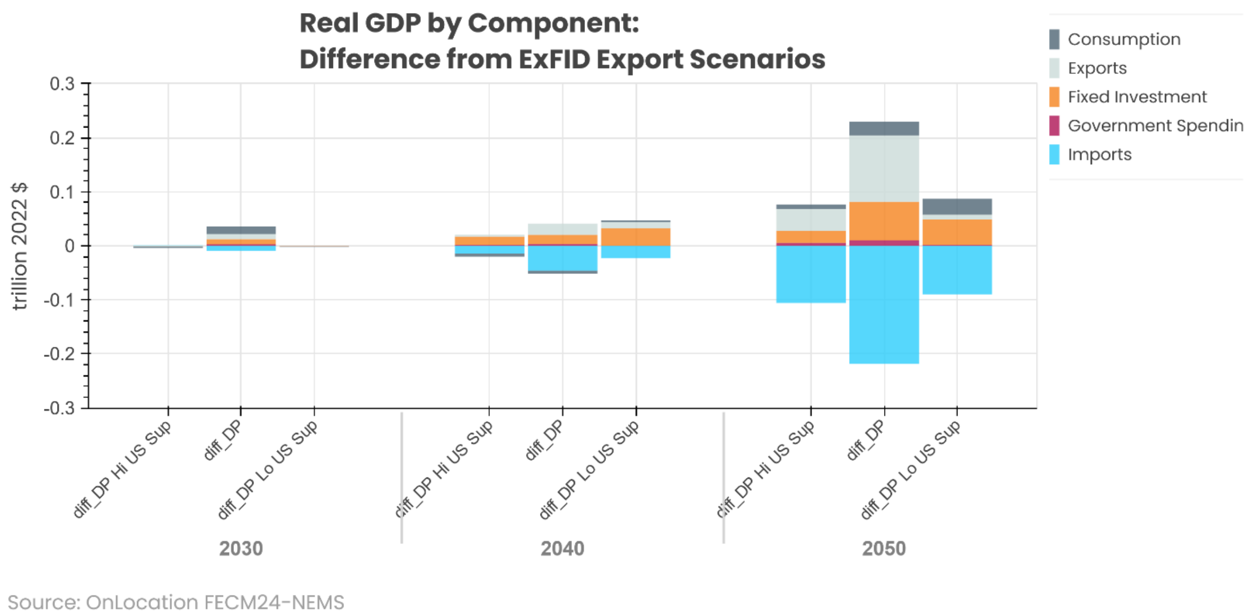


Figure 15. Differences in real GDP by component between Model Resolved and Existing/FID Exports scenarios under each supply assumption

(The prefix "diff_" refers to the difference of the *Model Resolved* scenarios from the *Existing/FID Exports* scenarios).

Table 7. GDP change in Model Resolved from Existing/FID Exports by scenario

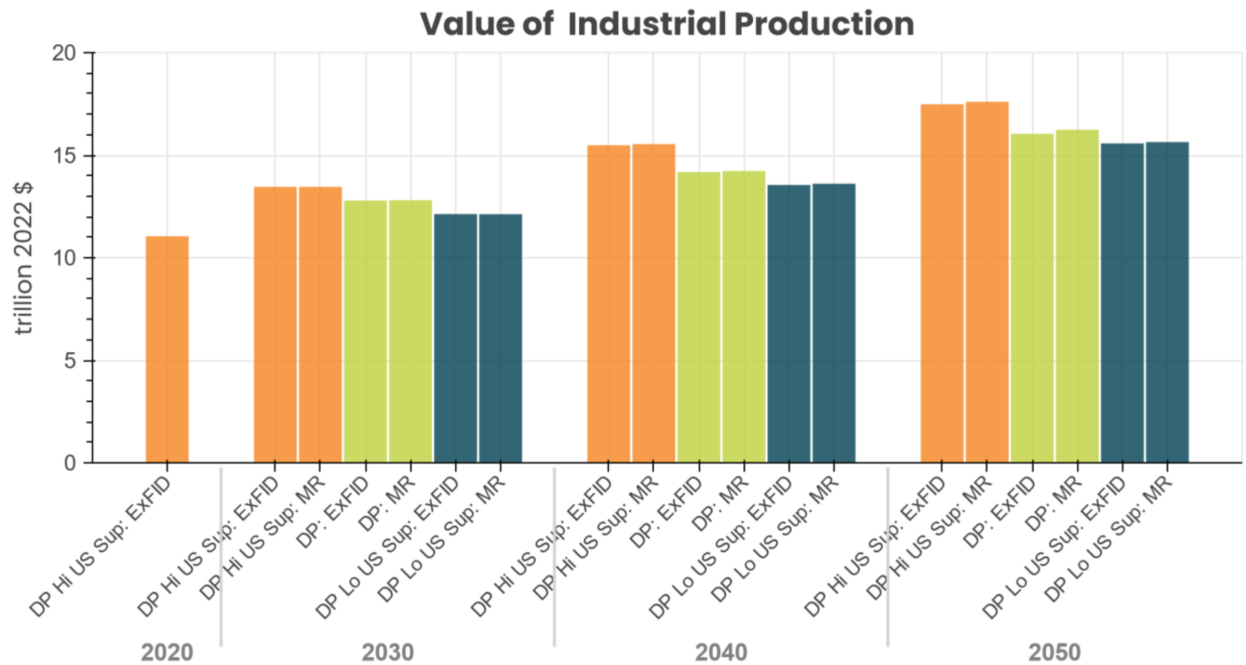
Scenarios	GDP Change in 2050 (billion $2022)	Cumulative GDP Change 2020-2050 (billion $2022)
Defined Policies (with reference U.S. supply)	80	410
Defined Policies High US Supply	11	94
Defined Policies Low US Supply	24	246

Cumulative GDP is discounted at 3%.

7. Industrial Output and Costs

One component of GDP tracked by NEMS is the value of industrial production, shown in Figure 16. Some industrial processes (such as certain bulk chemicals manufacturing) are more sensitive to natural gas prices, which were higher in the *Model Resolved* scenarios over the corresponding *Existing/FID Exports* scenarios. However, increased production, processing, transportation and export of natural gas requires additional equipment and activity, which falls under this category and generally mitigates any decline in other industries due to higher prices. Overall, NEMS results show an increase of 1.3%, or $203 billion in the value of industrial production in 2050 (with a cumulative increase of $893 billion from 2020 through 2050) in the *Defined Policies: Model Resolved* relative to *Defined Policies: Existing/FID Exports* (scenarios with reference U.S. supply assumption). Corresponding increases in the value of industrial production for the scenarios *Defined Policies High US Supply: Model Resolved* over *Defined Policies High US Supply: Existing/FID Exports* and *Defined Policies Low US Supply: Model Resolved* over *Defined Policies Low US Supply: Existing/FID Exports* are respectively 0.7% or $123 billion in 2050 (with a cumulative increase of $620 billion from 2020 through 2050) and 0.4% or $65 billion in 2050 (with a cumulative increase of $504 billion from 2020 through 2050), the increase primarily reflecting industrial activities related to increased production, processing, transportation and export of natural gas.

Accordingly, for the *Defined Policies* scenarios with reference U.S. supply assumption, increased LNG exports from *Existing/FID Exports* to *Model Resolved* results in 18% or $147 billion increase in industrial output from the oil and gas extraction subsector in 2050 (with a cumulative increase of $672 billion from 2020 through 2050), while the outputs from all other subsectors increases by 0.4% or $56 billion in 2050 (with a cumulative increase of $221 billion from 2020 through 2050). For the *Defined Policies High US Supply*, increased LNG exports from *Existing/FID Exports* to *Model Resolved* results in 13% or $133 billion increase in industrial output from the oil and gas extraction subsector in 2050 (with a cumulative increase of $596 billion from 2020 through 2050), while the outputs from all other subsectors decrease by 0.1% or $10 billion in 2050 (with a cumulative increase of $24 billion from 2020 through 2050). Under the *Defined Policies Low US Supply* assumption, increased LNG exports lead to a 23%, or $129 billion increase in industrial output from the oil and gas extraction subsector in 2050 (with a cumulative increase of $601 billion from 2020 through 2050), while the output from all other subsectors decreases by 0.4% or $64 billion in 2050 (with a cumulative decrease of $97 billion from 2020 through 2050).



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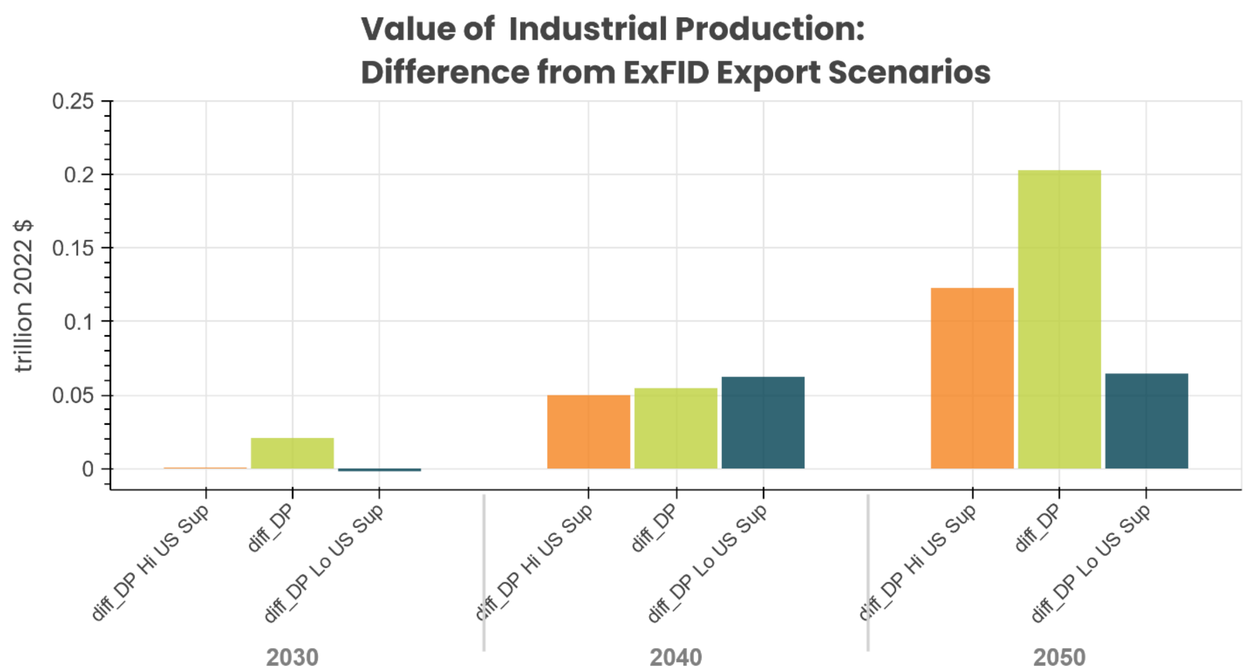


Source: OnLocation FECM24-NEMS

Figure 16. Value of industrial production, along with the difference between Model Resolved and Existing/FID Exports scenarios under each supply assumption

(The prefix "diff_" refers to the difference of the *Model Resolved* scenarios from the *Existing/FID Exports* scenarios).

Total energy costs increase with increased U.S. LNG exports due to the increase in natural gas and electricity prices for the industrial sector, relatively inelastic energy demand by industrial subsectors, and increases in demand from sectors that support the natural gas industry. Total energy costs for the industrial sector increase across all supply assumptions when U.S. LNG exports increase from existing and FID levels to *Model Resolved* levels.[16] Table 8 outlines industrial energy costs differences in 2050 and cumulatively over the study period (discounted at 3%) between the *Model Resolved* and the *Existing/FID Exports* scenarios.

Table 8. Changes in industrial energy costs in Model Resolved from Existing/FID Exports by scenario

Scenarios	**Energy Costs Change in 2050 (billion $2022)**	**Cumulative Energy Costs Change 2020-2050 (billion $2022)**
Defined Policies (with reference U.S. supply)	28.2	125
Defined Policies High US Supply	28.6	112
Defined Policies Low US Supply	26.1	118

Cumulative energy costs are discounted at 3%.

Total energy costs in the industrial sector are $28.2 billion higher in 2050 (cumulatively $125 billion higher from 2020 through 2050) in the *Defined Policies: Model Resolved* scenario compared with the *Defined Policies: Existing/FID Exports* scenario, under the reference U.S. supply assumption. Corresponding increases are $28.6 billion in 2050 (cumulatively $112 billion from 2020 through 2050) in the *Defined Policies High US Supply: Model Resolved* scenario compared with the *Defined Policies High US Supply: Existing/FID Exports*, and $26.1 billion in 2050 (cumulatively $118 billion from 2020 through 2050) in the *Defined Policies Low US Supply: Model Resolved* scenario compared with the *Defined Policies Low US Supply: Existing/FID Exports.*

Cost impacts vary by industrial subsector based on elasticity of gas demand and facility locations. Industrial subsectors that have more inelastic demand for natural gas face greater energy cost impacts from increases in natural gas prices. The location of industrial facilities will also determine whether electricity inputs are more dependent on natural gas-based generation. Facilities in regions with a higher share of natural gas electricity generation are impacted more by increases in electricity costs stemming from increased natural gas prices.

8. Regional Economic Impacts

Regional impacts of increased LNG exports on the value of industrial production are modest across scenarios, as shown in Figure 17 and Figure 18. Only in Region 7, West South Central, does the change in overall value of industrial production exceed 3% with increased LNG exports. This reflects the increase in economic activity in oil and gas extraction and processing of additional natural gas plant liquids for feedstocks that results from additional natural gas production needed to support LNG exports.

[16] Note: The industrial natural gas prices collected and published by EIA that are used as a basis for forecasted prices are reflective of the prices paid by industrial customers that purchase their natural gas from local distribution companies. These are typically smaller industrial customers. In 2023, the percentage of industrial volumes delivered that were covered by EIA's industrial price was 13.3%. (See Natural Gas Annual 2023 Table 23, Average price of natural gas delivered to consumers by state and sector, Industrial Percentage of total volume delivered, available at: https://www.eia.gov/naturalgas/annual/pdf/table_023.pdf

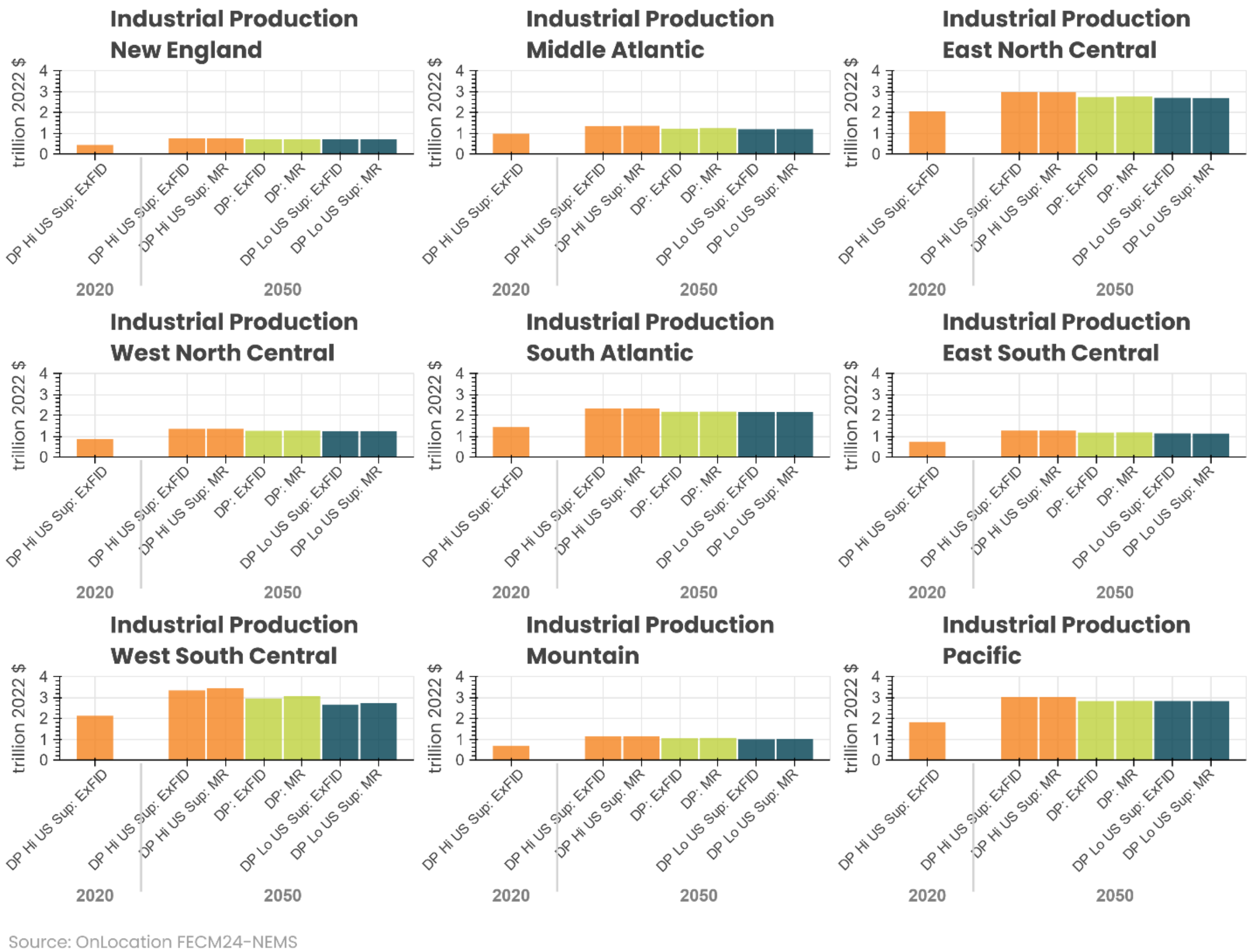
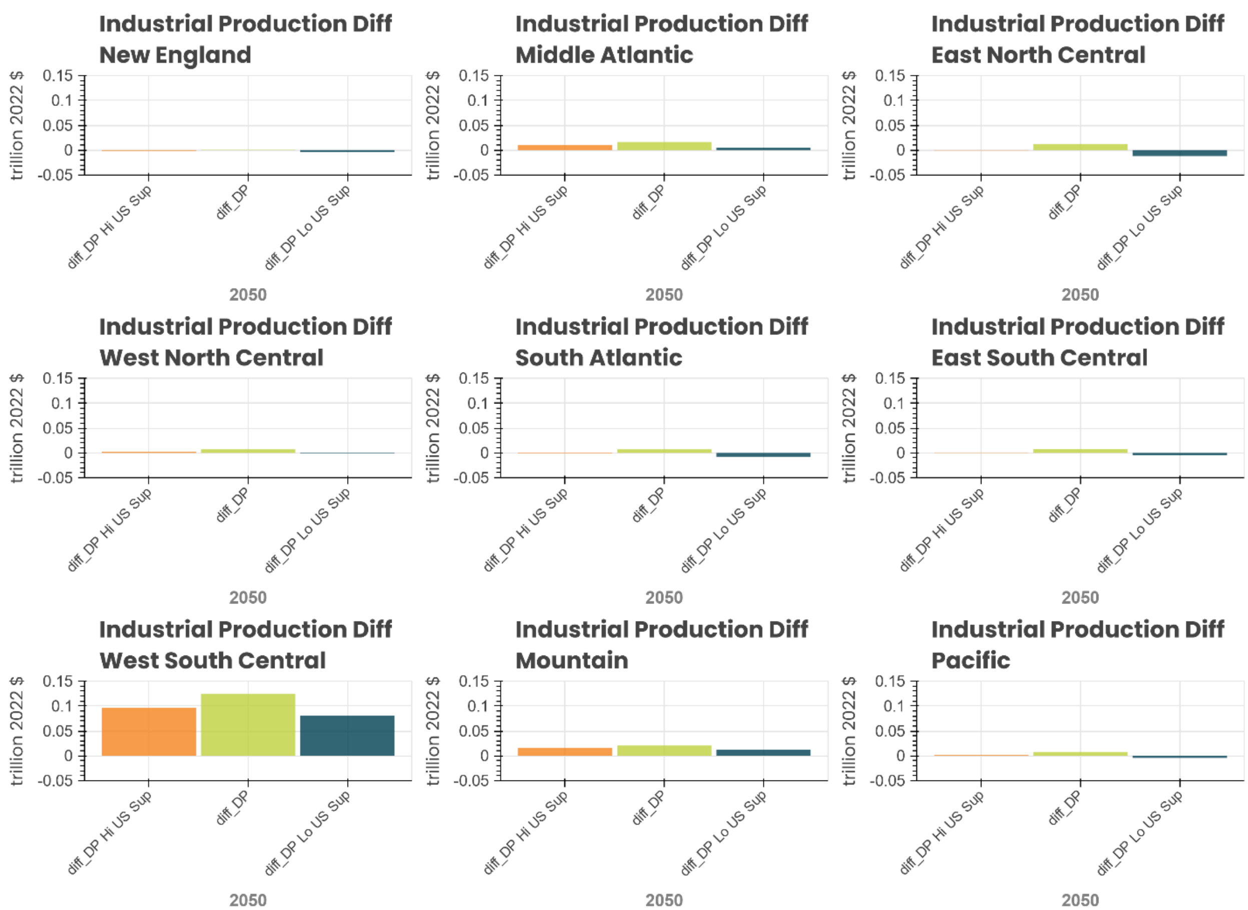


Figure 17. Regional value of industrial production for all scenarios (each combination of supply and exports assumptions)



Source: OnLocation FECM24-NEMS

Figure 18. Regional differences in Industrial Production between Model Resolved and Existing/FID Exports scenarios under each supply assumption

(The prefix “diff_” refers to the difference of the *Model Resolved* scenarios from the *Existing/FID Exports* scenarios).

9. Energy-related CO_2 emissions

NEMS tracks CO_2 emissions from the combustion and use of fossil fuels throughout the forecast period. Figure 19 plots net energy-related CO_2 emissions for all scenarios. With an initial level of 4.58 Gt CO_2 emitted in the United States in 2020 as reported in Annual Energy Outlook 2023, emissions decline steadily after 2025 in all scenarios through 2050. The *Defined Policies High US Supply* and *Defined Policies Low US Supply* scenarios have highest and lowest total emissions, respectively.

Energy-related CO_2 emissions increase about 1%-2% in 2050 in response to higher LNG export levels, across all supply assumptions. The CO_2 emission increase in *Model Resolved* compared to *Existing/FID Exports* scenarios is 23 MMT in *Defined Policies* with reference U.S. supply, 46 MMT in *Defined Policies High US Supply*, and 40 MMT in *Defined Policies Low US Supply* in 2050. The differences between *Model Resolved* and their corresponding *Existing/FID Exports* scenarios are consistent with the relatively unchanged natural gas consumption volumes between scenario *Defined Policies: Model Resolved* and *Defined Policies: Existing/FID Exports*, *Defined Policies High US Supply: Model Resolved* and *Defined Policies High US Supply: Existing/FID*

Exports, and *Defined Policies Low US Supply: Model Resolved* and *Defined Policies Low US Supply: Existing/FID Exports* (observed in Figure 6 and Figure 7).

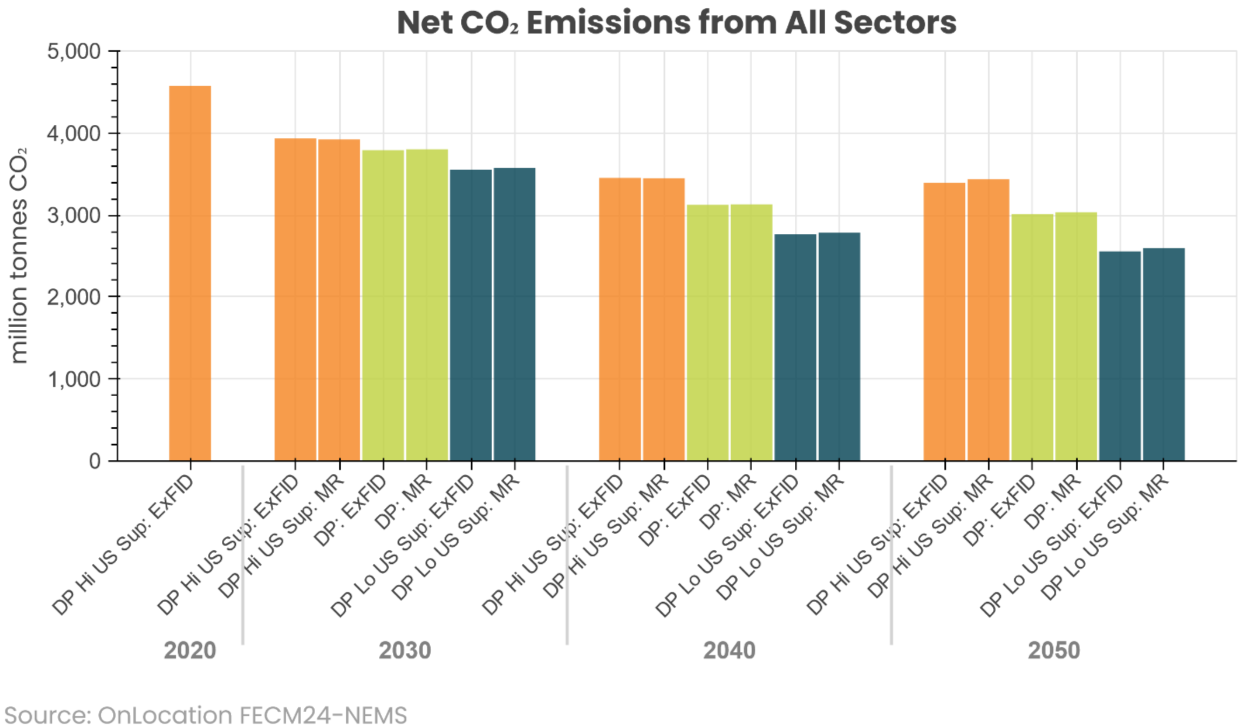


Figure 19. Net energy-related CO_2 emissions for all scenarios (each combination of supply and export assumptions)

B. Energy Burden and Distributional Impacts on U.S. Households

For insights into the distributional effects associated with projected changes in natural gas and electricity prices, HEIDM was used to estimate the corresponding changes in energy expenditures on a per household basis, by census division and by income group. Because these price effects and the associated distributional impacts are most significant in 2050, the distributional effects presented here focus on effects projected for that year. In addition, the analysis focuses on the *Defined Policies* (with reference U.S. supply) scenario and the *Defined Policies Low US Supply* scenario (*Model Resolved assumption* relative to *Existing/FID Exports* assumption in both scenarios). The scenarios provide the broadest range of energy burden estimates available from the domestic results.

As context for these results, Figure 20 presents NEMS' projected changes of residential natural gas and electricity prices for 2050, in both absolute and relative terms. As illustrated in Figure 20 natural gas prices under the *Defined Policies: Model Resolved* scenario relative to the corresponding *Existing/FID* Exports scenario increase by \$0.10/MMBtu to \$0.89/MMBtu, while the corresponding electricity price impact ranges from a minimal price reduction to an increase as high as \$1.75 per MMBtu (\$0.006 per kWh).[17] For the *Defined Policies Low US Supply* assumption, the price impacts are more significant, with natural gas prices increasing by \$0.33/MMBTU to \$2.07/MMBTU in the *Model Resolved* scenario relative to the *Existing/FID*

[17] For consistency with natural gas prices power prices are described in \$/MMBtu rather than \$/kWh. \$1/MMBTU corresponds to \$0.0034/kwh.

Exports scenario. Electricity prices under the *Defined Policies Low US Supply* assumption are projected to increase by $0.28/MMBtu to $4.12/MMBtu ($0.001 to $0.014 per kWh) under the *Model Resolved* scenario relative to the *Existing/FID Exports* scenario. This higher price impact for the *Defined Policies Low US Supply* scenario is consistent with the reduced availability of natural gas in the US market under this scenario. In addition, the increases in electricity prices exceed the projected price increases for natural gas in most areas. Natural gas price impacts are most significant in absolute and proportional terms in the West South Central census division, under both sets of scenarios. For electricity, price impacts are highest in absolute terms under both sets of scenarios in New England and in proportional terms in the West South Central

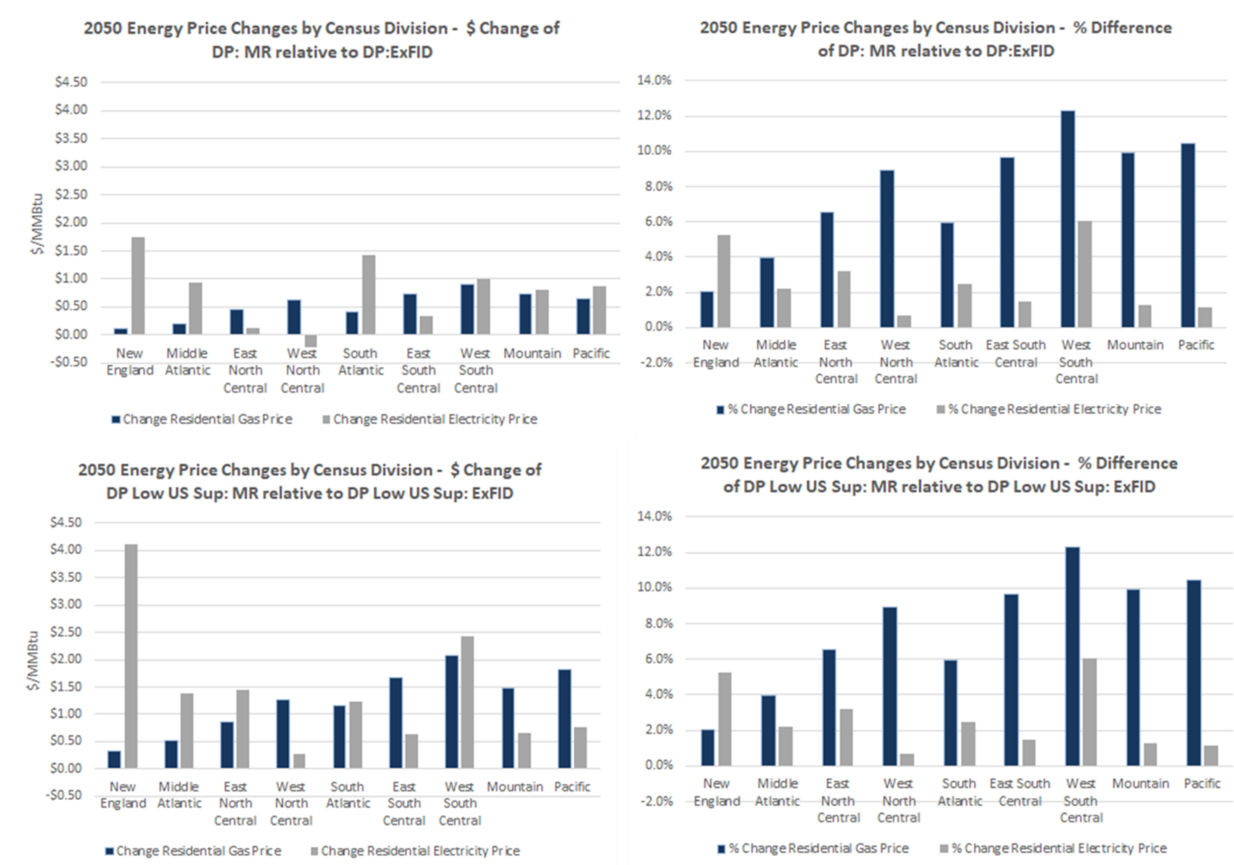


Figure 20. Projected residential natural gas and electricity price effects in 2050, by census division ($2022)

Figure 21 presents the natural gas and electricity expenditure impacts per household by income group and census division in 2050. These and other household expenditure impact estimates presented in this section reflect changes in residential natural gas and electricity prices only; they do not reflect how changes in energy prices for the industrial and commercial sectors may affect prices on goods and services consumed by households. In most geographic areas, the per-household expenditure impact is greater for electricity than for natural gas, consistent with the price impacts presented in Figure 20 above. For the *Defined Policies* (with reference U.S. supply) scenario, annual natural gas expenditures per household are up to $30 per year higher under the *Model Resolved* assumptions relative to the *Existing/FID Exports* assumptions. Under the *Defined Policies Low US Supply* assumption, the natural gas expenditure impact of the *Model Resolved* scenario relative to the *Existing/FID* Exports scenario is up to $59 per household per year. For both the *Defined Policies* with reference U.S. supply assumption and *the Defined Policies Low US Supply* scenarios, the gas expenditure impacts for the highest income households (annual income of $150,000 or more) under the *Model Resolved* scenarios are nearly double the impact projected for the lowest income households (annual income less than $30,000), in most census divisions. Note that the estimates of natural gas expenditure impacts per household presented above and in Figure 21 reflect the average impact across all households, inclusive of households that use natural gas and those that do not use gas. The average natural gas expenditure impacts per natural gas household (presented later below) exceed the natural gas expenditure impact averaged over all households.

Figure 21. Annual natural gas and electricity expenditure impacts per household in 2050, by income group and census division ($2022)

The estimated electricity expenditure impact per household is as high as $118 per year for the *Defined Policies: Model Resolved* scenario (relative to the *Defined Policies: Existing/FID Exports* scenario) and as high as $270 per household for the *Defined Policies Low US Supply: Model Resolved* scenario (relative to *Defined Policies Low US Supply: Existing/FID Exports*). For most census divisions, the proportional difference between electricity expenditure impacts per household for the highest income group and the lowest income group is slightly less than the difference projected for natural gas.

As noted above, these estimates of expenditure impacts per household reflect expenditures averaged across all households, including those that do not use natural gas. Therefore, the natural gas expenditure impacts shown above understate the natural gas expenditure impact per household for those households that use natural gas. For insights into natural gas expenditure impacts only for those households that use natural gas, Figure 22 presents natural gas expenditure impacts by income group and census division *per natural gas household*. When focusing on these households, the expenditure impact per household ranges from $5 per year to $34 per year for the lowest income group for the *Defined Policies: Model Resolved* scenario (relative to the *Defined Policies: Existing/FID Exports* scenario). The corresponding expenditure impact per household for the highest income group ranges from $6 per year to $47 per year. For the *Defined Policies Low US Supply: Model Resolved* scenario (relative to *Defined Policies Low US Supply: Existing/FID Exports*), the natural gas expenditure impacts per natural gas household range from $15 per year to $75 for the lowest household income group and $20 per year to $90 for the highest income group. These impact estimates are specific to natural gas households. No natural gas expenditure impact is expected for households that do not use natural gas.

For both natural gas and electricity, the spatial pattern of household expenditure impacts reflects the areas of greatest price effects and greatest gas, or electricity use per household. For example, the electricity expenditure impacts per household are projected to be highest in New England, which is also the census division with the highest electricity price impacts shown above in Figure 20.

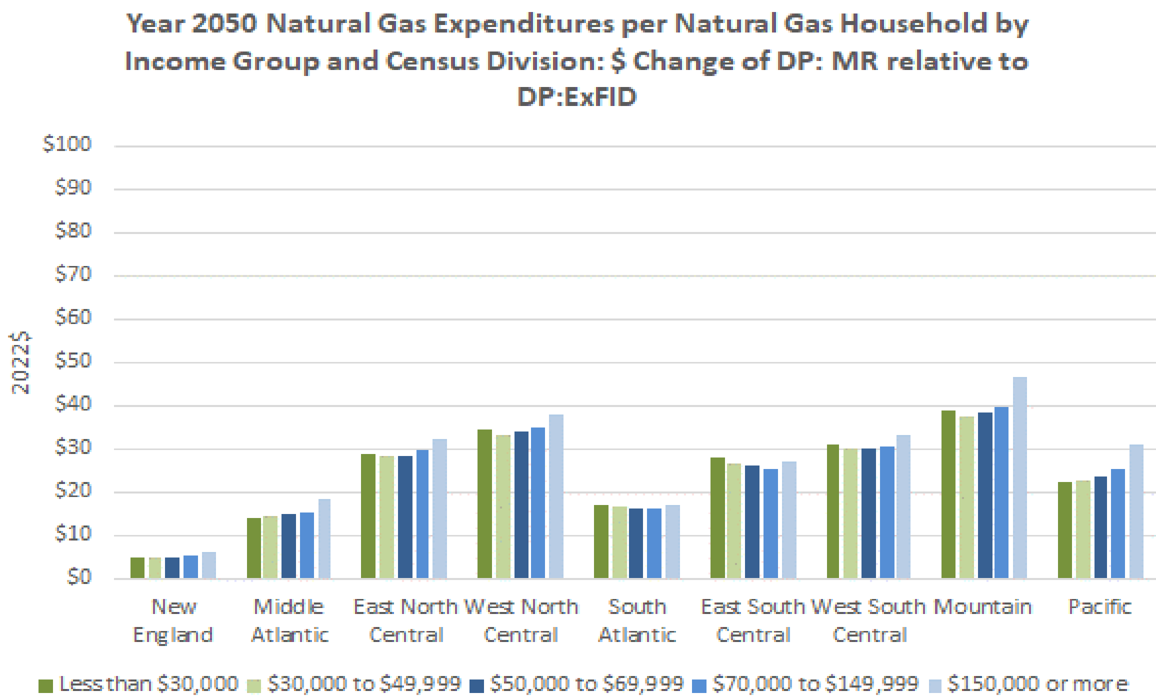
In addition, although the projected increase in residential gas prices is not as high in the East North Central as in other areas, residential natural gas use per household in this area is the second highest among the nine census divisions, based on projections from NEMS.

Table 9. Average natural gas and electricity expenditures per household, 2018-2022 (year 2022$)

Income Group	Average Annual Natural Gas Expenditures per Household	Average Annual Natural Gas Expenditures per Natural Gas Household	Average Annual Electricity Expenditures per Household
Less than $30,000	$453	$1,135	$1,587
$30,000 to $49,999	$511	$1,131	$1,763
$50,000 to $69,999	$549	$1,142	$1,863
$70,000 to $149,999	$629	$1,176	$2,068
$150,000 or more	$828	$1,332	$2,492

Source: U.S. Census, ACS 2018-2022, 5-year sample public use microdata

As context for these estimates, Table 9 presents average annual natural gas and electricity expenditures per household by income group for the entire U.S. over the 2018-2022 period. These data suggest that the increases in natural gas and electricity expenditures shown in Figure 21 and Figure 22 would represent relatively modest increases for most income groups and census divisions. For example, the increases in natural gas expenditures per household of less than $20 per year for the lowest income group under the *Defined Policies* (with reference U.S. supply) scenario (*Model Resolved* relative to *Existing/FID Exports*) are less than 5% of the typical gas expenditures of $453 per year for this group. Similarly, the increase in natural gas expenditures per natural gas household for this group under the *Defined Policies* (with reference U.S. supply) scenario is, at no more than $40 per household, less than 4% of their average annual gas expenditures of $1,135 per year. The increase in per-household electricity expenditures for this group under the *Defined Policies* (with reference U.S. supply) scenario are also less than 5% of the typical electricity expenditures for this group of $1,587 per year. Across census divisions, the electricity expenditure impact per household for the lowest income group does not exceed $80 per household.



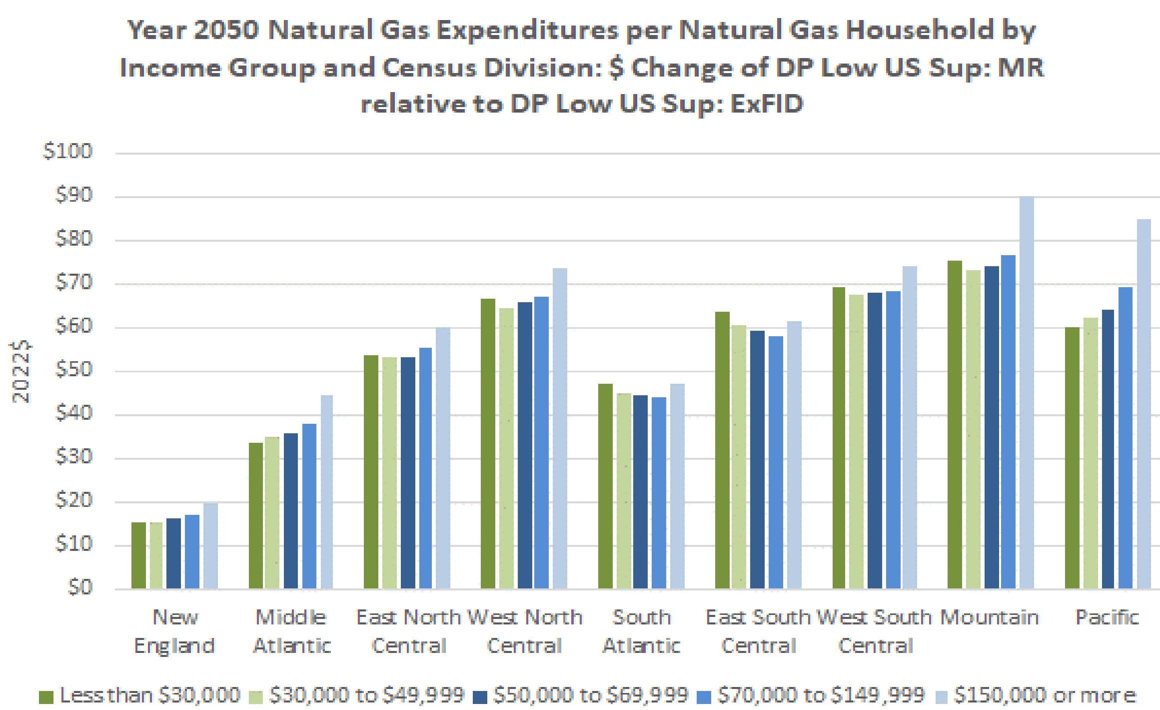
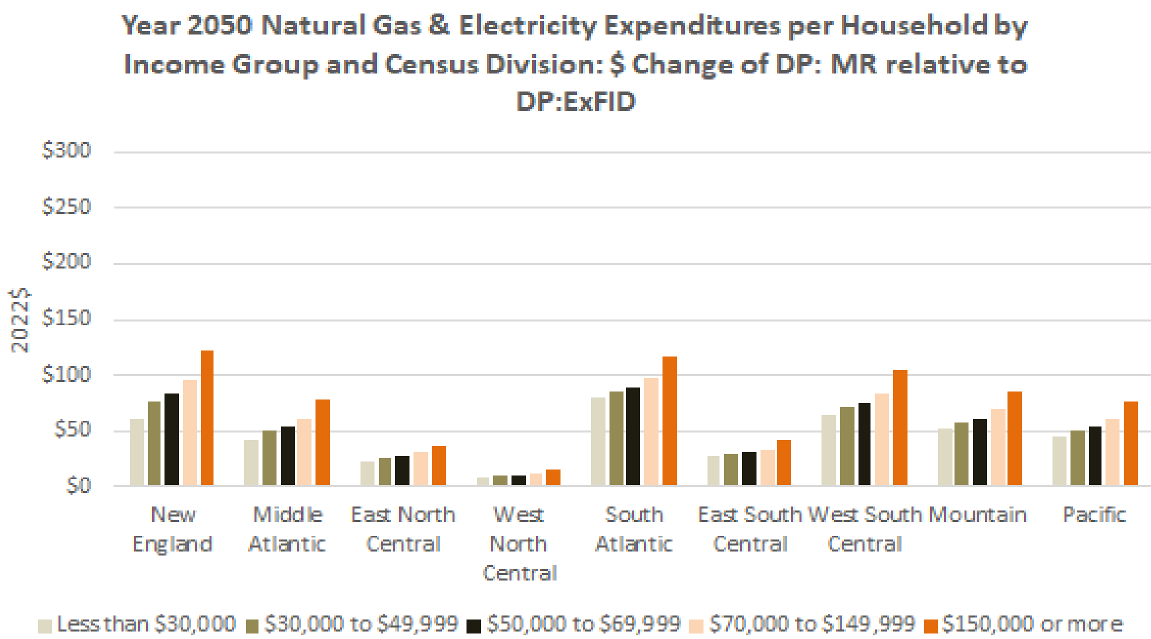


Figure 22. Natural gas expenditure impacts per natural gas household in 2050, by income group and census division

Figure 23 presents the ***combined*** year 2050 natural gas and electricity expenditure impacts per household by income group and census division. Both graphs within Figure 23 show expenditure impacts per household under the *Model Resolved* scenarios relative to the corresponding *Existing/FID Exports* scenarios. For *Defined Policies* (with reference U.S. supply assumption), the expenditure impact per household under the *Model Resolved* assumptions relative to the *Existing/FID Exports* assumptions ranges from $8 for the lowest income households in the West North Central to $123 for the highest income households in New England. For the *Defined Policies Low US Supply* scenario, the corresponding range is $46 to $283 per household, for the same income groups and census divisions. For the lowest income households, expenditure impacts per household under the *Defined Policies: Model Resolved* scenario (relative to the *Defined Policies: Existing/FID Exports*) are highest in the South Atlantic at $80 per household, followed by the West South Central at $65 per household, and New England ($61 per household). Under the *Defined Policies Low US Supply: Model Resolved* scenario (relative to the *Defined Policies Low US Supply: Existing/FID Exports*) expenditure impacts for the lowest income bracket are highest in the West South Central at $153 per household, followed closely by New England at $142 per household.

The estimates presented in Figure 23 represent combined natural gas and electricity expenditure impacts averaged over all households. Because the natural gas impacts per natural gas household exceed the impacts for the average household, the estimates presented in the figure are likely to understate the combined expenditure impact for natural gas households.



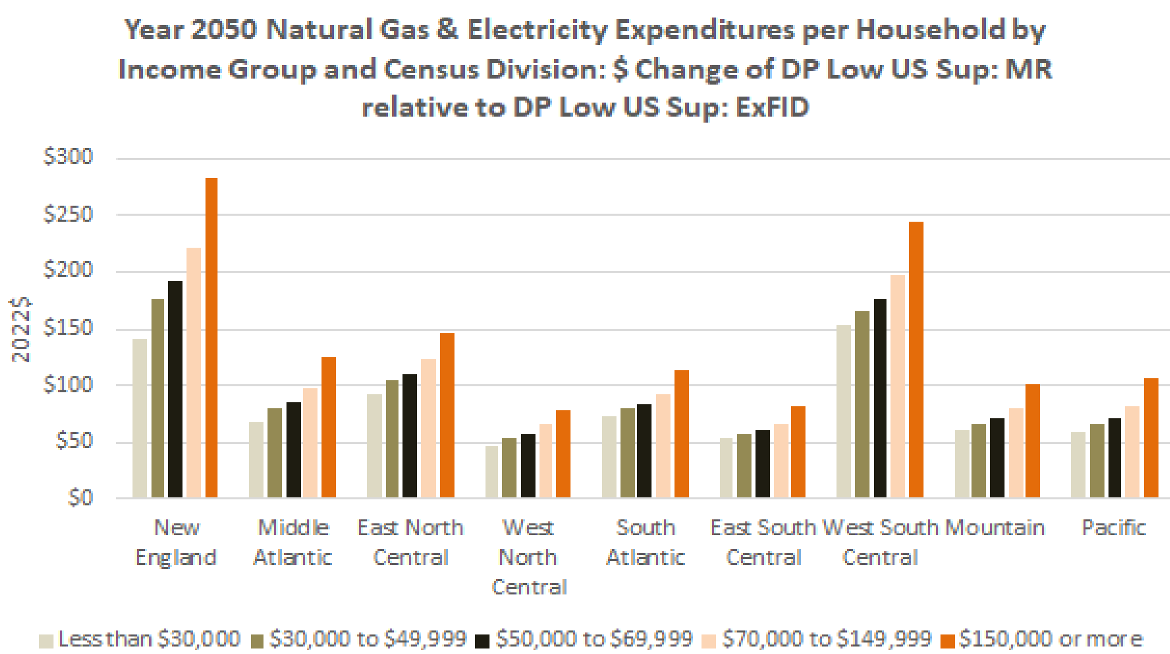


Figure 23. Combined natural gas and electricity expenditure impacts per household in 2050, by income group and census division.

Figure 24 presents the estimated natural gas and electricity expenditure impacts per household as a percentage of household income, for each income group and census division in 2050. Under the *Defined Policies* scenario (with reference U.S. supply assumption), the estimated natural gas and electricity expenditure impacts per household (*Defined Policies: Model Resolved* relative to

Defined Policies: Existing/FID Exports) are (individually) less than 0.5% of annual income across all income groups and census divisions. Similarly, for the *Defined Policies Low US Supply* scenarios (*Defined Policies Low US Supply: Model Resolved* relative to *Defined Policies Low US Supply: Existing/FID Exports*), expenditures per household for both natural gas and electricity are (individually) less than 0.9% of household income. Under both scenarios, however, the proportional impact varies significantly across income groups. Gas expenditure impacts per household as a percentage of household income are 8 to 10 times higher for the lowest income group (income of less than $30,000) than for the highest income group in *Model Resolved* relative to *Existing/FID Exports*, under both the *Defined Policies* (with reference U.S. supply assumption) and *Defined Policies Low US Supply*. For electricity, this range increases to 9 to 12 times higher.

Similar to the results presented in Figure 21 above for natural gas, these estimates of expenditure impacts as a percentage of household income reflect expenditures averaged across all households, including those that do not use natural gas. For insights specific to households that use natural gas, Figure 25 presents natural gas expenditure impacts per natural gas household as a fraction of household income, by both income group and census division. As shown in the figure, natural gas expenditure impacts per natural gas household for the lowest income group range from 0.03% to 0.24% of household income under the *Defined Policies* (with reference U.S. supply assumption) scenario (*Defined Policies: Model Resolved* relative to *Defined Policies: Existing/FID Exports*) and from 0.10% to 0.47% of household income under the *Defined Policies Low US Supply scenario* (*Defined Policies Low US Supply: Model Resolved* relative to *Defined Policies Low US Supply: Existing/FID Exports)*. These impact estimates are specific to natural gas households. No natural gas expenditure impact is expected for households that do not use natural gas.

As context for these results, Table 10 shows the percentage of household income spent on natural gas and electricity by income group, based on data for the 2018-2022 period for the entire U.S. These percentages are highest for households with income of less than $30,000, at 2.9% of annual income for household natural gas expenditures (across all households) and 10% of annual income for household electricity expenditures.

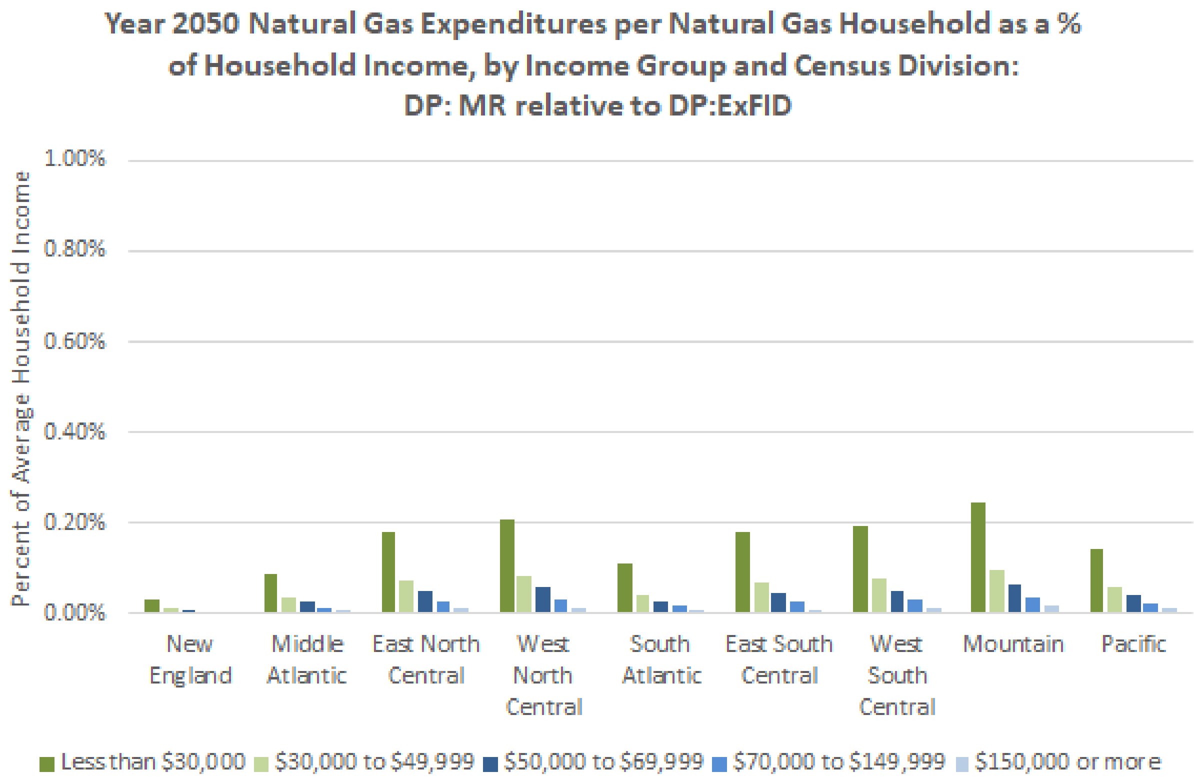
Table 10. Percent of household income spent on natural gas and electricity, 2018-2022

Income Group	% of Household Income Spent on Natural Gas (all households)	% of Household Income Spent on Natural Gas (natural gas households)	% of Household Income Spent on Electricity
Less than $30,000	2.9%	7.2%	10.0%
$30,000 to $49,999	1.3%	2.8%	4.4%
$50,000 to $69,999	0.9%	1.9%	3.1%
$70,000 to $149,999	0.6%	1.1%	2.0%
$150,000 or more	0.3%	0.5%	0.9%

Source: U.S. Census, ACS 2018-2022, 5-year sample public use microdata

Figure 26 shows the combined natural gas and electricity expenditure impacts as a percentage of household income, by income group and census division. These percentages represent the total change in energy burden associated with each scenario; energy burden is defined as the percentage of household income spent on home energy bills, excluding transportation fuel. As shown in the figure, the increase in energy burden varies significantly among income groups and among census divisions. Under the *Defined Policies* (with reference U.S. supply assumption) scenario (*Defined Policies: Model Resolved* relative to *Defined Policies: Existing/FID Exports*), the change in energy burden for the lowest income group ranges from 0.05% in the West North Central to 0.50% in the South Atlantic. For the highest income group, the increase in energy burden ranges from 0.01% in the West North Central to 0.04% in New England, the South Atlantic, and West South Central. Under the *Defined Policies Low US Supply* Scenario (*Defined Policies Low US Supply: Model Resolved* relative to *Defined Policies Low US Supply: Existing/FID Exports*), the change in energy burden for the lowest income households ranges from 0.28% in the West North Central to 0.96% in the West South Central. The increase in energy burden for the highest income households under this scenario ranges from 0.03% in the West North Central to 0.10% in New England.

Figure 24. Natural gas and electricity expenditures per household as a percentage of income



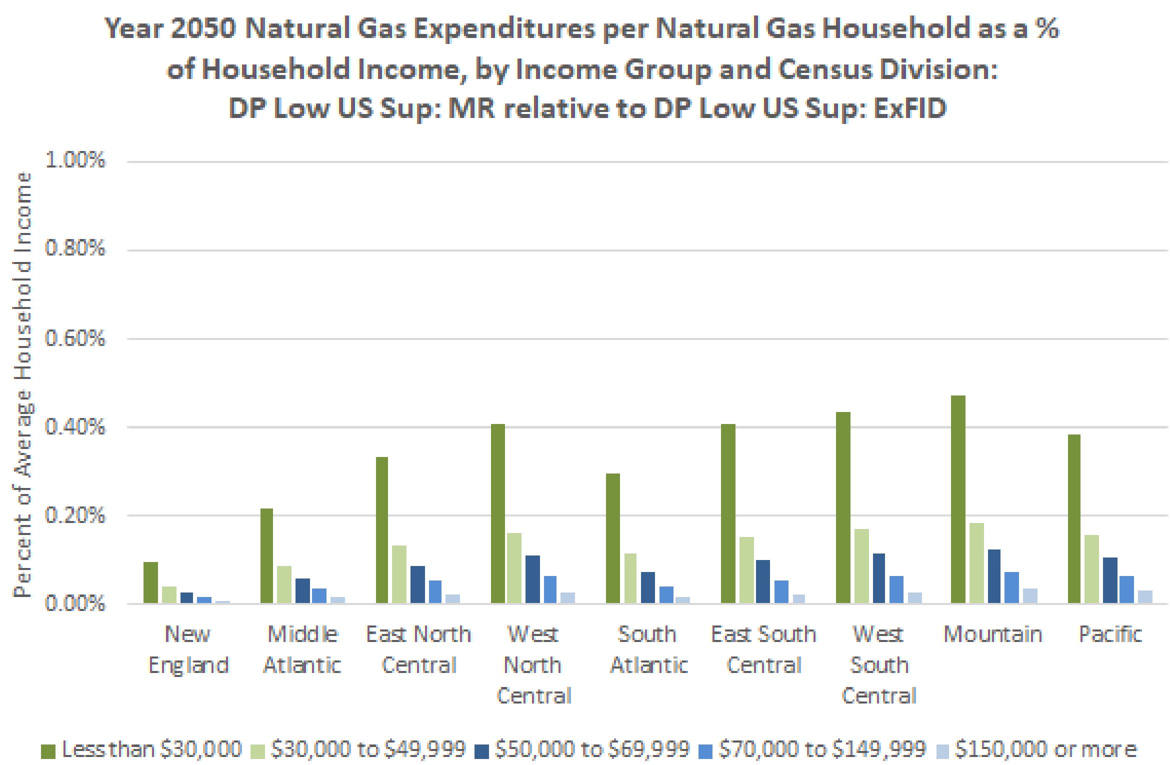
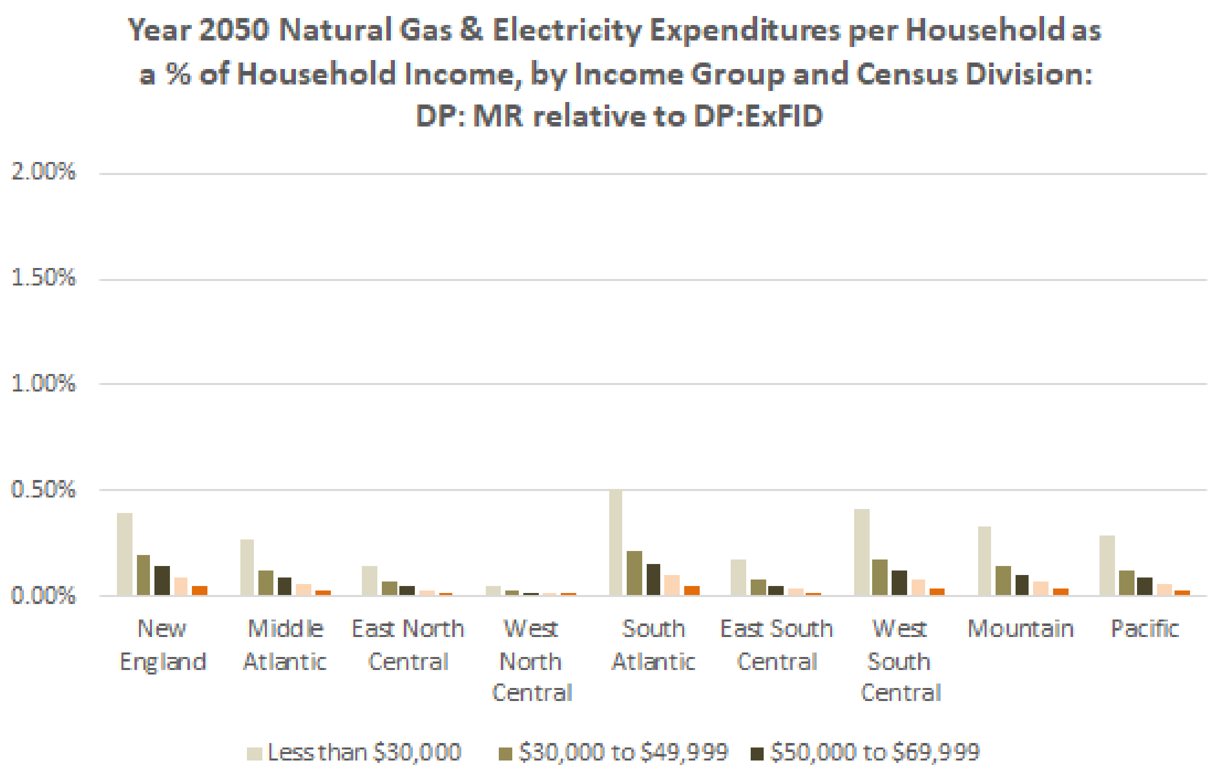


Figure 25. Natural gas expenditure impacts per natural gas household, percent of household income



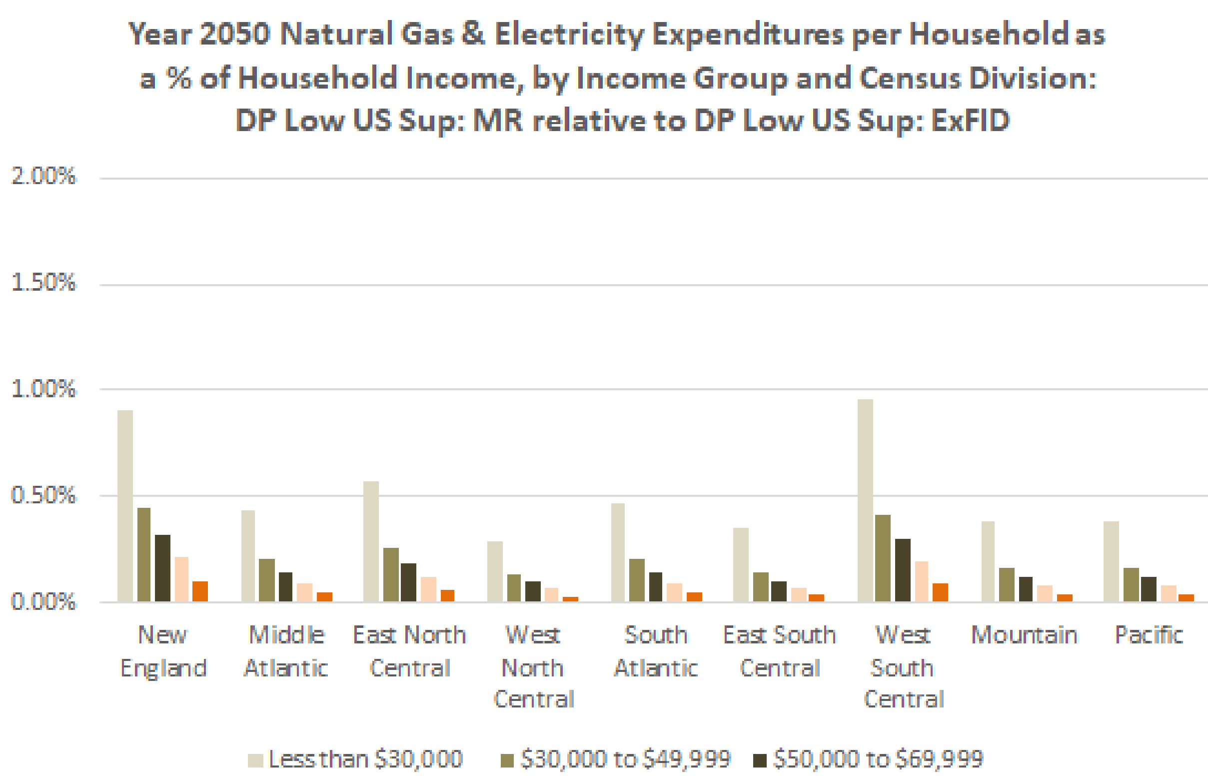
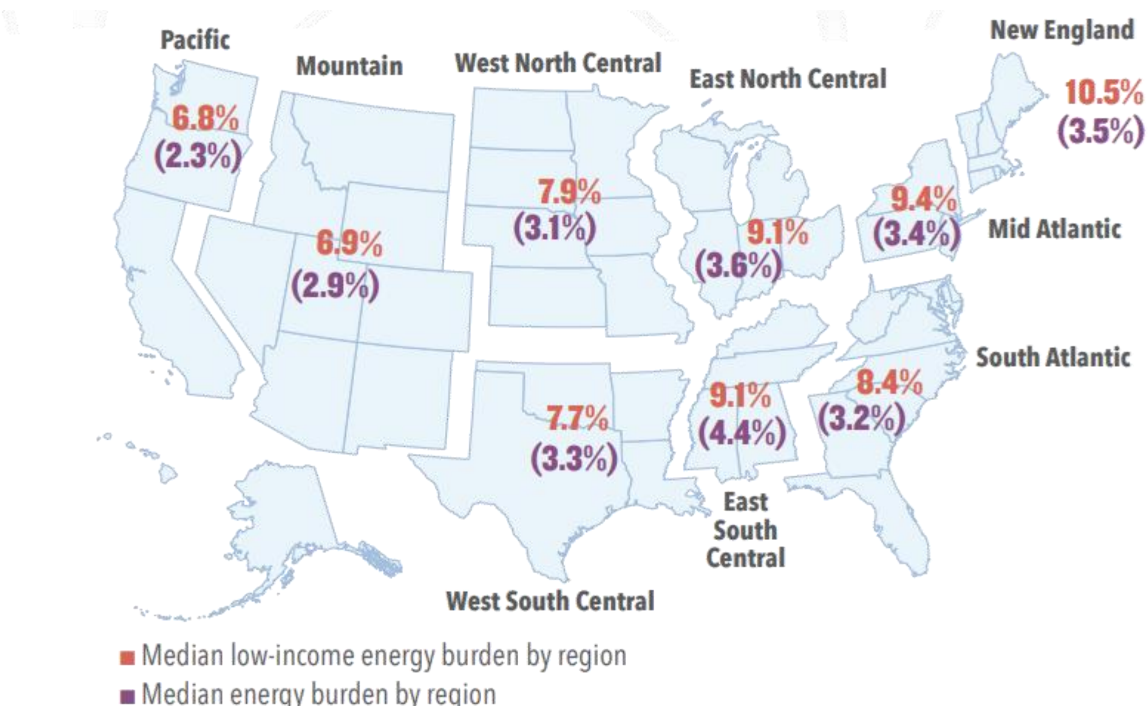


Figure 26. Combined natural gas & electricity expenditure impacts per household as a percent of household income

To provide context for these estimated changes in energy burden, Figure 27 presents U.S. energy burden in 2017, as estimated by the American Council for an Energy Efficient Economy (ACEEE).[18] As noted above, energy burden is defined as the percentage of household income spent on home energy bills, excluding transportation fuels. ACEEE estimated energy burden by census division, generating two energy burden estimates for each Division: one for all households in aggregate and another focused exclusively on low-income households (defined as households with income less than 200% of the federal poverty level). An energy burden of 6% or more is considered a high energy burden, and an energy burden of 10% or more is considered a severe energy burden. For the overall population of each census division (the values in purple in the figure), the ACEEE analysis suggests that, on average, households do not have a high energy burden. For low-income households, however, the ACEEE analysis found a high energy burden in all nine census divisions and a severe energy burden in one (New England). Although none of the income groups presented in the above analysis coincide exactly with the low-income group defined by ACEEE, the data presented in Figure 27 suggest that the increases in residential natural gas and electricity expenditures summarized above may exacerbate an already high energy burden for low-income households across all census divisions.



Source: ACEEE, 2020.

Figure 27. U.S. energy burden in 2017, by census division

[18] American Council for an Energy-Efficient Economy (ACEEE). 2020. “How High are Household Energy Burdens? An Assessment of National and Metropolitan Energy Burden across the United States.”

SUMMARY

The purpose of this study is to examine the potential global and U.S. energy system and GHG emissions implications of a wide range of levels of U.S. LNG exports. This Appendix covers results from two analytical frameworks used in the study: 1) the National Energy Modeling System (NEMS), and 2) the Household Energy Impact Distribution Model (HEIDM). Key conclusions:

1. U.S. natural gas prices measured at the Henry Hub increase when comparing existing and FID levels of U.S. natural gas exports to an export level based on modeled global demand (*Model Resolved*). Across the *Defined Policies* with reference U.S. supply assumption, 2050 Henry Hub prices are projected to increase 31%, from $3.53/MMBtu in *Defined Policies: Existing/FID Exports* to $4.62/MMBtu in *Defined Policies: Model Resolved*. Annual Henry Hub natural gas prices in *Defined Policies* with reference U.S. supply assumption - with existing and FID levels of U.S. natural gas exports - are lower than in the AEO 2023 with similar export levels, as improved modeling of the impacts of recent regulation and legislation lead to a decrease to U.S. natural gas consumption, primarily in the electric power generation sector.
2. U.S. residential gas prices are projected to be 4% higher in 2050 when comparing *Model Resolved* and *Existing/FID Exports* for the *Defined Policies* scenarios, with reference U.S. supply assumption (*Defined Policies: Model Resolved* relative to *Defined Policies: Existing/FID Exports*). Residential gas prices are 7% higher in *Model Resolved* compared to the *Existing/FID Exports* in 2050 under the *Low US Supply* assumption (*Defined Policies Low US Supply: Model Resolved* relative to *Defined Policies Low US Supply: Existing/FID Exports*), while 3% higher under the *High US Supply* assumption (*Defined Policies High US Supply: Model Resolved* relative to *Defined Policies High US Supply: Existing/FID Exports*). Across both export levels, under the *Defined Policies High US Supply* assumption, natural gas prices were lower than in scenarios with the reference assumption for U.S. supply resources. Industrial natural gas prices are projected to be 18% higher in 2050 when exports increase from the existing and FID exports level to the *Model Resolved* export level under the *Defined Policies* with reference U.S. supply assumption, while in *Defined Policies High US Supply* and *Defined Policies Low US Supply*, the prices are 18% and 22% higher, respectively.
3. For the *Defined Policies* with reference U.S. supply assumption, increased exports result in a $410 billion cumulative increase in GDP ($2022, discounted at 3%) over those with existing and FID levels of U.S. natural gas exports, during the study period (2020-2050). For the *Defined Policies High US Supply* and *Defined Policies Low US Supply* assumptions, the cumulative difference in GDP over the prediction horizon in the *Model Resolved* compared to the *Existing/FID Exports* scenario is $94 billion and $246 billion ($2022, discounted at 3%), respectively.
4. The value of industrial production, a component of GDP, increases with increased exports (by up to 1.3% in 2050 across scenarios), primarily through increased economic activity in the oil and gas sector necessary to support additional gas required for export. Overall, the value of industrial production is 9% higher in the *Defined Policies High US Supply* compared with the *Defined Policies* with reference U.S. supply assumption in 2050 (with the same level of exports), primarily reflecting increased natural gas production and lower prices due to the exogenous assumption of the larger, relatively low-cost U.S. resource base.

5. Domestic energy-related carbon dioxide (CO_2) emissions for the *Defined Policies* and under all supply assumptions, increase about 1%-2 in 2050 in response to increased LNG exports from *Existing/FID Exports* to *Model Resolved* levels (with a CO_2 emissions increase of 23 MMT in *Defined Policies* with reference U.S. supply, 46 MMT in *Defined Policies High US Supply* and 40 MMT in *Defined Policies Low US Supply* in 2050), reflecting greater emissions associated with the production, transportation, and liquefaction of natural gas for export.
6. Under the *Defined Policies* scenario with the reference U.S. supply assumption, the estimated annual energy expenditure impacts across all socioeconomic levels and census divisions are:
    a. Up to a $46.52 per year increase for natural gas expenditures at natural gas households (households identified in NEMS as using natural gas for space heating). The average natural gas household expenditure impact is up to 0.24% of average annual income and 6.7% of average natural gas bills.
    b. Up to a $118.37 per year average increase for electricity expenditures across all households. The average household expenditure impacts are up to 0.5% of average annual income and 3.5% of average electricity bills.
    c. Up to a $122.54 per year average increase for natural gas plus electricity expenditure across all households, with average household expenditure impacts up to 0.50% of average annual income and 3.4% of natural gas and electricity bills.

TABULATED VALUES FROM THE FIGURES

Table 11. U.S. primary energy consumption, tabulated by year. (see Figure 3)

Scenario	U.S. Primary Energy Consumption	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	Clean (Renew/Nuc)	EJ	19.3	23.2	32.9	38.1	40.4	43.3	48.5
	Petroleum/Other	EJ	35.4	39.2	37.8	35.4	33.7	33.2	33.0
	Natural Gas	EJ	33.4	33.7	33.3	32.7	34.9	37.2	37.4
	Coal	EJ	9.6	8.7	3.0	1.8	1.0	1.0	0.9
	Total	EJ	97.7	104.8	107.0	107.9	110.1	114.7	119.7
DP Hi US Sup: MR	Clean (Renew/Nuc)	EJ	19.3	23.2	33.0	38.3	41.1	44.5	49.2
	Petroleum/Other	EJ	35.4	39.2	37.8	35.4	33.8	33.4	33.3
	Natural Gas	EJ	33.4	33.7	33.1	32.4	34.6	37.0	37.9
	Coal	EJ	9.6	8.7	3.0	1.9	1.0	1.0	0.9
	Total	EJ	97.7	104.8	106.9	107.9	110.5	116.0	121.4
DP: ExFID	Clean (Renew/Nuc)	EJ	19.3	23.3	33.3	37.9	40.3	44.1	48.5
	Petroleum/Other	EJ	35.4	38.4	36.3	32.9	30.6	29.7	29.7
	Natural Gas	EJ	33.4	32.4	30.6	30.0	30.8	31.4	32.1
	Coal	EJ	9.6	9.0	3.5	1.9	0.9	0.8	0.8
	Total	EJ	97.7	103.0	103.7	102.7	102.6	106.0	111.1
DP: MR	Clean (Renew/Nuc)	EJ	19.3	23.4	33.1	37.8	41.0	44.8	50.7
	Petroleum/Other	EJ	35.4	38.4	36.3	33.0	30.7	30.1	30.3
	Natural Gas	EJ	33.4	32.4	30.8	29.9	30.8	31.9	32.1
	Coal	EJ	9.6	8.9	3.5	1.9	0.9	0.8	0.8
	Total	EJ	97.7	103.0	103.6	102.6	103.4	107.7	113.8
DP Lo US Sup: ExFID	Clean (Renew/Nuc)	EJ	19.3	23.9	38.2	42.9	44.9	50.1	55.0
	Petroleum/Other	EJ	35.4	37.4	35.0	32.0	29.4	28.1	27.7
	Natural Gas	EJ	33.4	29.0	24.4	24.0	24.2	24.0	24.1
	Coal	EJ	9.6	9.8	5.0	2.9	0.9	0.8	0.7
	Total	EJ	97.7	100.1	102.6	101.9	99.4	103.0	107.6
DP Lo US Sup: MR	Clean (Renew/Nuc)	EJ	19.3	23.9	37.9	43.1	45.3	50.9	56.4
	Petroleum/Other	EJ	35.4	37.4	35.0	32.0	29.4	28.2	27.8
	Natural Gas	EJ	33.4	29.0	24.5	24.0	24.5	24.7	24.6
	Coal	EJ	9.6	9.9	5.0	2.8	0.9	0.8	0.7
	Total	EJ	97.7	100.1	102.4	101.9	100.1	104.6	109.6
Diff_DP Hi US Sup	Clean (Renew/Nuc)	EJ	0.0	0.0	0.1	0.2	0.6	1.2	0.8
	Petroleum/Other	EJ	0.0	0.0	0.0	0.0	0.1	0.2	0.3
	Natural Gas	EJ	0.0	0.0	-0.2	-0.3	-0.3	-0.2	0.5
	Coal	EJ	0.0	0.0	0.0	0.1	0.0	0.0	0.0
	Total	EJ	0.0	0.0	-0.1	0.0	0.5	1.3	1.6
Diff_DP	Clean (Renew/Nuc)	EJ	0.0	0.0	-0.2	-0.1	0.6	0.7	2.2
	Petroleum/Other	EJ	0.0	0.0	0.1	0.1	0.1	0.4	0.6
	Natural Gas	EJ	0.0	0.0	0.2	0.0	0.0	0.6	0.0
	Coal	EJ	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	EJ	0.0	0.0	0.0	-0.1	0.7	1.7	2.7
Diff_DP Lo US Sup	Clean (Renew/Nuc)	EJ	0.0	0.0	-0.3	0.2	0.4	0.8	1.4
	Petroleum/Other	EJ	0.0	0.0	0.0	0.0	0.1	0.2	0.1
	Natural Gas	EJ	0.0	0.0	0.1	-0.1	0.3	0.7	0.5
	Coal	EJ	0.0	0.0	0.0	-0.1	0.0	0.0	0.0
	Total	EJ	0.0	0.0	-0.2	0.0	0.8	1.7	2.0
Diff_DP Hi US Sup	Clean (Renew/Nuc)	% Difference	0.0	0.0	0.2	0.5	1.6	2.8	1.6
	Petroleum/Other	% Difference	0.0	0.0	0.0	0.0	0.3	0.7	0.9
	Natural Gas	% Difference	0.0	0.0	-0.5	-0.9	-0.9	-0.5	1.5
	Coal	% Difference	0.0	-0.1	0.4	4.9	3.0	1.1	0.8
	Total	% Difference	0.0	0.0	-0.1	0.0	0.4	1.1	1.4
Diff_DP	Clean (Renew/Nuc)	% Difference	0.0	0.1	-0.6	-0.2	1.6	1.6	4.5
	Petroleum/Other	% Difference	0.0	0.0	0.1	0.2	0.5	1.5	2.0
	Natural Gas	% Difference	0.0	0.0	0.5	-0.1	-0.1	1.9	0.0
	Coal	% Difference	0.0	-0.5	-0.8	-1.6	-2.9	0.3	0.7
	Total	% Difference	0.0	0.0	0.0	-0.1	0.7	1.6	2.5
Diff_DP Lo US Sup	Clean (Renew/Nuc)	% Difference	0.0	0.0	-0.8	0.5	1.0	1.6	2.6
	Petroleum/Other	% Difference	0.0	0.0	0.0	0.0	0.3	0.5	0.3
	Natural Gas	% Difference	0.0	0.0	0.4	-0.3	1.1	2.8	2.1
	Coal	% Difference	0.0	0.1	0.0	-4.3	-2.6	3.7	0.4
	Total	% Difference	0.0	0.0	-0.2	0.0	0.8	1.6	1.9

Table 12. U.S. Henry Hub natural gas price, tabulated by year. (see Figure 2)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	$2022/MMBtu	2.23	3.13	2.30	2.64	2.73	2.56	2.47
DP Hi US Sup: MR	$2022/MMBtu	2.23	3.15	2.33	2.66	3.20	3.25	3.41
DP: ExFID	$2022/MMBtu	2.23	3.90	2.82	3.42	3.68	3.70	3.53
DP: MR	$2022/MMBtu	2.23	3.88	2.82	3.44	4.31	4.53	4.62
DP Lo US Sup: ExFID	$2022/MMBtu	2.23	6.26	5.03	6.75	7.55	7.33	7.28
DP Lo US Sup: MR	$2022/MMBtu	2.23	6.26	5.02	6.81	8.56	9.07	9.58
Diff_DP Hi US Sup	$2022/MMBtu	0.00	0.02	0.02	0.02	0.48	0.68	0.94
Diff_DP	$2022/MMBtu	0.00	-0.02	0.00	0.01	0.62	0.83	1.08
Diff_DP Lo US Sup	$2022/MMBtu	0.00	0.01	-0.01	0.06	1.00	1.74	2.30
Diff_DP Hi US Sup	% Difference	0.0	0.6	1.0	0.8	17.5	26.7	38.0
Diff_DP	% Difference	0.0	-0.5	0.1	0.4	16.9	22.4	30.6
Diff_DP Lo US Sup	% Difference	0.0	0.1	-0.2	0.9	13.3	23.7	31.6

Table 13. L48 natural gas production, tabulated by year. (see Figure 4)

Scenario	L48 Natural Gas Production	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	Onshore-SWest	Bcf/d	14.1	19.0	21.6	22.7	24.4	25.1	25.4
	Onshore-RkyMtn	Bcf/d	10.6	10.0	11.5	11.7	11.6	11.1	10.5
	Onshore-Other	Bcf/d	2.5	2.9	3.1	2.9	2.8	2.7	2.8
	Onshore-Midco	Bcf/d	9.4	7.2	6.9	6.6	6.4	7.3	7.7
	Onshore-Gulf	Bcf/d	19.3	30.6	28.0	29.5	30.9	31.7	31.0
	Onshore-East	Bcf/d	32.9	34.9	34.4	35.5	37.7	40.3	41.4
	Offshore	Bcf/d	2.2	2.5	4.1	4.8	6.0	7.5	6.6
	Total	Bcf/d	90.9	107.2	109.6	113.7	119.8	125.6	125.4
DP Hi US Sup: MR	Onshore-SWest	Bcf/d	14.1	19.0	21.7	22.9	27.0	29.6	32.8
	Onshore-RkyMtn	Bcf/d	10.6	10.0	11.6	11.8	12.0	12.1	12.4
	Onshore-Other	Bcf/d	2.5	2.9	3.1	2.9	2.8	2.7	2.8
	Onshore-Midco	Bcf/d	9.4	7.3	6.9	6.6	7.0	8.8	9.9
	Onshore-Gulf	Bcf/d	19.3	30.4	27.4	28.7	37.1	43.3	45.3
	Onshore-East	Bcf/d	32.9	35.0	34.3	35.7	39.5	43.6	45.7
	Offshore	Bcf/d	2.2	2.5	4.1	4.8	6.0	7.8	7.1
	Total	Bcf/d	90.9	107.2	109.1	113.3	131.5	147.9	156.0
DP: ExFID	Onshore-SWest	Bcf/d	14.1	16.3	17.6	18.8	19.3	20.3	21.2
	Onshore-RkyMtn	Bcf/d	10.6	9.7	10.0	9.3	9.3	9.0	8.7
	Onshore-Other	Bcf/d	2.5	2.4	2.4	2.3	2.3	2.2	2.2
	Onshore-Midco	Bcf/d	9.4	7.3	6.7	6.1	5.7	5.7	5.6
	Onshore-Gulf	Bcf/d	19.3	28.7	26.6	28.4	28.8	28.4	27.6
	Onshore-East	Bcf/d	32.9	35.8	35.1	37.3	39.1	41.0	41.0
	Offshore	Bcf/d	2.2	2.4	3.6	3.5	3.2	3.0	3.1
	Total	Bcf/d	90.9	102.7	102.0	105.8	107.6	109.6	109.4
DP: MR	Onshore-SWest	Bcf/d	14.1	16.3	17.7	19.0	22.4	26.4	29.7
	Onshore-RkyMtn	Bcf/d	10.6	9.7	10.0	9.4	10.0	10.4	10.5
	Onshore-Other	Bcf/d	2.5	2.4	2.4	2.3	2.3	2.2	2.2
	Onshore-Midco	Bcf/d	9.4	7.4	6.7	6.0	6.5	7.5	7.9
	Onshore-Gulf	Bcf/d	19.3	28.7	26.5	28.4	34.9	40.9	43.3
	Onshore-East	Bcf/d	32.9	35.8	35.2	37.4	41.0	42.9	42.2
	Offshore	Bcf/d	2.2	2.4	3.6	3.5	3.2	3.3	3.9
	Total	Bcf/d	90.9	102.7	102.1	106.0	120.4	133.7	139.6
DP Lo US Sup: ExFID	Onshore-SWest	Bcf/d	14.1	12.6	10.6	11.0	11.3	11.9	12.2
	Onshore-RkyMtn	Bcf/d	10.6	10.5	9.8	8.9	8.1	7.0	6.4
	Onshore-Other	Bcf/d	2.5	2.2	1.9	1.7	1.5	1.3	1.1
	Onshore-Midco	Bcf/d	9.4	7.3	6.0	5.2	4.3	3.9	3.8
	Onshore-Gulf	Bcf/d	19.3	22.5	22.5	24.8	23.8	22.9	22.3
	Onshore-East	Bcf/d	32.9	35.5	31.6	34.4	36.6	36.6	36.4
	Offshore	Bcf/d	2.2	2.2	2.2	1.8	1.9	2.6	2.1
	Total	Bcf/d	90.9	92.8	84.6	87.7	87.6	86.1	84.3
DP Lo US Sup: MR	Onshore-SWest	Bcf/d	14.1	12.6	10.6	11.0	13.4	16.1	18.5
	Onshore-RkyMtn	Bcf/d	10.6	10.5	9.8	8.9	8.8	8.4	7.9
	Onshore-Other	Bcf/d	2.5	2.2	1.9	1.7	1.5	1.3	1.1
	Onshore-Midco	Bcf/d	9.4	7.3	6.0	5.2	5.1	5.4	5.5
	Onshore-Gulf	Bcf/d	19.3	22.5	22.5	24.8	31.4	35.8	37.9
	Onshore-East	Bcf/d	32.9	35.6	31.6	34.6	38.5	40.2	41.3

Scenario	L48 Natural Gas Production	Units	2020	2025	2030	2035	2040	2045	2050
	Offshore	Bcf/d	2.2	2.2	2.2	1.8	2.2	3.2	2.4
	Total	Bcf/d	90.9	92.9	84.6	88.1	100.9	110.4	114.8
Diff_DP Hi US Sup	Onshore-SWest	Bcf/d	0.0	0.0	0.1	0.2	2.6	4.5	7.5
	Onshore-RkyMtn	Bcf/d	0.0	0.0	0.1	0.0	0.4	1.0	1.9
	Onshore-Other	Bcf/d	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Onshore-Midco	Bcf/d	0.0	0.0	0.0	0.0	0.6	1.5	2.1
	Onshore-Gulf	Bcf/d	0.0	-0.2	-0.6	-0.8	6.2	11.6	14.3
	Onshore-East	Bcf/d	0.0	0.1	-0.1	0.1	1.7	3.3	4.3
	Offshore	Bcf/d	0.0	0.0	0.0	0.0	0.0	0.3	0.5
	Total	Bcf/d	0.0	0.0	-0.4	-0.4	11.7	22.3	30.5
Diff_DP	Onshore-SWest	Bcf/d	0.0	0.0	0.1	0.2	3.2	6.1	8.5
	Onshore-RkyMtn	Bcf/d	0.0	0.0	0.0	0.0	0.7	1.4	1.7
	Onshore-Other	Bcf/d	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Onshore-Midco	Bcf/d	0.0	0.0	-0.1	-0.1	0.8	1.8	2.2
	Onshore-Gulf	Bcf/d	0.0	0.0	-0.1	0.0	6.1	12.5	15.7
	Onshore-East	Bcf/d	0.0	0.0	0.1	0.1	2.0	1.9	1.2
	Offshore	Bcf/d	0.0	0.0	0.0	0.0	0.0	0.4	0.7
	Total	Bcf/d	0.0	0.0	0.1	0.2	12.7	24.0	30.2
Diff_DP Lo US Sup	Onshore-SWest	Bcf/d	0.0	0.0	0.0	0.0	2.1	4.3	6.3
	Onshore-RkyMtn	Bcf/d	0.0	0.0	0.0	0.0	0.7	1.4	1.6
	Onshore-Other	Bcf/d	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Onshore-Midco	Bcf/d	0.0	0.0	0.0	0.0	0.8	1.5	1.6
	Onshore-Gulf	Bcf/d	0.0	0.0	0.0	0.1	7.6	12.9	15.6
	Onshore-East	Bcf/d	0.0	0.0	0.0	0.3	1.8	3.6	4.9
	Offshore	Bcf/d	0.0	0.0	0.0	0.0	0.2	0.6	0.3
	Total	Bcf/d	0.0	0.0	-0.1	0.4	13.3	24.3	30.5
Diff_DP Hi US Sup	Onshore-SWest	% Difference	0.0	0.0	0.7	0.9	10.8	17.8	29.4
	Onshore-RkyMtn	% Difference	0.0	0.3	0.6	0.3	3.5	9.4	18.1
	Onshore-Other	% Difference	0.0	0.0	0.0	0.0	0.1	0.0	0.0
	Onshore-Midco	% Difference	0.0	0.3	0.6	0.1	9.9	21.0	27.3
	Onshore-Gulf	% Difference	0.0	-0.6	-2.2	-2.8	20.2	36.5	46.1
	Onshore-East	% Difference	0.0	0.3	-0.2	0.3	4.6	8.3	10.3
	Offshore	% Difference	0.0	0.1	-0.1	0.6	0.5	4.6	7.3
	Total	% Difference	0.0	0.0	-0.4	-0.4	9.7	17.7	24.3
Diff_DP	Onshore-SWest	% Difference	0.0	0.1	0.6	0.9	16.5	30.1	40.3
	Onshore-RkyMtn	% Difference	0.0	-0.3	0.2	0.3	7.3	15.4	19.7
	Onshore-Other	% Difference	0.0	0.0	-0.3	-0.1	0.0	-0.1	0.2
	Onshore-Midco	% Difference	0.0	0.6	-0.9	-1.4	13.5	31.4	40.0
	Onshore-Gulf	% Difference	0.0	0.2	-0.3	0.1	21.2	44.0	57.1
	Onshore-East	% Difference	0.0	-0.1	0.4	0.2	5.0	4.6	3.0
	Offshore	% Difference	0.0	-0.7	0.4	0.3	1.5	12.4	24.0
	Total	% Difference	0.0	0.0	0.1	0.2	11.8	21.9	27.6
Diff_DP Lo US Sup	Onshore-SWest	% Difference	0.0	0.0	0.0	0.3	19.1	36.1	51.4
	Onshore-RkyMtn	% Difference	0.0	0.0	-0.1	0.3	8.6	19.9	24.9
	Onshore-Other	% Difference	0.0	0.0	0.0	0.0	0.1	0.1	2.7
	Onshore-Midco	% Difference	0.0	0.0	0.0	0.3	17.5	37.8	42.8
	Onshore-Gulf	% Difference	0.0	0.0	-0.1	0.2	32.0	56.1	70.2
	Onshore-East	% Difference	0.0	0.0	-0.1	0.8	5.0	9.9	13.6
	Offshore	% Difference	0.0	0.0	0.0	0.3	12.1	25.3	16.0
	Total	% Difference	0.0	0.0	-0.1	0.5	15.2	28.2	36.1

Table 14. U.S. natural gas consumption, tabulated by year. (see Figure 6)

Scenario	U.S. Natural Gas Consumption	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	Transportation	Tcf	0.9	0.9	0.8	0.8	0.8	0.9	1.0
	Residential	Tcf	4.7	4.8	4.8	4.6	4.4	4.3	4.2
	Power	Tcf	11.6	10.6	9.1	8.0	9.2	10.4	9.9
	Industrial	Tcf	10.1	11.1	12.1	12.8	13.7	14.3	14.7
	Hydrogen	Tcf	0.0	0.0	0.2	0.3	0.4	0.9	1.2
	Commercial	Tcf	3.2	3.4	3.4	3.4	3.4	3.3	3.3
	Total	Tcf	30.5	30.8	30.4	29.8	31.9	34.0	34.2
DP Hi US Sup: MR	Transportation	Tcf	0.9	0.9	0.8	0.8	0.8	1.0	1.1
	Residential	Tcf	4.7	4.8	4.8	4.6	4.4	4.3	4.2

Scenario	U.S. Natural Gas Consumption	Units	2020	2025	2030	2035	2040	2045	2050
	Power	Tcf	11.6	10.6	8.9	7.7	8.6	9.3	9.2
	Industrial	Tcf	10.1	11.1	12.1	12.8	14.1	15.2	15.8
	Hydrogen	Tcf	0.0	0.0	0.2	0.3	0.4	0.9	1.1
	Commercial	Tcf	3.2	3.4	3.4	3.4	3.3	3.3	3.2
	Total	Tcf	30.5	30.8	30.3	29.6	31.6	33.8	34.7
DP: ExFID	Transportation	Tcf	0.9	0.8	0.7	0.7	0.8	0.8	0.9
	Residential	Tcf	4.7	4.7	4.7	4.5	4.3	4.2	4.2
	Power	Tcf	11.6	10.1	7.8	7.1	7.6	7.7	7.8
	Industrial	Tcf	10.1	10.5	11.1	11.4	11.7	11.8	12.1
	Hydrogen	Tcf	0.0	0.0	0.2	0.3	0.4	0.9	1.2
	Commercial	Tcf	3.2	3.4	3.4	3.4	3.3	3.2	3.2
	Total	Tcf	30.5	29.6	28.0	27.4	28.2	28.7	29.3
DP: MR	Transportation	Tcf	0.9	0.8	0.7	0.7	0.8	0.9	1.0
	Residential	Tcf	4.7	4.7	4.7	4.5	4.3	4.2	4.1
	Power	Tcf	11.6	10.1	7.9	7.0	7.1	7.2	6.5
	Industrial	Tcf	10.1	10.5	11.1	11.4	12.1	12.8	13.4
	Hydrogen	Tcf	0.0	0.0	0.2	0.3	0.4	0.9	1.2
	Commercial	Tcf	3.2	3.4	3.4	3.4	3.3	3.2	3.2
	Total	Tcf	30.5	29.6	28.1	27.4	28.1	29.2	29.3
DP Lo US Sup: ExFID	Transportation	Tcf	0.9	0.8	0.7	0.7	0.7	0.7	0.8
	Residential	Tcf	4.7	4.6	4.6	4.4	4.2	4.1	4.0
	Power	Tcf	11.6	8.3	4.0	3.8	4.0	3.6	3.7
	Industrial	Tcf	10.1	9.5	9.6	9.7	9.7	9.5	9.4
	Hydrogen	Tcf	0.0	0.0	0.2	0.3	0.4	0.9	1.2
	Commercial	Tcf	3.2	3.3	3.2	3.2	3.1	3.0	3.0
	Total	Tcf	30.5	26.5	22.3	22.0	22.1	21.9	22.0
DP Lo US Sup: MR	Transportation	Tcf	0.9	0.8	0.7	0.7	0.7	0.8	0.9
	Residential	Tcf	4.7	4.6	4.6	4.4	4.2	4.1	4.0
	Power	Tcf	11.6	8.3	4.0	3.7	3.8	3.4	3.2
	Industrial	Tcf	10.1	9.5	9.6	9.7	10.2	10.4	10.4
	Hydrogen	Tcf	0.0	0.0	0.2	0.3	0.4	0.9	1.2
	Commercial	Tcf	3.2	3.3	3.2	3.2	3.1	3.0	2.9
	Total	Tcf	30.5	26.5	22.4	21.9	22.4	22.5	22.5
Diff_DP Hi US Sup	Transportation	Tcf	0.0	0.0	0.0	0.0	0.0	0.1	0.2
	Residential	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power	Tcf	0.0	0.0	-0.1	-0.3	-0.7	-1.1	-0.7
	Industrial	Tcf	0.0	0.0	0.0	0.0	0.4	0.9	1.1
	Hydrogen	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Commercial	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	Tcf	0.0	0.0	-0.1	-0.3	-0.3	-0.2	0.5
Diff_DP	Transportation	Tcf	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	Residential	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power	Tcf	0.0	0.0	0.1	0.0	-0.5	-0.5	-1.4
	Industrial	Tcf	0.0	0.0	0.0	0.0	0.4	1.0	1.3
	Hydrogen	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Commercial	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	Tcf	0.0	0.0	0.1	0.0	0.0	0.5	0.0
Diff_DP Lo US Sup	Transportation	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.1
	Residential	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power	Tcf	0.0	0.0	0.1	-0.1	-0.2	-0.2	-0.5
	Industrial	Tcf	0.0	0.0	0.0	0.0	0.5	0.8	1.0
	Hydrogen	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Commercial	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
	Total	Tcf	0.0	0.0	0.1	-0.1	0.2	0.6	0.5
Diff_DP Hi US Sup	Transportation	% Difference	0.0	-0.2	-0.4	-0.1	1.7	8.5	17.0
	Residential	% Difference	0.0	0.0	0.0	0.0	-0.3	-0.3	-0.4
	Power	% Difference	0.0	0.1	-1.5	-3.4	-7.4	-10.8	-7.4
	Industrial	% Difference	0.0	0.0	-0.1	0.0	3.1	6.3	7.7
	Hydrogen	% Difference	0.0	0.0	0.0	0.0	-0.2	-1.6	-1.4
	Commercial	% Difference	0.0	0.0	0.0	0.0	-0.6	-0.7	-1.0
	Total	% Difference	0.0	0.0	-0.5	-0.9	-0.9	-0.6	1.5
Diff_DP	Transportation	% Difference	0.0	0.0	0.4	0.0	5.9	10.3	12.4
	Residential	% Difference	0.0	0.0	0.0	0.0	-0.3	-0.5	-0.5
	Power	% Difference	0.0	0.0	1.4	-0.6	-6.4	-6.6	-17.4

Scenario	U.S. Natural Gas Consumption	Units	2020	2025	2030	2035	2040	2045	2050
	Industrial	% Difference	0.0	0.0	0.2	0.1	3.8	8.7	10.8
	Hydrogen	% Difference	0.0	0.0	0.0	0.0	-0.3	-0.9	0.3
	Commercial	% Difference	0.0	0.0	0.0	0.0	-0.7	-1.1	-1.3
	Total	% Difference	0.0	0.0	0.5	-0.1	-0.1	1.9	0.0
Diff_DP Lo US Sup	Transportation	% Difference	0.0	0.0	-0.1	0.3	4.4	6.4	11.6
	Residential	% Difference	0.0	0.0	0.0	0.0	-0.4	-0.7	-1.0
	Power	% Difference	0.0	-0.1	2.4	-1.7	-5.6	-5.1	-12.9
	Industrial	% Difference	0.0	0.0	0.0	0.1	4.9	8.8	10.2
	Hydrogen	% Difference	0.0	-28.6	0.0	-2.3	-0.1	-0.9	-1.0
	Commercial	% Difference	0.0	0.0	0.0	0.0	-0.8	-1.5	-2.1
	Total	% Difference	0.0	0.0	0.4	-0.3	1.1	2.8	2.1

Table 15. Differences in natural gas consumption by sub-sector, tabulated by year.(see Figure 7)

Scenario	U.S. Natural Gas Consumption	Units	2020	2025	2030	2035	2040	2045	2050
Diff_DP Hi US Sup	Vehicles	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Residential	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power	Tcf	0.0	0.0	-0.1	-0.3	-0.7	-1.1	-0.7
	Pipeline Fuel	Tcf	0.0	0.0	0.0	0.0	0.0	0.1	0.2
	Other Industrial	Tcf	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.2
	Liquefy for Export	Tcf	0.0	0.0	0.0	0.0	0.4	0.7	0.9
	Lease/Plant Fuel	Tcf	0.0	0.0	0.0	0.0	0.2	0.3	0.5
	Hydrogen	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Commercial	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	Tcf	0.0	0.0	-0.1	-0.3	-0.3	-0.2	0.5
Diff_DP	Vehicles	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Residential	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power	Tcf	0.0	0.0	0.1	0.0	-0.5	-0.5	-1.4
	Pipeline Fuel	Tcf	0.0	0.0	0.0	0.0	0.1	0.1	0.1
	Other Industrial	Tcf	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
	Liquefy for Export	Tcf	0.0	0.0	0.0	0.0	0.4	0.7	0.9
	Lease/Plant Fuel	Tcf	0.0	0.0	0.0	0.0	0.2	0.4	0.5
	Hydrogen	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Commercial	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total	Tcf	0.0	0.0	0.1	0.0	0.0	0.5	0.0
Diff_DP Lo US Sup	Vehicles	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Residential	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Power	Tcf	0.0	0.0	0.1	-0.1	-0.2	-0.2	-0.5
	Pipeline Fuel	Tcf	0.0	0.0	0.0	0.0	0.0	0.1	0.1
	Other Industrial	Tcf	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.3
	Liquefy for Export	Tcf	0.0	0.0	0.0	0.0	0.4	0.7	0.9
	Lease/Plant Fuel	Tcf	0.0	0.0	0.0	0.0	0.2	0.3	0.4
	Hydrogen	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Commercial	Tcf	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
	Total	Tcf	0.0	0.0	0.1	-0.1	0.2	0.6	0.5

Table 16. Total U.S. energy-related CO_2 emissions, tabulated by year. (see Figure 19)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	Gt CO_2	4.58	4.66	3.94	3.57	3.45	3.46	3.39
DP Hi US Sup: MR	Gt CO_2	4.58	4.66	3.92	3.55	3.45	3.47	3.44
DP: ExFID	Gt CO_2	4.58	4.58	3.79	3.35	3.12	3.03	3.01
DP: MR	Gt CO_2	4.58	4.58	3.80	3.35	3.13	3.08	3.03
DP Lo US Sup: ExFID	Gt CO_2	4.58	4.45	3.56	3.11	2.77	2.62	2.56
DP Lo US Sup: MR	Gt CO_2	4.58	4.45	3.57	3.11	2.79	2.66	2.60
Diff_DP Hi US Sup	Gt CO_2	0	0.00	-0.01	-0.01	-0.01	0.01	0.05
Diff_DP	Gt CO_2	0	-0.01	0.01	0.00	0.01	0.05	0.02
Diff_DP Lo US Sup	Gt CO_2	0	0.00	0.02	0.00	0.02	0.05	0.04
Diff_DP Hi US Sup	% Difference	0	-0.02	-0.32	-0.37	-0.18	0.17	1.36
Diff_DP	% Difference	0	-0.13	0.26	0.06	0.21	1.61	0.75
Diff_DP Lo US Sup	% Difference	0	-0.02	0.51	-0.01	0.74	1.81	1.57

Table 17. Natural gas price by gas supply region, tabulated by year. (see Figure 8 and Figure 9)

Scenario	Region	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	East	$2022/MMBtu	1.38	2.32	1.61	1.67	1.72	1.73	1.62
DP Hi US Sup: MR	East	$2022/MMBtu	1.38	2.33	1.61	1.66	1.73	1.73	1.64
DP: ExFID	East	$2022/MMBtu	1.38	2.91	1.76	1.89	2.18	2.18	1.95
DP: MR	East	$2022/MMBtu	1.38	2.88	1.76	1.86	2.35	2.33	2.13
DP Lo US Sup: ExFID	East	$2022/MMBtu	1.38	5.10	3.88	4.71	4.94	4.73	4.61
DP Lo US Sup: MR	East	$2022/MMBtu	1.38	5.11	3.87	4.75	5.13	5.07	5.13
Diff_DP Hi US Sup	East	$2022/MMBtu	0.00	0.00	0.00	0.00	0.02	0.00	0.01
Diff_DP	East	$2022/MMBtu	0.00	-0.02	-0.01	-0.03	0.17	0.15	0.18
Diff_DP Lo US Sup	East	$2022/MMBtu	0.00	0.01	-0.01	0.03	0.18	0.34	0.52
Diff_DP Hi US Sup	East	% Difference	0.0	0.2	0.2	-0.2	0.9	-0.1	0.8
Diff_DP	East	% Difference	0.0	-0.8	-0.3	-1.7	7.6	6.8	9.1
Diff_DP Lo US Sup	East	% Difference	0.0	0.1	-0.2	0.7	3.7	7.3	11.3
DP Hi US Sup: ExFID	Gulf Coast	$2022/MMBtu	1.78	2.78	1.96	2.29	2.37	2.21	2.12
DP Hi US Sup: MR	Gulf Coast	$2022/MMBtu	1.78	2.80	1.98	2.31	2.85	2.88	3.04
DP: ExFID	Gulf Coast	$2022/MMBtu	1.78	3.54	2.47	3.07	3.33	3.34	3.18
DP: MR	Gulf Coast	$2022/MMBtu	1.78	3.52	2.47	3.08	3.94	4.15	4.23
DP Lo US Sup: ExFID	Gulf Coast	$2022/MMBtu	1.78	5.97	4.75	6.48	7.30	7.08	7.03
DP Lo US Sup: MR	Gulf Coast	$2022/MMBtu	1.78	5.98	4.74	6.55	8.30	8.82	9.33
Diff_DP Hi US Sup	Gulf Coast	$2022/MMBtu	0.00	0.02	0.02	0.02	0.47	0.67	0.92
Diff_DP	Gulf Coast	$2022/MMBtu	0.00	-0.02	0.00	0.01	0.62	0.81	1.05
Diff_DP Lo US Sup	Gulf Coast	$2022/MMBtu	0.00	0.01	-0.01	0.06	1.01	1.75	2.31
Diff_DP Hi US Sup	Gulf Coast	% Difference	0.0	0.7	1.3	1.0	19.9	30.4	43.5
Diff_DP	Gulf Coast	% Difference	0.0	-0.5	0.0	0.4	18.5	24.3	33.2
Diff_DP Lo US Sup	Gulf Coast	% Difference	0.0	0.1	-0.2	1.0	13.8	24.7	32.8
DP Hi US Sup: ExFID	Midcontinent	$2022/MMBtu	1.59	2.43	1.73	2.02	2.14	1.96	1.85
DP Hi US Sup: MR	Midcontinent	$2022/MMBtu	1.59	2.45	1.74	2.04	2.50	2.44	2.48
DP: ExFID	Midcontinent	$2022/MMBtu	1.59	3.21	2.19	2.74	2.97	2.97	2.82
DP: MR	Midcontinent	$2022/MMBtu	1.59	3.19	2.18	2.74	3.49	3.63	3.64
DP Lo US Sup: ExFID	Midcontinent	$2022/MMBtu	1.59	5.49	4.39	6.08	6.91	6.70	6.57
DP Lo US Sup: MR	Midcontinent	$2022/MMBtu	1.59	5.50	4.39	6.13	7.66	7.91	8.26
Diff_DP Hi US Sup	Midcontinent	$2022/MMBtu	0.00	0.01	0.01	0.01	0.36	0.48	0.63
Diff_DP	Midcontinent	$2022/MMBtu	0.00	-0.02	-0.01	0.00	0.52	0.65	0.82
Diff_DP Lo US Sup	Midcontinent	$2022/MMBtu	0.00	0.01	-0.01	0.06	0.75	1.21	1.69
Diff_DP Hi US Sup	Midcontinent	% Difference	0.0	0.6	0.5	0.7	16.8	24.3	34.0
Diff_DP	Midcontinent	% Difference	0.0	-0.6	-0.2	0.0	17.5	22.0	29.1
Diff_DP Lo US Sup	Midcontinent	% Difference	0.0	0.2	-0.2	0.9	10.9	18.1	25.8
DP Hi US Sup: ExFID	Southwest	$2022/MMBtu	1.42	2.40	1.72	1.98	2.10	1.94	1.88
DP Hi US Sup: MR	Southwest	$2022/MMBtu	1.42	2.41	1.72	2.00	2.54	2.57	2.73
DP: ExFID	Southwest	$2022/MMBtu	1.42	3.18	2.16	2.76	3.03	3.06	2.90
DP: MR	Southwest	$2022/MMBtu	1.42	3.16	2.16	2.77	3.62	3.84	3.92
DP Lo US Sup: ExFID	Southwest	$2022/MMBtu	1.42	5.70	4.55	6.27	7.12	6.88	6.73
DP Lo US Sup: MR	Southwest	$2022/MMBtu	1.42	5.71	4.55	6.33	7.94	8.42	8.98
Diff_DP Hi US Sup	Southwest	$2022/MMBtu	0.00	0.01	0.00	0.02	0.45	0.63	0.86
Diff_DP	Southwest	$2022/MMBtu	0.00	-0.02	0.00	0.00	0.59	0.78	1.02
Diff_DP Lo US Sup	Southwest	$2022/MMBtu	0.00	0.01	-0.01	0.06	0.82	1.54	2.25
Diff_DP Hi US Sup	Southwest	% Difference	0.0	0.6	0.2	0.9	21.4	32.3	45.6
Diff_DP	Southwest	% Difference	0.0	-0.6	-0.2	0.0	19.5	25.6	35.1
Diff_DP Lo US Sup	Southwest	% Difference	0.0	0.1	-0.2	1.0	11.5	22.4	33.4
DP Hi US Sup: ExFID	Rocky Mountain	$2022/MMBtu	1.71	2.38	1.66	1.88	2.03	1.95	1.93
DP Hi US Sup: MR	Rocky Mountain	$2022/MMBtu	1.71	2.39	1.67	1.88	2.41	2.40	2.45
DP: ExFID	Rocky Mountain	$2022/MMBtu	1.71	3.14	2.10	2.69	2.95	2.97	2.87
DP: MR	Rocky Mountain	$2022/MMBtu	1.71	3.12	2.10	2.69	3.47	3.64	3.69
DP Lo US Sup: ExFID	Rocky Mountain	$2022/MMBtu	1.71	5.41	4.31	6.00	6.84	6.65	6.49
DP Lo US Sup: MR	Rocky Mountain	$2022/MMBtu	1.71	5.41	4.30	6.05	7.53	7.82	8.11

Scenario	Region	Units	2020	2025	2030	2035	2040	2045	2050
Diff_DP Hi US Sup	Rocky Mountain	$2022/MMBtu	0.00	0.01	0.01	0.00	0.38	0.46	0.52
Diff_DP	Rocky Mountain	$2022/MMBtu	0.00	-0.02	-0.01	0.00	0.52	0.66	0.82
Diff_DP Lo US Sup	Rocky Mountain	$2022/MMBtu	0.00	0.01	-0.01	0.05	0.69	1.18	1.62
Diff_DP Hi US Sup	Rocky Mountain	% Difference	0	0.5	0.5	-0.2	19.0	23.4	26.6
Diff_DP	Rocky Mountain	% Difference	0	-0.6	-0.4	-0.1	17.8	22.3	28.7
Diff_DP Lo US Sup	Rocky Mountain	% Difference	0	0.1	-0.2	0.9	10.1	17.7	25.0
DP Hi US Sup: ExFID	Northern Great Plains	$2022/MMBtu	3.05	3.36	2.46	2.72	3.08	3.04	3.03
DP Hi US Sup: MR	Northern Great Plains	$2022/MMBtu	3.05	3.37	2.50	2.66	3.30	3.30	3.45
DP: ExFID	Northern Great Plains	$2022/MMBtu	3.05	4.07	2.79	3.33	3.65	3.70	3.70
DP: MR	Northern Great Plains	$2022/MMBtu	3.05	4.06	2.84	3.38	4.17	4.41	4.54
DP Lo US Sup: ExFID	Northern Great Plains	$2022/MMBtu	3.05	6.12	4.81	6.54	7.33	7.13	6.98
DP Lo US Sup: MR	Northern Great Plains	$2022/MMBtu	3.05	6.13	4.81	6.60	8.09	8.42	8.89
Diff_DP Hi US Sup	Northern Great Plains	$2022/MMBtu	0.00	0.02	0.03	-0.06	0.22	0.26	0.42
Diff_DP	Northern Great Plains	$2022/MMBtu	0.00	-0.01	0.05	0.05	0.52	0.71	0.84
Diff_DP Lo US Sup	Northern Great Plains	$2022/MMBtu	0.00	0.01	0.00	0.06	0.76	1.28	1.92
Diff_DP Hi US Sup	Northern Great Plains	% Difference	0.0	0.5	1.3	-2.1	7.1	8.7	13.8
Diff_DP	Northern Great Plains	% Difference	0.0	-0.2	1.8	1.4	14.2	19.3	22.7
Diff_DP Lo US Sup	Northern Great Plains	% Difference	0.0	0.1	-0.1	1.0	10.4	18.0	27.5
DP Hi US Sup: ExFID	West Coast	$2022/MMBtu	1.90	2.39	1.71	1.97	2.13	1.99	1.87
DP Hi US Sup: MR	West Coast	$2022/MMBtu	1.90	2.40	1.72	1.97	2.41	2.27	2.18
DP: ExFID	West Coast	$2022/MMBtu	1.90	3.00	2.07	2.53	2.72	2.65	2.47
DP: MR	West Coast	$2022/MMBtu	1.90	2.98	2.06	2.53	3.08	3.05	2.88
DP Lo US Sup: ExFID	West Coast	$2022/MMBtu	1.90	4.87	3.90	5.18	5.55	5.27	5.16
DP Lo US Sup: MR	West Coast	$2022/MMBtu	1.90	4.87	3.89	5.22	5.90	6.00	6.24
Diff_DP Hi US Sup	West Coast	$2022/MMBtu	0.00	0.01	0.01	0.00	0.28	0.28	0.32
Diff_DP	West Coast	$2022/MMBtu	0.00	-0.01	-0.01	0.00	0.36	0.40	0.41
Diff_DP Lo US Sup	West Coast	$2022/MMBtu	0.00	0.00	-0.01	0.05	0.36	0.73	1.08
Diff_DP Hi US Sup	West Coast	% Difference	0.0	0.3	0.7	0.1	13.1	14.1	17.0
Diff_DP	West Coast	% Difference	0.0	-0.5	-0.4	-0.2	13.4	15.1	16.6
Diff_DP Lo US Sup	West Coast	% Difference	0.0	0.1	-0.3	0.9	6.4	13.8	20.9

Table 18. Residential natural gas price, tabulated by year. (see Figure 10)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	$2022/MMBtu	11.64	11.74	10.54	11.07	11.49	11.71	11.68
DP Hi US Sup: MR	$2022/MMBtu	11.64	11.75	10.53	11.08	11.71	11.97	12.03
DP: ExFID	$2022/MMBtu	11.64	12.42	10.87	11.54	12.05	12.28	12.31
DP: MR	$2022/MMBtu	11.64	12.39	10.87	11.55	12.38	12.72	12.80
DP Lo US Sup: ExFID	$2022/MMBtu	11.64	14.58	12.86	14.34	15.03	15.08	15.18
DP Lo US Sup: MR	$2022/MMBtu	11.64	14.58	12.84	14.37	15.47	15.89	16.31
Diff_DP Hi US Sup	$2022/MMBtu	0.00	0.01	-0.01	0.01	0.22	0.26	0.36
Diff_DP	$2022/MMBtu	0.00	-0.03	0.00	0.01	0.33	0.44	0.50
Diff_DP Lo US Sup	$2022/MMBtu	0.00	0.00	-0.01	0.04	0.44	0.81	1.13
Diff_DP Hi US Sup	% Difference	0.0	0.1	-0.1	0.1	1.9	2.2	3.1
Diff_DP	% Difference	0.0	-0.2	0.0	0.1	2.7	3.6	4.0
Diff_DP Lo US Sup	% Difference	0.0	0.0	-0.1	0.3	2.9	5.4	7.5

Table 19. Industrial natural gas price, tabulated by year. (see Table 6)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	$2022/MMBtu	3.09	4.20	3.34	3.60	3.73	3.61	3.50
DP Hi US Sup: MR	$2022/MMBtu	3.09	4.22	3.36	3.61	4.08	4.08	4.13
DP: ExFID	$2022/MMBtu	3.09	4.93	3.79	4.27	4.50	4.50	4.35
DP: MR	$2022/MMBtu	3.09	4.91	3.79	4.27	4.98	5.13	5.13
DP Lo US Sup: ExFID	$2022/MMBtu	3.09	7.19	5.94	7.44	8.04	7.82	7.73
DP Lo US Sup: MR	$2022/MMBtu	3.09	7.20	5.93	7.49	8.73	9.04	9.40
Diff_DP Hi US Sup	$2022/MMBtu	0.00	0.01	0.02	0.01	0.35	0.47	0.64
Diff_DP	$2022/MMBtu	0.00	-0.02	0.00	0.01	0.49	0.64	0.78
Diff_DP Lo US Sup	$2022/MMBtu	0.00	0.01	-0.01	0.05	0.68	1.21	1.67
Diff_DP Hi US Sup	% Difference	0.0	0.3	0.5	0.2	9.4	12.9	18.2
Diff_DP	% Difference	0.0	-0.4	0.0	0.2	10.8	14.1	18.0
Diff_DP Lo US Sup	% Difference	0.0	0.1	-0.2	0.7	8.5	15.5	21.6

Table 20. Power Sector natural gas price, tabulated by year. (see Table 6)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	$2022/MMBtu	2.63	3.52	2.61	2.87	3.07	2.93	2.75
DP Hi US Sup: MR	$2022/MMBtu	2.63	3.53	2.61	2.87	3.37	3.27	3.21
DP: ExFID	$2022/MMBtu	2.63	4.19	2.97	3.46	3.82	3.84	3.57
DP: MR	$2022/MMBtu	2.63	4.17	2.97	3.44	4.23	4.28	4.21
DP Lo US Sup: ExFID	$2022/MMBtu	2.63	6.31	4.67	6.19	7.03	6.61	6.21
DP Lo US Sup: MR	$2022/MMBtu	2.63	6.32	4.65	6.27	7.57	7.48	7.46
Diff_DP Hi US Sup	$2022/MMBtu	0.00	0.01	0.01	0.00	0.30	0.34	0.46
Diff_DP	$2022/MMBtu	0.00	-0.02	0.00	-0.02	0.41	0.44	0.64
Diff_DP Lo US Sup	$2022/MMBtu	0.00	0.01	-0.02	0.08	0.54	0.87	1.25
Diff_DP Hi US Sup	% Difference	0.0	0.3	0.2	0.0	9.9	11.6	16.8
Diff_DP	% Difference	0.0	-0.6	0.1	-0.6	10.7	11.4	18.0
Diff_DP Lo US Sup	% Difference	0.0	0.1	-0.4	1.3	7.7	13.2	20.2

Table 21. Commercial natural gas price, tabulated by year. (see Table 6)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	$2022/MMBtu	8.17	8.52	7.81	8.06	8.25	8.32	8.21
DP Hi US Sup: MR	$2022/MMBtu	8.17	8.53	7.79	8.07	8.46	8.58	8.56
DP: ExFID	$2022/MMBtu	8.17	9.13	8.12	8.51	8.79	8.87	8.82
DP: MR	$2022/MMBtu	8.17	9.10	8.11	8.52	9.11	9.30	9.30
DP Lo US Sup: ExFID	$2022/MMBtu	8.17	11.08	10.00	11.17	11.63	11.54	11.57
DP Lo US Sup: MR	$2022/MMBtu	8.17	11.08	9.99	11.21	12.05	12.32	12.67
Diff_DP Hi US Sup	$2022/MMBtu	0.00	0.01	-0.02	0.01	0.21	0.25	0.35
Diff_DP	$2022/MMBtu	0.00	-0.03	0.00	0.01	0.32	0.42	0.48
Diff_DP Lo US Sup	$2022/MMBtu	0.00	0.00	-0.01	0.03	0.42	0.78	1.10
Diff_DP Hi US Sup	% Difference	0.0	0.1	-0.2	0.1	2.6	3.0	4.3
Diff_DP	% Difference	0.0	-0.3	0.0	0.1	3.6	4.8	5.4
Diff_DP Lo US Sup	% Difference	0.0	0.0	-0.1	0.3	3.6	6.8	9.5

Table 22. Transportation natural gas price, tabulated by year. (see Table 6)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	$2022/MMBtu	14.70	13.92	12.38	11.94	11.23	10.31	9.58
DP Hi US Sup: MR	$2022/MMBtu	14.70	13.93	12.39	11.94	11.55	10.71	10.09
DP: ExFID	$2022/MMBtu	14.70	14.68	12.70	12.51	11.99	11.28	10.46
DP: MR	$2022/MMBtu	14.70	14.67	12.71	12.54	12.49	11.86	11.22
DP Lo US Sup: ExFID	$2022/MMBtu	14.70	17.11	15.11	16.29	16.61	15.51	14.65
DP Lo US Sup: MR	$2022/MMBtu	14.70	17.12	15.10	16.35	17.41	17.48	17.04
Diff_DP Hi US Sup	$2022/MMBtu	0.00	0.01	0.02	0.00	0.33	0.40	0.51
Diff_DP	$2022/MMBtu	0.00	-0.01	0.01	0.03	0.50	0.58	0.76
Diff_DP Lo US Sup	$2022/MMBtu	0.00	0.01	-0.01	0.05	0.80	1.97	2.39
Diff_DP Hi US Sup	% Difference	0.0	0.1	0.1	0.0	2.9	3.9	5.3
Diff_DP	% Difference	0.0	-0.1	0.1	0.3	4.2	5.2	7.2
Diff_DP Lo US Sup	% Difference	0.0	0.0	-0.1	0.3	4.8	12.7	16.3

Table 23. Residential natural gas price by region, tabulated by year. (see Figure 11 and Figure 12)

Scenario	Region	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	New England	$2022/MMBtu	15.80	16.05	15.19	15.03	14.97	14.95	14.87
DP Hi US Sup: MR	New England	$2022/MMBtu	15.80	16.05	15.17	15.03	15.01	14.97	14.92
DP: ExFID	New England	$2022/MMBtu	15.80	16.27	15.24	15.14	15.13	15.09	15.02
DP: MR	New England	$2022/MMBtu	15.80	16.26	15.24	15.16	15.22	15.19	15.12
DP Lo US Sup: ExFID	New England	$2022/MMBtu	15.80	17.39	16.01	16.32	16.33	16.15	16.12
DP Lo US Sup: MR	New England	$2022/MMBtu	15.80	17.39	16.00	16.33	16.43	16.37	16.45
Diff_DP Hi US Sup	New England	$2022/MMBtu	0.00	0.00	-0.02	0.00	0.04	0.02	0.06
Diff_DP	New England	$2022/MMBtu	0.00	-0.01	-0.01	0.02	0.09	0.11	0.10
Diff_DP Lo US Sup	New England	$2022/MMBtu	0.00	0.00	0.00	0.01	0.10	0.22	0.33
Diff_DP Hi US Sup	New England	% Difference	0.0	0.0	-0.1	0.0	0.3	0.2	0.4
Diff_DP	New England	% Difference	0.0	-0.1	-0.1	0.1	0.6	0.7	0.7
Diff_DP Lo US Sup	New England	% Difference	0.0	0.0	0.0	0.1	0.6	1.4	2.1
DP Hi US Sup: ExFID	Middle Atlantic	$2022/MMBtu	12.61	11.16	10.00	9.99	10.19	10.47	9.85
DP Hi US Sup: MR	Middle Atlantic	$2022/MMBtu	12.61	11.16	9.87	9.99	10.26	10.47	9.98
DP: ExFID	Middle Atlantic	$2022/MMBtu	12.61	11.68	10.08	10.31	10.61	10.65	10.47
DP: MR	Middle Atlantic	$2022/MMBtu	12.61	11.66	10.07	10.32	10.80	10.90	10.68
DP Lo US Sup: ExFID	Middle Atlantic	$2022/MMBtu	12.61	13.58	12.04	12.93	13.22	13.09	13.01
DP Lo US Sup: MR	Middle Atlantic	$2022/MMBtu	12.61	13.58	12.03	12.96	13.41	13.44	13.53
Diff_DP Hi US Sup	Middle Atlantic	$2022/MMBtu	0.00	0.00	-0.13	0.00	0.07	0.00	0.13
Diff_DP	Middle Atlantic	$2022/MMBtu	0.00	-0.02	-0.02	0.01	0.19	0.24	0.21
Diff_DP Lo US Sup	Middle Atlantic	$2022/MMBtu	0.00	0.00	-0.01	0.03	0.19	0.35	0.52
Diff_DP Hi US Sup	Middle Atlantic	% Difference	0.0	0.0	-1.3	0.0	0.7	0.0	1.3
Diff_DP	Middle Atlantic	% Difference	0.0	-0.2	-0.2	0.1	1.8	2.3	2.0
Diff_DP Lo US Sup	Middle Atlantic	% Difference	0.0	0.0	-0.1	0.2	1.4	2.7	4.0
DP Hi US Sup: ExFID	East North Central	$2022/MMBtu	8.99	9.24	8.32	9.03	9.46	9.63	9.68
DP Hi US Sup: MR	East North Central	$2022/MMBtu	8.99	9.26	8.33	9.04	9.70	9.91	10.03
DP: ExFID	East North Central	$2022/MMBtu	8.99	10.02	8.78	9.52	10.05	10.30	10.32
DP: MR	East North Central	$2022/MMBtu	8.99	9.99	8.77	9.52	10.39	10.73	10.77
DP Lo US Sup: ExFID	East North Central	$2022/MMBtu	8.99	12.39	10.97	12.54	13.16	13.21	13.33
DP Lo US Sup: MR	East North Central	$2022/MMBtu	8.99	12.39	10.95	12.58	13.45	13.79	14.20
Diff_DP Hi US Sup	East North Central	$2022/MMBtu	0.00	0.01	0.02	0.02	0.24	0.28	0.35
Diff_DP	East North Central	$2022/MMBtu	0.00	-0.04	-0.01	0.00	0.33	0.43	0.45
Diff_DP Lo US Sup	East North Central	$2022/MMBtu	0.00	0.00	-0.01	0.04	0.29	0.59	0.87
Diff_DP Hi US Sup	East North Central	% Difference	0.0	0.2	0.2	0.2	2.6	2.9	3.6
Diff_DP	East North Central	% Difference	0.0	-0.4	-0.1	0.0	3.3	4.2	4.4
Diff_DP Lo US Sup	East North Central	% Difference	0.0	0.0	-0.1	0.3	2.2	4.5	6.5
DP Hi US Sup: ExFID	West North Central	$2022/MMBtu	9.32	9.89	9.16	9.81	10.22	10.31	10.31
DP Hi US Sup: MR	West North Central	$2022/MMBtu	9.32	9.90	9.18	9.83	10.53	10.71	10.82
DP: ExFID	West North Central	$2022/MMBtu	9.32	10.65	9.65	10.45	10.90	11.09	11.05
DP: MR	West North Central	$2022/MMBtu	9.32	10.62	9.65	10.46	11.34	11.66	11.68
DP Lo US Sup: ExFID	West North Central	$2022/MMBtu	9.32	12.86	11.87	13.49	14.19	14.19	14.27
DP Lo US Sup: MR	West North Central	$2022/MMBtu	9.32	12.87	11.86	13.53	14.64	15.15	15.54
Diff_DP Hi US Sup	West North Central	$2022/MMBtu	0.00	0.01	0.02	0.02	0.32	0.39	0.51
Diff_DP	West North Central	$2022/MMBtu	0.00	-0.03	0.00	0.01	0.44	0.57	0.63
Diff_DP Lo US Sup	West North Central	$2022/MMBtu	0.00	0.00	-0.01	0.04	0.46	0.97	1.28
Diff_DP Hi US Sup	West North Central	% Difference	0.0	0.1	0.2	0.2	3.1	3.8	5.0
Diff_DP	West North Central	% Difference	0.0	-0.3	0.0	0.1	4.0	5.1	5.7
Diff_DP Lo US Sup	West North Central	% Difference	0.0	0.0	-0.1	0.3	3.2	6.8	8.9
DP Hi US Sup: ExFID	South Atlantic	$2022/MMBtu	14.88	15.08	14.95	15.55	16.03	16.32	16.52
DP Hi US Sup: MR	South Atlantic	$2022/MMBtu	14.88	15.09	14.96	15.57	16.25	16.62	16.90
DP: ExFID	South Atlantic	$2022/MMBtu	14.88	15.58	15.25	15.97	16.57	16.92	17.10
DP: MR	South Atlantic	$2022/MMBtu	14.88	15.55	15.25	15.95	16.85	17.28	17.52
DP Lo US Sup: ExFID	South Atlantic	$2022/MMBtu	14.88	17.43	16.98	18.37	19.12	19.30	19.57
DP Lo US Sup: MR	South Atlantic	$2022/MMBtu	14.88	17.43	16.97	18.40	19.51	20.06	20.73
Diff_DP Hi US Sup	South Atlantic	$2022/MMBtu	0.00	0.01	0.00	0.01	0.21	0.30	0.38
Diff_DP	South Atlantic	$2022/MMBtu	0.00	-0.03	0.00	-0.02	0.28	0.36	0.42
Diff_DP Lo US Sup	South Atlantic	$2022/MMBtu	0.00	0.01	-0.01	0.03	0.39	0.76	1.16
Diff_DP Hi US Sup	South Atlantic	% Difference	0.0	0.1	0.0	0.1	1.3	1.8	2.3
Diff_DP	South Atlantic	% Difference	0.0	-0.2	0.0	-0.1	1.7	2.1	2.4
Diff_DP Lo US Sup	South Atlantic	% Difference	0.0	0.0	-0.1	0.1	2.0	3.9	5.9
DP Hi US Sup: ExFID	East South Central	$2022/MMBtu	11.94	11.58	11.96	12.78	13.32	13.56	13.73
DP Hi US Sup: MR	East South Central	$2022/MMBtu	11.94	11.60	11.98	12.81	13.69	14.05	14.36

Scenario	Region	Units	2020	2025	2030	2035	2040	2045	2050
DP: ExFID	East South Central	$2022/MMBtu	11.94	12.24	12.40	13.39	14.03	14.37	14.47
DP: MR	East South Central	$2022/MMBtu	11.94	12.21	12.41	13.39	14.46	14.97	15.19
DP Lo US Sup: ExFID	East South Central	$2022/MMBtu	11.94	14.23	14.36	16.12	17.00	17.15	17.36
DP Lo US Sup: MR	East South Central	$2022/MMBtu	11.94	14.23	14.34	16.16	17.59	18.32	19.04
Diff_DP Hi US Sup	East South Central	$2022/MMBtu	0.00	0.02	0.02	0.02	0.37	0.49	0.63
Diff_DP	East South Central	$2022/MMBtu	0.00	-0.03	0.01	0.00	0.43	0.60	0.72
Diff_DP Lo US Sup	East South Central	$2022/MMBtu	0.00	0.00	-0.02	0.04	0.59	1.18	1.68
Diff_DP Hi US Sup	East South Central	% Difference	0.0	0.1	0.2	0.2	2.8	3.6	4.6
Diff_DP	East South Central	% Difference	0.0	-0.2	0.1	0.0	3.1	4.1	5.0
Diff_DP Lo US Sup	East South Central	% Difference	0.0	0.0	-0.1	0.3	3.5	6.9	9.7
DP Hi US Sup: ExFID	West South Central	$2022/MMBtu	12.14	12.44	11.41	12.00	12.34	12.47	12.63
DP Hi US Sup: MR	West South Central	$2022/MMBtu	12.14	12.46	11.43	12.03	12.73	13.04	13.37
DP: ExFID	West South Central	$2022/MMBtu	12.14	13.16	11.84	12.63	13.09	13.35	13.44
DP: MR	West South Central	$2022/MMBtu	12.14	13.13	11.85	12.64	13.60	14.05	14.33
DP Lo US Sup: ExFID	West South Central	$2022/MMBtu	12.14	15.44	13.92	15.62	16.50	16.59	16.80
DP Lo US Sup: MR	West South Central	$2022/MMBtu	12.14	15.45	13.90	15.67	17.40	18.18	18.87
Diff_DP Hi US Sup	West South Central	$2022/MMBtu	0.00	0.02	0.02	0.02	0.39	0.57	0.75
Diff_DP	West South Central	$2022/MMBtu	0.00	-0.03	0.01	0.01	0.51	0.70	0.89
Diff_DP Lo US Sup	West South Central	$2022/MMBtu	0.00	0.00	-0.01	0.05	0.89	1.58	2.07
Diff_DP Hi US Sup	West South Central	% Difference	0.0	0.1	0.2	0.2	3.2	4.5	5.9
Diff_DP	West South Central	% Difference	0.0	-0.2	0.0	0.1	3.9	5.2	6.7
Diff_DP Lo US Sup	West South Central	% Difference	0.0	0.0	-0.1	0.3	5.4	9.5	12.3
DP Hi US Sup: ExFID	Mountain	$2022/MMBtu	9.01	9.56	9.49	10.17	10.62	10.75	10.79
DP Hi US Sup: MR	Mountain	$2022/MMBtu	9.01	9.57	9.51	10.17	10.94	11.15	11.29
DP: ExFID	Mountain	$2022/MMBtu	9.01	10.24	9.97	10.84	11.34	11.55	11.55
DP: MR	Mountain	$2022/MMBtu	9.01	10.22	9.98	10.85	11.79	12.15	12.28
DP Lo US Sup: ExFID	Mountain	$2022/MMBtu	9.01	12.22	12.04	13.80	14.75	14.79	14.82
DP Lo US Sup: MR	Mountain	$2022/MMBtu	9.01	12.22	12.03	13.83	15.42	15.93	16.29
Diff_DP Hi US Sup	Mountain	$2022/MMBtu	0.00	0.01	0.02	0.01	0.32	0.41	0.51
Diff_DP	Mountain	$2022/MMBtu	0.00	-0.02	0.00	0.01	0.44	0.59	0.73
Diff_DP Lo US Sup	Mountain	$2022/MMBtu	0.00	0.00	-0.01	0.03	0.67	1.14	1.47
Diff_DP Hi US Sup	Mountain	% Difference	0.0	0.1	0.2	0.1	3.0	3.8	4.7
Diff_DP	Mountain	% Difference	0.0	-0.2	0.0	0.1	3.9	5.1	6.3
Diff_DP Lo US Sup	Mountain	% Difference	0.0	0.0	-0.1	0.2	4.5	7.7	9.9
DP Hi US Sup: ExFID	Pacific	$2022/MMBtu	15.04	16.24	11.70	12.45	13.19	13.54	13.71
DP Hi US Sup: MR	Pacific	$2022/MMBtu	15.04	16.26	11.72	12.43	13.35	13.72	13.99
DP: ExFID	Pacific	$2022/MMBtu	15.04	17.17	11.93	12.86	13.62	14.02	14.21
DP: MR	Pacific	$2022/MMBtu	15.04	17.14	11.96	12.89	13.98	14.56	14.86
DP Lo US Sup: ExFID	Pacific	$2022/MMBtu	15.04	19.88	13.79	15.88	17.09	17.26	17.36
DP Lo US Sup: MR	Pacific	$2022/MMBtu	15.04	19.89	13.78	15.92	17.87	18.57	19.17
Diff_DP Hi US Sup	Pacific	$2022/MMBtu	0.00	0.02	0.02	-0.02	0.16	0.19	0.28
Diff_DP	Pacific	$2022/MMBtu	0.00	-0.03	0.03	0.02	0.36	0.54	0.65
Diff_DP Lo US Sup	Pacific	$2022/MMBtu	0.00	0.01	-0.01	0.04	0.78	1.31	1.81
Diff_DP Hi US Sup	Pacific	% Difference	0.0	0.1	0.2	-0.1	1.2	1.4	2.0
Diff_DP	Pacific	% Difference	0.0	-0.2	0.2	0.2	2.7	3.9	4.6
Diff_DP Lo US Sup	Pacific	% Difference	0.0	0.0	-0.1	0.3	4.5	7.6	10.4

Table 24. U.S. real GDP and differences, tabulated by year. (see Figure 14 and Figure 15)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	$2022, Trillion	23.33	26.35	29.45	32.62	36.37	40.35	44.24
DP Hi US Sup: MR	$2022, Trillion	23.33	26.35	29.45	32.61	36.38	40.38	44.25
DP: ExFID	$2022, Trillion	23.33	25.92	28.48	31.17	34.47	38.26	42.53
DP: MR	$2022, Trillion	23.33	25.92	28.51	31.18	34.48	38.34	42.61
DP Lo US Sup: ExFID	$2022, Trillion	23.33	25.53	27.91	30.75	34.25	38.22	42.58
DP Lo US Sup: MR	$2022, Trillion	23.33	25.53	27.91	30.75	34.28	38.27	42.60
Diff_DP Hi US Sup	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.03	0.01
Diff_DP	$2022, Trillion	0.00	0.00	0.03	0.00	0.00	0.08	0.08
Diff_DP Lo US Sup	$2022, Trillion	0.00	0.00	0.00	0.00	0.03	0.06	0.02
Diff_DP Hi US Sup	% Difference	0.00	-0.01	-0.01	-0.01	0.01	0.07	0.02
Diff_DP	% Difference	0.00	-0.01	0.10	0.01	0.01	0.21	0.19
Diff_DP Lo US Sup	% Difference	0.00	0.00	-0.01	-0.01	0.08	0.15	0.06

Table 25. U.S. real GDP and differences by component, tabulated by year. (see Figure 14 and Figure 15)

Scenario	Real GDP by Component	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	Imports	$2022, Trillion	-4.00	-5.26	-6.31	-7.72	-9.16	-11.01	-13.06
	Government Spending	$2022, Trillion	4.26	4.37	4.49	4.62	4.86	5.12	5.35
	Fixed Investment	$2022, Trillion	4.21	4.90	5.37	5.99	6.70	7.47	8.27
	Exports	$2022, Trillion	2.80	3.59	4.33	5.01	5.93	7.06	8.20
	Consumption	$2022, Trillion	16.03	18.62	21.39	24.36	27.55	30.94	34.35
DP Hi US Sup: MR	Imports	$2022, Trillion	-4.00	-5.26	-6.31	-7.72	-9.18	-11.07	-13.17
	Government Spending	$2022, Trillion	4.26	4.37	4.49	4.62	4.86	5.13	5.36
	Fixed Investment	$2022, Trillion	4.21	4.90	5.37	5.99	6.72	7.50	8.29
	Exports	$2022, Trillion	2.80	3.59	4.33	5.01	5.93	7.09	8.24
	Consumption	$2022, Trillion	16.03	18.62	21.38	24.36	27.54	30.95	34.36
DP: ExFID	Imports	$2022, Trillion	-4.00	-5.19	-6.07	-7.26	-8.42	-9.98	-11.93
	Government Spending	$2022, Trillion	4.26	4.35	4.42	4.50	4.68	4.88	5.12
	Fixed Investment	$2022, Trillion	4.21	4.72	5.16	5.71	6.35	7.08	7.92
	Exports	$2022, Trillion	2.80	3.45	3.98	4.42	5.07	5.96	7.07
	Consumption	$2022, Trillion	16.03	18.45	20.80	23.46	26.36	29.69	33.44
DP: MR	Imports	$2022, Trillion	-4.00	-5.19	-6.07	-7.27	-8.46	-10.13	-12.15
	Government Spending	$2022, Trillion	4.26	4.35	4.42	4.50	4.68	4.90	5.13
	Fixed Investment	$2022, Trillion	4.21	4.72	5.17	5.71	6.37	7.14	7.99
	Exports	$2022, Trillion	2.80	3.45	3.99	4.43	5.09	6.04	7.20
	Consumption	$2022, Trillion	16.03	18.45	20.81	23.46	26.35	29.71	33.47
DP Lo US Sup: ExFID	Imports	$2022, Trillion	-4.00	-5.04	-5.83	-6.89	-7.65	-8.51	-9.48
	Government Spending	$2022, Trillion	4.26	4.34	4.38	4.46	4.64	4.80	4.98
	Fixed Investment	$2022, Trillion	4.21	4.48	4.93	5.44	5.96	6.53	7.04
	Exports	$2022, Trillion	2.80	3.24	3.72	4.16	4.71	5.43	6.27
	Consumption	$2022, Trillion	16.03	18.38	20.54	23.33	26.38	29.83	33.74
DP Lo US Sup: MR	Imports	$2022, Trillion	-4.00	-5.04	-5.83	-6.90	-7.68	-8.57	-9.57
	Government Spending	$2022, Trillion	4.26	4.34	4.38	4.46	4.64	4.80	4.99
	Fixed Investment	$2022, Trillion	4.21	4.48	4.93	5.44	5.99	6.60	7.09
	Exports	$2022, Trillion	2.80	3.24	3.72	4.15	4.72	5.45	6.28
	Consumption	$2022, Trillion	16.03	18.38	20.54	23.32	26.39	29.85	33.77
Diff_DP Hi US Sup	Imports	$2022, Trillion	0.00	0.00	0.00	0.00	-0.01	-0.06	-0.11
	Government Spending	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.01	0.01
	Fixed Investment	$2022, Trillion	0.00	0.00	0.00	0.00	0.02	0.03	0.02
	Exports	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.03	0.04
	Consumption	$2022, Trillion	0.00	0.00	0.00	0.00	-0.01	0.01	0.01
Diff_DP	Imports	$2022, Trillion	0.00	0.00	-0.01	-0.02	-0.05	-0.15	-0.22
	Government Spending	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.02	0.01
	Fixed Investment	$2022, Trillion	0.00	0.00	0.01	0.00	0.02	0.06	0.07
	Exports	$2022, Trillion	0.00	0.00	0.01	0.01	0.02	0.08	0.12
	Consumption	$2022, Trillion	0.00	0.00	0.01	0.00	-0.01	0.02	0.03
Diff_DP Lo US Sup	Imports	$2022, Trillion	0.00	0.00	0.00	0.00	-0.02	-0.06	-0.09
	Government Spending	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fixed Investment	$2022, Trillion	0.00	0.00	0.00	0.00	0.03	0.07	0.05
	Exports	$2022, Trillion	0.00	0.00	0.00	0.00	0.01	0.02	0.01
	Consumption	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.02	0.03
Diff_DP Hi US Sup	Imports	% Difference	0.00	-0.01	-0.01	-0.03	0.16	0.59	0.81
	Government Spending	% Difference	0.00	0.00	0.00	0.00	0.04	0.17	0.10
	Fixed Investment	% Difference	0.00	-0.02	-0.01	0.00	0.23	0.36	0.27
	Exports	% Difference	0.00	-0.02	-0.01	-0.04	0.06	0.45	0.49
	Consumption	% Difference	0.00	-0.01	-0.01	-0.01	-0.02	0.02	0.02
Diff_DP	Imports	% Difference	0.00	-0.01	0.15	0.21	0.55	1.46	1.83
	Government Spending	% Difference	0.00	0.00	0.06	0.03	0.07	0.32	0.20
	Fixed Investment	% Difference	0.00	-0.01	0.19	0.04	0.27	0.89	0.90
	Exports	% Difference	0.00	-0.01	0.24	0.24	0.41	1.38	1.73
	Consumption	% Difference	0.00	-0.01	0.07	0.00	-0.02	0.07	0.08
Diff_DP Lo US Sup	Imports	% Difference	0.00	0.00	0.01	0.01	0.30	0.72	0.95
	Government Spending	% Difference	0.00	0.00	0.00	0.00	0.01	0.03	0.03
	Fixed Investment	% Difference	0.00	0.01	-0.01	-0.01	0.53	1.00	0.67
	Exports	% Difference	0.00	0.00	-0.01	-0.03	0.26	0.39	0.14
	Consumption	% Difference	0.00	0.00	0.00	0.00	0.01	0.07	0.09

Table 26. U.S. value of industrial production, tabulated by year. (see Figure 16)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	$2022, Trillion	11.05	12.45	13.46	14.39	15.49	16.61	17.48
DP Hi US Sup: MR	$2022, Trillion	11.05	12.45	13.46	14.38	15.54	16.73	17.60
DP: ExFID	$2022, Trillion	11.05	12.07	12.79	13.41	14.18	15.06	16.04
DP: MR	$2022, Trillion	11.05	12.07	12.81	13.42	14.23	15.23	16.24
DP Lo US Sup: ExFID	$2022, Trillion	11.05	11.54	12.13	12.78	13.55	14.53	15.57
DP Lo US Sup: MR	$2022, Trillion	11.05	11.54	12.13	12.78	13.61	14.63	15.64
Diff_DP Hi US Sup	$2022, Trillion	0.00	0.00	0.00	0.00	0.05	0.12	0.12
Diff_DP	$2022, Trillion	0.00	0.00	0.02	0.01	0.05	0.17	0.20
Diff_DP Lo US Sup	$2022, Trillion	0.00	0.00	0.00	0.00	0.06	0.10	0.06
Diff_DP Hi US Sup	% Difference	0.00	-0.01	0.01	-0.01	0.32	0.71	0.70
Diff_DP	% Difference	0.00	-0.01	0.16	0.05	0.39	1.14	1.27
Diff_DP Lo US Sup	% Difference	0.00	0.00	-0.02	-0.01	0.46	0.67	0.42

Table 27. U.S. value of industrial production by sub-sector, tabulated by year. (See Section: Industrial Output and Costs)

Scenario	Industrial Output	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	Oil and Gas Extraction	$2022, billion	710.2	890.3	951.8	979.0	1010.9	1036.1	1029.8
	Other	$2022, billion	10338.8	11556.7	12503.9	13406.5	14478.3	15571.4	16449.8
DP Hi US Sup: MR	Oil and Gas Extraction	$2022, billion	710.2	890.3	953.3	979.3	1064.4	1144.1	1163.0
	Other	$2022, billion	10338.8	11555.4	12503.1	13404.5	14474.8	15581.4	16439.6
DP: ExFID	Oil and Gas Extraction	$2022, billion	710.2	802.2	804.2	815.3	813.3	817.1	822.5
	Other	$2022, billion	10338.8	11271.5	11981.3	12598.8	13362.0	14241.4	15216.7
DP: MR	Oil and Gas Extraction	$2022, billion	710.2	802.2	809.9	820.6	872.9	937.0	969.7
	Other	$2022, billion	10338.8	11270.4	11996.6	12600.7	13357.3	14292.9	15272.6
DP Lo US Sup: ExFID	Oil and Gas Extraction	$2022, billion	710.2	687.8	613.1	596.8	585.2	577.4	556.2
	Other	$2022, billion	10338.8	10848.4	11513.7	12181.4	12960.4	13951.3	15015.3
DP Lo US Sup: MR	Oil and Gas Extraction	$2022, billion	710.2	688.3	613.0	597.6	646.1	685.6	684.7
	Other	$2022, billion	10338.8	10848.1	11512.1	12178.7	12962.0	13939.9	14951.5
Diff_DP Hi US Sup	Oil and Gas Extraction	$2022, billion	0.0	0.0	1.5	0.3	53.5	108.0	133.2
	Other	$2022, billion	0.0	-1.3	-0.8	-2.0	-3.5	10.0	-10.2
Diff_DP	Oil and Gas Extraction	$2022, billion	0.0	0.0	5.7	5.3	59.5	119.8	147.1
	Other	$2022, billion	0.0	-1.1	15.3	1.9	-4.8	51.4	55.9
Diff_DP Lo US Sup	Oil and Gas Extraction	$2022, billion	0.0	0.5	-0.2	0.8	60.9	108.2	128.5
	Other	$2022, billion	0.0	-0.4	-1.7	-2.7	1.5	-11.4	-63.8
Diff_DP Hi US Sup	Oil and Gas Extraction	% Difference	0.0	0.0	0.2	0.0	5.3	10.4	12.9
	Other	% Difference	0.0	0.0	0.0	0.0	0.0	0.1	-0.1
Diff_DP	Oil and Gas Extraction	% Difference	0.0	0.0	0.7	0.7	7.3	14.7	17.9
	Other	% Difference	0.0	0.0	0.1	0.0	0.0	0.4	0.4
Diff_DP Lo US Sup	Oil and Gas Extraction	% Difference	0.0	0.1	0.0	0.1	10.4	18.7	23.1
	Other	% Difference	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4

Table 28. Industrial energy costs, tabulated by year. (see Table 8)

Scenario	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	$2022, billion	170.12	232.90	217.07	243.62	272.26	293.51	299.92
DP Hi US Sup: MR	$2022, billion	170.12	232.78	217.06	243.07	283.87	313.11	328.56
DP: ExFID	$2022, billion	170.12	243.06	220.28	241.14	266.41	282.32	294.74

DP: MR	$2022, billion	170.12	242.87	220.50	241.88	279.37	304.11	322.93
DP Lo US Sup: ExFID	$2022, billion	170.61	272.06	256.91	291.60	327.81	339.44	356.49
DP Lo US Sup: MR	$2022, billion	170.63	272.25	256.71	292.44	340.19	359.54	382.62
Diff_DP Hi US Sup	$2022, billion	0.00	-0.11	-0.02	-0.55	11.61	19.60	28.63
Diff_DP	$2022, billion	0.00	-0.19	0.22	0.74	12.97	21.79	28.19
Diff_DP Lo US Sup	$2022, billion	0.02	0.18	-0.20	0.85	12.38	20.10	26.13
Diff_DP Hi US Sup	% Difference	0.00	-0.05	-0.01	-0.23	4.27	6.68	9.55
Diff_DP	% Difference	0.00	-0.08	0.10	0.31	4.87	7.72	9.56
Diff_DP Lo US Sup	% Difference	0.01	0.07	-0.08	0.29	3.78	5.92	7.33

Table 29. Value of industrial production by region, tabulated by year. (see Figure 17 and Figure 18)

Scenario	Region	Units	2020	2025	2030	2035	2040	2045	2050
DP Hi US Sup: ExFID	New England	$2022, Trillion	0.43	0.49	0.54	0.59	0.65	0.71	0.76
DP Hi US Sup: MR	New England	$2022, Trillion	0.43	0.49	0.54	0.59	0.65	0.71	0.76
DP: ExFID	New England	$2022, Trillion	0.43	0.48	0.52	0.56	0.60	0.65	0.71
DP: MR	New England	$2022, Trillion	0.43	0.48	0.52	0.56	0.60	0.65	0.71
DP Lo US Sup: ExFID	New England	$2022, Trillion	0.43	0.46	0.50	0.54	0.59	0.64	0.70
DP Lo US Sup: MR	New England	$2022, Trillion	0.43	0.46	0.50	0.54	0.59	0.64	0.70
Diff_DP Hi US Sup	New England	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP	New England	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP Lo US Sup	New England	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP Hi US Sup	New England	% Difference	0.00	-0.01	-0.01	-0.02	-0.07	-0.03	-0.19
Diff_DP	New England	% Difference	0.00	-0.01	0.13	-0.04	-0.15	0.15	0.06
Diff_DP Lo US Sup	New England	% Difference	0.00	0.00	-0.02	-0.03	-0.04	-0.16	-0.53
DP Hi US Sup: ExFID	Middle Atlantic	$2022, Trillion	0.98	1.06	1.12	1.17	1.24	1.30	1.34
DP Hi US Sup: MR	Middle Atlantic	$2022, Trillion	0.98	1.06	1.12	1.17	1.24	1.31	1.35
DP: ExFID	Middle Atlantic	$2022, Trillion	0.98	1.03	1.07	1.09	1.13	1.17	1.22
DP: MR	Middle Atlantic	$2022, Trillion	0.98	1.03	1.07	1.09	1.13	1.19	1.23
DP Lo US Sup: ExFID	Middle Atlantic	$2022, Trillion	0.98	0.98	1.01	1.04	1.08	1.13	1.19
DP Lo US Sup: MR	Middle Atlantic	$2022, Trillion	0.98	0.98	1.01	1.04	1.08	1.14	1.19
Diff_DP Hi US Sup	Middle Atlantic	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Diff_DP	Middle Atlantic	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.01	0.02
Diff_DP Lo US Sup	Middle Atlantic	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.01	0.00
Diff_DP Hi US Sup	Middle Atlantic	% Difference	0.00	-0.01	0.00	-0.01	0.28	0.68	0.74
Diff_DP	Middle Atlantic	% Difference	0.00	-0.01	0.16	0.04	0.32	1.13	1.33
Diff_DP Lo US Sup	Middle Atlantic	% Difference	0.00	0.00	-0.02	-0.02	0.40	0.63	0.41
DP Hi US Sup: ExFID	East North Central	$2022, Trillion	2.04	2.28	2.42	2.57	2.73	2.87	2.96
DP Hi US Sup: MR	East North Central	$2022, Trillion	2.04	2.27	2.42	2.57	2.73	2.87	2.96
DP: ExFID	East North Central	$2022, Trillion	2.04	2.21	2.31	2.41	2.51	2.62	2.73
DP: MR	East North Central	$2022, Trillion	2.04	2.21	2.32	2.41	2.51	2.63	2.74
DP Lo US Sup: ExFID	East North Central	$2022, Trillion	2.04	2.13	2.22	2.33	2.43	2.56	2.69
DP Lo US Sup: MR	East North Central	$2022, Trillion	2.04	2.13	2.22	2.32	2.43	2.56	2.68
Diff_DP Hi US Sup	East North Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP	East North Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Diff_DP Lo US Sup	East North Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Diff_DP Hi US Sup	East North Central	% Difference	0.00	-0.01	-0.01	-0.01	0.00	0.10	-0.04
Diff_DP	East North Central	% Difference	0.00	-0.01	0.14	0.03	-0.01	0.42	0.45
Diff_DP Lo US Sup	East North Central	% Difference	0.00	-0.01	-0.01	-0.01	0.00	0.10	-0.04
DP Hi US Sup: ExFID	West North Central	$2022, Trillion	0.85	0.95	1.03	1.10	1.19	1.27	1.34
DP Hi US Sup: MR	West North Central	$2022, Trillion	0.85	0.95	1.03	1.10	1.19	1.28	1.35
DP: ExFID	West North Central	$2022, Trillion	0.85	0.92	0.99	1.04	1.11	1.18	1.25
DP: MR	West North Central	$2022, Trillion	0.85	0.92	0.99	1.04	1.11	1.18	1.26
DP Lo US Sup: ExFID	West North Central	$2022, Trillion	0.85	0.89	0.95	1.00	1.07	1.15	1.24
DP Lo US Sup: MR	West North Central	$2022, Trillion	0.85	0.89	0.95	1.00	1.08	1.16	1.24
Diff_DP Hi US Sup	West North Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP	West North Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Diff_DP Lo US Sup	West North Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP Hi US Sup	West North Central	% Difference	0.00	-0.01	0.00	-0.01	0.09	0.25	0.17
Diff_DP	West North Central	% Difference	0.00	-0.01	0.12	0.01	0.09	0.53	0.57
Diff_DP Lo US Sup	West North Central	% Difference	0.00	0.00	-0.01	-0.02	0.16	0.18	-0.10
DP Hi US Sup: ExFID	South Atlantic	$2022, Trillion	1.43	1.58	1.73	1.86	2.03	2.20	2.33
DP Hi US Sup: MR	South Atlantic	$2022, Trillion	1.43	1.58	1.73	1.86	2.03	2.20	2.33
DP: ExFID	South Atlantic	$2022, Trillion	1.43	1.54	1.65	1.75	1.88	2.02	2.16

Scenario	Region	Units	2020	2025	2030	2035	2040	2045	2050
DP: MR	South Atlantic	$2022, Trillion	1.43	1.54	1.66	1.75	1.88	2.02	2.17
DP Lo US Sup: ExFID	South Atlantic	$2022, Trillion	1.43	1.48	1.59	1.70	1.83	1.99	2.16
DP Lo US Sup: MR	South Atlantic	$2022, Trillion	1.43	1.48	1.59	1.70	1.83	1.99	2.15
Diff_DP Hi US Sup	South Atlantic	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP	South Atlantic	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Diff_DP Lo US Sup	South Atlantic	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	-0.01
Diff_DP Hi US Sup	South Atlantic	% Difference	0.00	-0.02	-0.01	-0.01	0.00	0.10	-0.04
Diff_DP	South Atlantic	% Difference	0.00	-0.02	0.15	0.01	-0.03	0.37	0.33
Diff_DP Lo US Sup	South Atlantic	% Difference	0.00	0.00	-0.02	-0.02	0.04	-0.02	-0.37
DP Hi US Sup: ExFID	East South Central	$2022, Trillion	0.72	0.84	0.92	1.01	1.10	1.19	1.27
DP Hi US Sup: MR	East South Central	$2022, Trillion	0.72	0.84	0.92	1.01	1.10	1.19	1.27
DP: ExFID	East South Central	$2022, Trillion	0.72	0.81	0.87	0.94	1.01	1.08	1.17
DP: MR	East South Central	$2022, Trillion	0.72	0.81	0.88	0.94	1.01	1.09	1.17
DP Lo US Sup: ExFID	East South Central	$2022, Trillion	0.72	0.78	0.83	0.91	0.97	1.05	1.13
DP Lo US Sup: MR	East South Central	$2022, Trillion	0.72	0.78	0.83	0.91	0.97	1.04	1.12
Diff_DP Hi US Sup	East South Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP	East South Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Diff_DP Lo US Sup	East South Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP Hi US Sup	East South Central	% Difference	0.00	-0.01	0.00	-0.01	0.01	0.18	0.07
Diff_DP	East South Central	% Difference	0.00	-0.01	0.15	0.07	0.06	0.57	0.65
Diff_DP Lo US Sup	East South Central	% Difference	0.00	0.00	-0.02	-0.03	0.05	-0.04	-0.42
DP Hi US Sup: ExFID	West South Central	$2022, Trillion	2.12	2.45	2.64	2.80	2.99	3.19	3.33
DP Hi US Sup: MR	West South Central	$2022, Trillion	2.12	2.45	2.64	2.80	3.03	3.27	3.43
DP: ExFID	West South Central	$2022, Trillion	2.12	2.33	2.44	2.52	2.63	2.78	2.94
DP: MR	West South Central	$2022, Trillion	2.12	2.33	2.45	2.53	2.68	2.88	3.07
DP Lo US Sup: ExFID	West South Central	$2022, Trillion	2.12	2.17	2.21	2.29	2.38	2.51	2.65
DP Lo US Sup: MR	West South Central	$2022, Trillion	2.12	2.17	2.21	2.29	2.42	2.58	2.73
Diff_DP Hi US Sup	West South Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.04	0.08	0.10
Diff_DP	West South Central	$2022, Trillion	0.00	0.00	0.01	0.01	0.04	0.10	0.12
Diff_DP Lo US Sup	West South Central	$2022, Trillion	0.00	0.00	0.00	0.00	0.04	0.08	0.08
Diff_DP Hi US Sup	West South Central	% Difference	0.00	-0.01	0.04	0.00	1.27	2.53	2.89
Diff_DP	West South Central	% Difference	0.00	-0.01	0.27	0.21	1.67	3.61	4.22
Diff_DP Lo US Sup	West South Central	% Difference	0.00	0.02	-0.01	0.01	1.86	3.00	3.05
DP Hi US Sup: ExFID	Mountain	$2022, Trillion	0.68	0.77	0.83	0.89	0.97	1.05	1.12
DP Hi US Sup: MR	Mountain	$2022, Trillion	0.68	0.77	0.83	0.89	0.98	1.07	1.14
DP: ExFID	Mountain	$2022, Trillion	0.68	0.75	0.79	0.83	0.89	0.96	1.03
DP: MR	Mountain	$2022, Trillion	0.68	0.75	0.79	0.83	0.90	0.98	1.05
DP Lo US Sup: ExFID	Mountain	$2022, Trillion	0.68	0.71	0.74	0.78	0.84	0.91	0.99
DP Lo US Sup: MR	Mountain	$2022, Trillion	0.68	0.71	0.74	0.78	0.85	0.93	1.00
Diff_DP Hi US Sup	Mountain	$2022, Trillion	0.00	0.00	0.00	0.00	0.01	0.01	0.02
Diff_DP	Mountain	$2022, Trillion	0.00	0.00	0.00	0.00	0.01	0.02	0.02
Diff_DP Lo US Sup	Mountain	$2022, Trillion	0.00	0.00	0.00	0.00	0.01	0.01	0.01
Diff_DP Hi US Sup	Mountain	% Difference	0.00	-0.01	0.02	0.00	0.65	1.30	1.41
Diff_DP	Mountain	% Difference	0.00	-0.01	0.20	0.09	0.78	1.80	1.98
Diff_DP Lo US Sup	Mountain	% Difference	0.00	0.01	-0.02	0.00	0.89	1.39	1.29
DP Hi US Sup: ExFID	Pacific	$2022, Trillion	1.81	2.05	2.22	2.39	2.59	2.82	3.02
DP Hi US Sup: MR	Pacific	$2022, Trillion	1.81	2.05	2.22	2.39	2.60	2.82	3.02
DP: ExFID	Pacific	$2022, Trillion	1.81	2.00	2.14	2.26	2.42	2.61	2.82
DP: MR	Pacific	$2022, Trillion	1.81	2.00	2.15	2.26	2.42	2.62	2.83
DP Lo US Sup: ExFID	Pacific	$2022, Trillion	1.81	1.94	2.07	2.20	2.36	2.58	2.83
DP Lo US Sup: MR	Pacific	$2022, Trillion	1.81	1.94	2.07	2.20	2.37	2.59	2.82
Diff_DP Hi US Sup	Pacific	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP	Pacific	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.01	0.01
Diff_DP Lo US Sup	Pacific	$2022, Trillion	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Diff_DP Hi US Sup	Pacific	% Difference	0.00	-0.01	0.00	-0.02	0.06	0.15	0.05
Diff_DP	Pacific	% Difference	0.00	-0.01	0.11	-0.02	0.01	0.34	0.27
Diff_DP Lo US Sup	Pacific	% Difference	0.00	0.00	-0.01	-0.02	0.12	0.10	-0.15

Table 30. Projected residential natural gas and electricity price effects in 2050, by census division. (see Figure 20)

Scenario	Region	Change Residential Gas Price ($2022/MMBtu)	Change Residential Electricity Price ($2022/MMBtu)	Percent Change Residential Gas Price	Percent Change Residential Electricity Price
DP: MR relative to DP:ExFID	New England	$0.10	$1.75	0.7%	2.5%
DP: MR relative to DP:ExFID	Middle Atlantic	$0.21	$0.94	2.0%	1.7%
DP: MR relative to DP:ExFID	East North Central	$0.45	$0.13	4.4%	0.3%
DP: MR relative to DP:ExFID	West North Central	$0.63	-$0.21	5.7%	-0.6%
DP: MR relative to DP:ExFID	South Atlantic	$0.42	$1.42	2.4%	3.5%
DP: MR relative to DP:ExFID	East South Central	$0.72	$0.34	5.0%	1.0%
DP: MR relative to DP:ExFID	West South Central	$0.89	$1.01	6.7%	2.8%
DP: MR relative to DP:ExFID	Mountain	$0.73	$0.81	6.3%	1.9%
DP: MR relative to DP:ExFID	Pacific	$0.65	$0.88	4.6%	1.56%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	New England	$0.33	$4.12	2.1%	5.2%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Middle Atlantic	$0.52	$1.39	4.0%	2.2%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East North Central	$0.87	$1.45	6.5%	3.2%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West North Central	$1.28	$0.28	8.9%	0.7%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	South Atlantic	$1.16	$1.23	5.9%	2.5%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East South Central	$1.68	$0.64	9.7%	1.5%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West South Central	$2.07	$2.44	12.3%	6.0%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Mountain	$1.47	$0.65	9.9%	1.3%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Pacific	$1.81	$0.78	10.4%	1.17%

Table 31. Projected annual natural gas and electricity expenditure impacts per household in 2050, by income group and census division. (see Figure 21)

Scenario	Region	Fuel	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP: MR relative to DP:ExFID	New England	Natural Gas	$1.99	$2.51	$2.81	$3.16	$4.17
DP: MR relative to DP:ExFID	Middle Atlantic	Natural Gas	$7.04	$8.58	$9.16	$10.15	$12.75
DP: MR relative to DP:ExFID	East North Central	Natural Gas	$17.41	$20.00	$21.26	$23.74	$28.41
DP: MR relative to DP:ExFID	West North Central	Natural Gas	$17.50	$20.16	$22.12	$24.88	$30.15
DP: MR relative to DP:ExFID	South Atlantic	Natural Gas	$3.78	$4.05	$4.35	$5.22	$8.21
DP: MR relative to DP:ExFID	East South Central	Natural Gas	$9.59	$9.82	$10.30	$11.17	$15.44
DP: MR relative to DP:ExFID	West South Central	Natural Gas	$10.42	$10.98	$11.72	$13.48	$18.87
DP: MR relative to DP:ExFID	Mountain	Natural Gas	$17.76	$18.89	$19.86	$22.65	$28.85

Scenario	Region	Fuel	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP: MR relative to DP:ExFID	Pacific	Natural Gas	$11.70	$13.02	$14.02	$16.43	$21.86
DP: MR relative to DP:ExFID	New England	Electricity	$59.31	$73.42	$79.98	$92.71	$118.37
DP: MR relative to DP:ExFID	Middle Atlantic	Electricity	$35.08	$41.12	$44.03	$50.33	$65.01
DP: MR relative to DP:ExFID	East North Central	Electricity	$5.42	$6.09	$6.48	$7.28	$8.51
DP: MR relative to DP:ExFID	West North Central	Electricity	-$9.23	-$10.39	-$11.27	-$12.67	-$14.68
DP: MR relative to DP:ExFID	South Atlantic	Electricity	$75.96	$81.64	$84.86	$92.86	$109.23
DP: MR relative to DP:ExFID	East South Central	Electricity	$17.72	$19.26	$20.15	$22.04	$25.75
DP: MR relative to DP:ExFID	West South Central	Electricity	$54.54	$59.53	$62.99	$70.39	$85.23
DP: MR relative to DP:ExFID	Mountain	Electricity	$34.68	$38.56	$41.47	$46.62	$57.02
DP: MR relative to DP:ExFID	Pacific	Electricity	$32.83	$36.93	$39.59	$44.40	$55.46
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	New England	Natural Gas	$6.39	$8.07	$9.06	$10.19	$13.42
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Middle Atlantic	Natural Gas	$17.16	$20.89	$22.31	$24.73	$31.06
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East North Central	Natural Gas	$32.39	$37.21	$39.56	$44.16	$52.86
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West North Central	Natural Gas	$33.88	$39.03	$42.83	$48.16	$58.37
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	South Atlantic	Natural Gas	$10.36	$11.10	$11.93	$14.32	$22.51
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East South Central	Natural Gas	$21.84	$22.36	$23.45	$25.44	$35.15
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West South Central	Natural Gas	$23.48	$24.73	$26.42	$30.37	$42.52
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Mountain	Natural Gas	$34.50	$36.69	$38.57	$44.00	$56.04
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Pacific	Natural Gas	$31.78	$35.35	$38.08	$44.61	$59.37
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	New England	Electricity	$135.30	$167.49	$182.44	$211.49	$270.03
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Middle Atlantic	Electricity	$50.73	$59.45	$63.67	$72.78	$94.01
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East North Central	Electricity	$59.32	$66.73	$71.02	$79.68	$93.14
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West North Central	Electricity	$12.56	$14.13	$15.32	$17.23	$19.96
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	South Atlantic	Electricity	$63.53	$68.28	$70.97	$77.67	$91.35
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East South Central	Electricity	$32.39	$35.20	$36.84	$40.29	$47.06

Scenario	Region	Fuel	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West South Central	Electricity	$129.35	$141.19	$149.39	$166.93	$202.15
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Mountain	Electricity	$26.92	$29.93	$32.19	$36.19	$44.26
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Pacific	Electricity	$27.90	$31.39	$33.64	$37.73	$47.13

Table 32. Annual natural gas impacts per natural gas household in 2050, by income group and census divisio.n (see Figure 22)

Scenario	Region	Fuel	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP: MR relative to DP:ExFID	New England	Natural Gas	$4.75	$4.84	$5.03	$5.32	$6.19
DP: MR relative to DP:ExFID	Middle Atlantic	Natural Gas	$13.88	$14.42	$14.74	$15.52	$18.23
DP: MR relative to DP:ExFID	East North Central	Natural Gas	$28.75	$28.47	$28.61	$29.68	$32.33
DP: MR relative to DP:ExFID	West North Central	Natural Gas	$34.50	$33.36	$34.06	$34.76	$37.95
DP: MR relative to DP:ExFID	South Atlantic	Natural Gas	$17.20	$16.48	$16.31	$16.06	$17.15
DP: MR relative to DP:ExFID	East South Central	Natural Gas	$28.02	$26.70	$26.15	$25.43	$26.96
DP: MR relative to DP:ExFID	West South Central	Natural Gas	$30.85	$30.13	$30.35	$30.40	$32.99
DP: MR relative to DP:ExFID	Mountain	Natural Gas	$38.85	$37.76	$38.29	$39.66	$46.52
DP: MR relative to DP:ExFID	Pacific	Natural Gas	$22.20	$22.96	$23.57	$25.50	$31.24
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	New England	Natural Gas	$15.28	$15.59	$16.19	$17.13	$19.91
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Middle Atlantic	Natural Gas	$33.82	$35.13	$35.93	$37.82	$44.44
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East North Central	Natural Gas	$53.50	$52.99	$53.25	$55.24	$60.17
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West North Central	Natural Gas	$66.72	$64.53	$65.88	$67.24	$73.40
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	South Atlantic	Natural Gas	$47.05	$45.09	$44.61	$43.93	$46.93
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East South Central	Natural Gas	$63.68	$60.69	$59.44	$57.81	$61.27
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West South Central	Natural Gas	$69.29	$67.68	$68.17	$68.29	$74.10
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Mountain	Natural Gas	$75.24	$73.12	$74.15	$76.81	$90.10
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Pacific	Natural Gas	$60.24	$62.30	$63.97	$69.19	$84.77

Table 33. Projected annual combined natural gas and electricity expenditure impacts per household in 2050, by income group and census division. (see Figure 23)

Scenario	Region	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP: MR relative to DP:ExFID	New England	$61.30	$75.93	$82.79	$95.88	$122.54
DP: MR relative to DP:ExFID	Middle Atlantic	$42.13	$49.69	$53.19	$60.49	$77.76
DP: MR relative to DP:ExFID	East North Central	$22.82	$26.09	$27.75	$31.01	$36.92
DP: MR relative to DP:ExFID	West North Central	$8.27	$9.77	$10.86	$12.21	$15.48
DP: MR relative to DP:ExFID	South Atlantic	$79.74	$85.69	$89.21	$98.09	$117.43
DP: MR relative to DP:ExFID	East South Central	$27.31	$29.08	$30.45	$33.22	$41.18
DP: MR relative to DP:ExFID	West South Central	$64.96	$70.50	$74.71	$83.86	$104.10
DP: MR relative to DP:ExFID	Mountain	$52.45	$57.44	$61.32	$69.27	$85.87
DP: MR relative to DP:ExFID	Pacific	$44.54	$49.95	$53.61	$60.83	$77.32
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	New England	$141.69	$175.56	$191.50	$221.68	$283.45
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Middle Atlantic	$67.89	$80.35	$85.98	$97.51	$125.07
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East North Central	$91.71	$103.93	$110.58	$123.84	$146.00
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West North Central	$46.44	$53.16	$58.15	$65.39	$78.34
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	South Atlantic	$73.89	$79.38	$82.90	$91.99	$113.86
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East South Central	$54.23	$57.56	$60.29	$65.73	$82.21
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West South Central	$152.83	$165.92	$175.81	$197.31	$244.67
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Mountain	$61.43	$66.62	$70.75	$80.19	$100.30
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Pacific	$59.68	$66.74	$71.72	$82.34	$106.50

Table 34. Natural gas and electricity expenditures per household in 2050 as a percentage of income, by income group and census division. (see Figure 24)

Scenario	Region	Fuel	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP: MR relative to DP:ExFID	New England	Natural Gas	0.01%	0.01%	0.00%	0.00%	0.00%
DP: MR relative to DP:ExFID	Middle Atlantic	Natural Gas	0.05%	0.02%	0.02%	0.01%	0.00%
DP: MR relative to DP:ExFID	East North Central	Natural Gas	0.11%	0.05%	0.04%	0.02%	0.01%
DP: MR relative to DP:ExFID	West North Central	Natural Gas	0.11%	0.05%	0.04%	0.02%	0.01%
DP: MR relative to DP:ExFID	South Atlantic	Natural Gas	0.02%	0.01%	0.01%	0.01%	0.00%
DP: MR relative to DP:ExFID	East South Central	Natural Gas	0.06%	0.02%	0.02%	0.01%	0.01%
DP: MR relative to DP:ExFID	West South Central	Natural Gas	0.07%	0.03%	0.02%	0.01%	0.01%
DP: MR relative to DP:ExFID	Mountain	Natural Gas	0.11%	0.05%	0.03%	0.02%	0.01%
DP: MR relative to DP:ExFID	Pacific	Natural Gas	0.08%	0.03%	0.02%	0.02%	0.01%

Scenario	Region	Fuel	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP: MR relative to DP:ExFID	New England	Electricity	0.38%	0.18%	0.13%	0.09%	0.04%
DP: MR relative to DP:ExFID	Middle Atlantic	Electricity	0.23%	0.10%	0.07%	0.05%	0.02%
DP: MR relative to DP:ExFID	East North Central	Electricity	0.03%	0.02%	0.01%	0.01%	0.00%
DP: MR relative to DP:ExFID	West North Central	Electricity	-0.06%	-0.03%	-0.02%	-0.01%	-0.01%
DP: MR relative to DP:ExFID	South Atlantic	Electricity	0.48%	0.20%	0.14%	0.09%	0.04%
DP: MR relative to DP:ExFID	East South Central	Electricity	0.11%	0.05%	0.03%	0.02%	0.01%
DP: MR relative to DP:ExFID	West South Central	Electricity	0.34%	0.15%	0.11%	0.07%	0.03%
DP: MR relative to DP:ExFID	Mountain	Electricity	0.22%	0.10%	0.07%	0.04%	0.02%
DP: MR relative to DP:ExFID	Pacific	Electricity	0.21%	0.09%	0.07%	0.04%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	New England	Natural Gas	0.04%	0.02%	0.02%	0.01%	0.00%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Middle Atlantic	Natural Gas	0.11%	0.05%	0.04%	0.02%	0.01%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East North Central	Natural Gas	0.20%	0.09%	0.07%	0.04%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West North Central	Natural Gas	0.21%	0.10%	0.07%	0.05%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	South Atlantic	Natural Gas	0.07%	0.03%	0.02%	0.01%	0.01%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East South Central	Natural Gas	0.14%	0.06%	0.04%	0.02%	0.01%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West South Central	Natural Gas	0.15%	0.06%	0.04%	0.03%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Mountain	Natural Gas	0.22%	0.09%	0.06%	0.04%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Pacific	Natural Gas	0.20%	0.09%	0.06%	0.04%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	New England	Electricity	0.86%	0.42%	0.30%	0.20%	0.10%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Middle Atlantic	Electricity	0.33%	0.15%	0.11%	0.07%	0.03%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East North Central	Electricity	0.37%	0.17%	0.12%	0.08%	0.04%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West North Central	Electricity	0.08%	0.04%	0.03%	0.02%	0.01%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	South Atlantic	Electricity	0.40%	0.17%	0.12%	0.08%	0.03%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East South Central	Electricity	0.21%	0.09%	0.06%	0.04%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West South Central	Electricity	0.81%	0.35%	0.25%	0.16%	0.08%

Scenario	Region	Fuel	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Mountain	Electricity	0.17%	0.07%	0.05%	0.03%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Pacific	Electricity	0.18%	0.08%	0.06%	0.04%	0.02%

Table 35. Natural gas expenditures per natural gas household in 2050 as a percentage of income, by income group and census division. (see Figure 25)

Scenario	Region	Fuel	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP: MR relative to DP:ExFID	New England	Natural Gas	0.03%	0.01%	0.01%	0.01%	0.00%
DP: MR relative to DP:ExFID	Middle Atlantic	Natural Gas	0.09%	0.04%	0.02%	0.01%	0.01%
DP: MR relative to DP:ExFID	East North Central	Natural Gas	0.18%	0.07%	0.05%	0.03%	0.01%
DP: MR relative to DP:ExFID	West North Central	Natural Gas	0.21%	0.08%	0.06%	0.03%	0.01%
DP: MR relative to DP:ExFID	South Atlantic	Natural Gas	0.11%	0.04%	0.03%	0.02%	0.01%
DP: MR relative to DP:ExFID	East South Central	Natural Gas	0.18%	0.07%	0.04%	0.02%	0.01%
DP: MR relative to DP:ExFID	West South Central	Natural Gas	0.19%	0.08%	0.05%	0.03%	0.01%
DP: MR relative to DP:ExFID	Mountain	Natural Gas	0.24%	0.09%	0.06%	0.04%	0.02%
DP: MR relative to DP:ExFID	Pacific	Natural Gas	0.14%	0.06%	0.04%	0.02%	0.01%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	New England	Natural Gas	0.10%	0.04%	0.03%	0.02%	0.01%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Middle Atlantic	Natural Gas	0.22%	0.09%	0.06%	0.04%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East North Central	Natural Gas	0.33%	0.13%	0.09%	0.05%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West North Central	Natural Gas	0.41%	0.16%	0.11%	0.06%	0.03%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	South Atlantic	Natural Gas	0.30%	0.11%	0.07%	0.04%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East South Central	Natural Gas	0.41%	0.15%	0.10%	0.06%	0.02%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West South Central	Natural Gas	0.44%	0.17%	0.11%	0.07%	0.03%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Mountain	Natural Gas	0.47%	0.18%	0.12%	0.07%	0.03%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Pacific	Natural Gas	0.39%	0.16%	0.11%	0.07%	0.03%

Table 36. Combined natural gas & electricity expenditure impacts per household as a percent of household income in 2050, by income group and census division. (see Figure 26)

Scenario	Region	Less than $30,000	$30,000 to $49,999	$50,000 to $69,999	$70,000 to $149,999	$150,000 or more
DP: MR relative to DP:ExFID	New England	0.39%	0.19%	0.14%	0.09%	0.04%
DP: MR relative to DP:ExFID	Middle Atlantic	0.27%	0.12%	0.09%	0.06%	0.03%
DP: MR relative to DP:ExFID	East North Central	0.14%	0.07%	0.05%	0.03%	0.01%
DP: MR relative to DP:ExFID	West North Central	0.05%	0.02%	0.02%	0.01%	0.01%
DP: MR relative to DP:ExFID	South Atlantic	0.50%	0.22%	0.15%	0.09%	0.04%
DP: MR relative to DP:ExFID	East South Central	0.17%	0.07%	0.05%	0.03%	0.02%
DP: MR relative to DP:ExFID	West South Central	0.41%	0.18%	0.13%	0.08%	0.04%
DP: MR relative to DP:ExFID	Mountain	0.33%	0.14%	0.10%	0.07%	0.03%
DP: MR relative to DP:ExFID	Pacific	0.29%	0.13%	0.09%	0.06%	0.03%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	New England	0.90%	0.44%	0.32%	0.21%	0.10%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Middle Atlantic	0.44%	0.20%	0.14%	0.09%	0.04%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East North Central	0.57%	0.26%	0.19%	0.12%	0.06%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West North Central	0.28%	0.13%	0.10%	0.06%	0.03%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	South Atlantic	0.47%	0.20%	0.14%	0.09%	0.04%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	East South Central	0.35%	0.14%	0.10%	0.06%	0.03%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	West South Central	0.96%	0.42%	0.29%	0.19%	0.09%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Mountain	0.39%	0.17%	0.12%	0.08%	0.04%
DP Lo US Sup: MR relative to DP Lo US Sup: ExFID	Pacific	0.38%	0.17%	0.12%	0.08%	0.04%