DRAFT

Environmental Assessment

Mexico Pacific Limited LLC

MPL Facility Design Increase

Office of Resource Sustainability

Office of Fossil Energy and Carbon Management

U.S. Department of Energy

November 2023

DOE/EA-2235

THIS PAGE INTENTIONALLY LEFT BLANK

Table of Contents

ACRONYMS & ABBREVIATIONS

AEO	Annual Energy Outlook
ASEA	Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos/National Agency for Industrial Security and Environmental Protection for the Hydrocarbon Industry [Mexico]
Bcf	Billion cubic feet
Bcf/d	Billion cubic feet per day
Bcf/yr	Billion cubic feet per year
CCS	Carbon Capture and Storage
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide-equivalent
CRE	Comisión Reguladora de Energía/Energy Regulatory Commission [Mexico]
DOE	U.S. Department of Energy
EA	Environmental Assessment
EIA	U.S. Energy Information Administration
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ERA	Environmental Risk Assessment [Mexico]
EViS	Evaluación de Impacto Social/Social Impact Assessment [Mexico]
FECM	Office of Fossil Energy and Carbon Management
FERC	Federal Energy Regulatory Commission
FTA	Free Trade Agreement
GWP	Global Warming Potential
IEA	International Energy Agency
INAH	Instituto Nacional de Antropología e Historia/National Institute of Anthropology and History [Mexico]
LGEEPA	Ley General del Equilibrio Ecológico y la Protección al Ambiente/General Law of Ecological Balance and Environmental Protection [Mexico]
LNG	Liquefied Natural Gas
MIA	Manifestación de Impacto Ambiental [Mexico review process - Environmental Impact Assessment]
MWh	Megawatt-hour
MMcf	Million cubic feet
NETL	National Energy Technology Laboratory
SEMARNET	Secretaría de Medio Ambiente y Recursos Naturales/Ministry of Environmental and Natural Resources [Mexico]
SENER	Secretaría de Energía/Ministry of Energy [Mexico]
NEPA	National Environmental Policy Act
NGA	Natural Gas Act
PHMSA	Pipeline and Hazardous Materials Safety Administration
ROI	Region of Influence
Tcf	Trillion cubic feet

1 Introduction

1.1 Background

The Department of Energy (DOE) Office of Fossil Energy and Carbon Management (FECM) received an application[1] from Mexico Pacific Limited LLC (MPL or Applicant)[2] on December 28, 2022 (Application). In this Application, MPL requests long-term, multi-contract authorization to export domestically-produced natural gas from the United States to Mexico through existing and future cross-border pipeline facilities and, after liquefaction in Mexico, to re-export[3] the U.S.-sourced natural gas in the form of liquefied natural gas (LNG) to other countries.

The Natural Gas Act (NGA)[4] requires that proposed imports and/or exports of natural gas, including LNG, in applications to FECM requesting authorization of imports and/or exports from and/or to any nation with which there is in effect a free trade agreement (FTA) requiring national treatment for trade in natural gas (collectively, FTA countries), be deemed consistent with the public interest and granted without modification or delay.[5]

In the case of applications to export LNG to non-FTA countries,[6] section 3(a) of the NGA[7] requires DOE to conduct a public interest review and grant authority to export unless DOE finds that the proposed exports would not be consistent with the public interest. In addition, DOE's decision whether to authorize natural gas exports to non-FTA countries must comply with the National Environmental Policy Act (NEPA).[8] This environmental assessment (EA), prepared pursuant to NEPA, also informs DOE's public interest analysis under NGA Section 3(a).

---

[1] Application of Mexico Pacific Limited LLC for Additional Long-Term, Multi-Contract Authorization to Export Natural Gas to Mexico and to Re-Export Liquefied Natural Gas to Free Trade Agreement and Non-Free Trade Agreement Nations, Docket No. 22-167-LNG (Dec. 28, 2022), https://www.energy.gov/sites/default/files/2023-01/22-167-LNG_0.pdf.

[2] The Applicant's legal name is Mexico Pacific Limited LLC. The Applicant is a limited liability company organized under the laws of Delaware with its principal place of business in Houston, Texas. The Applicant's two largest shareholders are Q-LNG Holdings, LLC and AVAIO MPL Special, LP.

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

[4] 15 U.S.C. § 717b(c).

[5] DOE is required by NGA section 3(c) to authorize LNG exports to FTA countries. Section 3(c) provides that all such exports are "deemed to be consistent with the public interest" and that their authorization "shall be granted without modification or delay." Therefore, because DOE lacks discretion with respect to such approvals, the approvals do not require environmental analysis under the National Environmental Policy Act, 42 U.S.C. § 4321 *et seq*. The U.S. Trade Representative maintains a list of countries with which the United States has FTAs at https://ustr.gov/trade-agreements/free-trade-agreements.

[6] Non-FTA countries are those with which the U.S. does not have an FTA requiring national treatment for trade in natural gas, and with which trade is not prohibited by U.S. law or policy.

[7] 15 U.S.C. § 717b(a).

[8] 42 U.S.C. § 4321 *et seq*.

1.2 Purpose and Need

1.2.1 Applicant

MPL states that it is developing a natural gas liquefaction facility, located near Puerto Libertad in the State of Sonora, Mexico (MPL Facility). MPL adds that the MPL Facility "… [would be] particularly well positioned to supply LNG into Asian markets, including markets in Korea, Japan, and China, each of which can be supplied by vessel from the MPL Facility without having to transit the Panama Canal, as well as markets in South America (in particular Chile, Colombia, and Ecuador)."[9] MPL also raises the possibility of exports to additional countries.[10]

1.2.2 Department of Energy

DOE's purpose is to review the Application under NGA section 3(a), and to authorize the natural gas exports requested unless it finds that the proposed exports would not be consistent with the public interest.

1.3 Alternatives

DOE evaluated the Proposed Action of granting the requested authorization to MPL and a No Action Alternative in which the requested authorization would not be granted.

1.3.1 Proposed Action

1.3.1.1 Project Description

MPL filed the Application in connection with its continuing development of the MPL Facility. (*See* Figure 1). In the Application, MPL states that, once completed, the MPL Facility will be capable of receiving, processing, and liquefying natural gas, storing the resulting LNG, and loading LNG onto oceangoing LNG carriers for re-export to other countries and, potentially, for delivery to markets elsewhere in Mexico.[11] In its Original Application,[12] MPL previously sought—and was granted by DOE—authorization to export up to the equivalent of 621 billion cubic feet (Bcf) per year (Bcf/yr) of U.S.-sourced natural gas to Mexico for end use in Mexico and/or, after liquefaction in Mexico, for export by vessel from the proposed MPL Facility to FTA and non-FTA nations.[12] The Application states that MPL is seeking authorization to export an additional 425.57 Bcf/yr of natural gas by pipeline from the U.S. to Mexico to align with increased peak planned liquefaction capacity, for a total of 1,046.57 Bcf/yr.[13] As amended, this prior authorization extends through December 31, 2050.

---

[9] Application at 8.
[10] *Id.* at 27.
[11] *Id.* at 4.
[12] *Mexico Pac. Ltd. LLC*, DOE/FE Order No. 4248, Docket No. 18-70-LNG (Sept. 19, 2018) and *Mexico Pac. Ltd. LLC*, DOE/FE Order No. 4312, Docket No. 18-70-LNG (Dec. 14, 2018).
[13] Application at 3.

Figure 1. Location of MPL Facility near Puerto Libertad (Source: Original Application)

Natural Gas Supply and Transportation

The Application states that MPL plans to source natural gas from "a variety of U.S. producing basins."[14] MPL states that it "…will export natural gas to Mexico via existing cross-border gas transmission pipelines, including an interstate natural gas pipeline owned by Sierrita Gas Pipeline LLC, and intrastate natural gas pipelines owned by Comanche Trail Pipeline, LLC, Roadrunner Gas Transmission, LLC and Trans Pecos Pipeline, LLC, all located in west Texas."[15] Further, the Application states that MPL "has concluded that the available pipeline capacity in both the U.S. and Mexico is more than adequate to support exports to the Facility."[16] In a supplement to the Application (Supplement), MPL stated that it is adding a proposed pipeline to the several existing natural gas transportation route options for the MPL Facility. This proposed Texas intrastate pipeline, the Saguaro Connector Pipeline, L.L.C., has applied to the Federal Energy Regulatory Commission (FERC) for authorization to site and construct border crossing facilities and has requested a Presidential Permit.[17]

---

[14] *Id.* at 9.
[15] *Id.*
[16] *Id.* at 9-10.
[17] Mexico Pacific Limited LLC, Docket No. 22-167-LNG Supplement to Application of Mexico Pacific Limited LLC for Additional Long-Term, Multi-Contract Authorization to Export Natural Gas to Mexico and to Re-export Liquefied Natural Gas to Free Trade Agreement and Non-Free Trade Agreement Nations – Supplemental Information on Available Pipeline Transportation Alternatives, at 2-3 (Jan. 23, 2023), https://www.energy.gov/sites/default/files/2023-01/MPL%20Letter%20supplementing%20Export%20Application%20%281_23_23%29%2022_167_LNG.pdf [hereinafter Supplement].

In the Application, MPL states that its "description of the MPL Facility in the Original Application is incorporated by reference herein as it remains largely unchanged from the Original Application, except as noted in this application."[18] The changes noted in section II of the Application ("Status of the Facility") cover site control, a commercial update, design and construction of the MPL Facility, and sources of natural gas to be exported.[19] In the Original Application, MPL provided a Project Overview, included as Attachment 1.[20]

In the Original Application, MPL highlighted planned natural gas supply purchases at the Waha Hub in West Texas.[21] MPL further stated that the MPL Facility could be supplied with natural gas via several different pipeline routes, including sourcing gas at the Waha Hub and at the Henry Hub in Louisiana, and provided a map (Figure 1, above) and another graphic illustrating three potential pipeline pathways (Figure 2).[22]

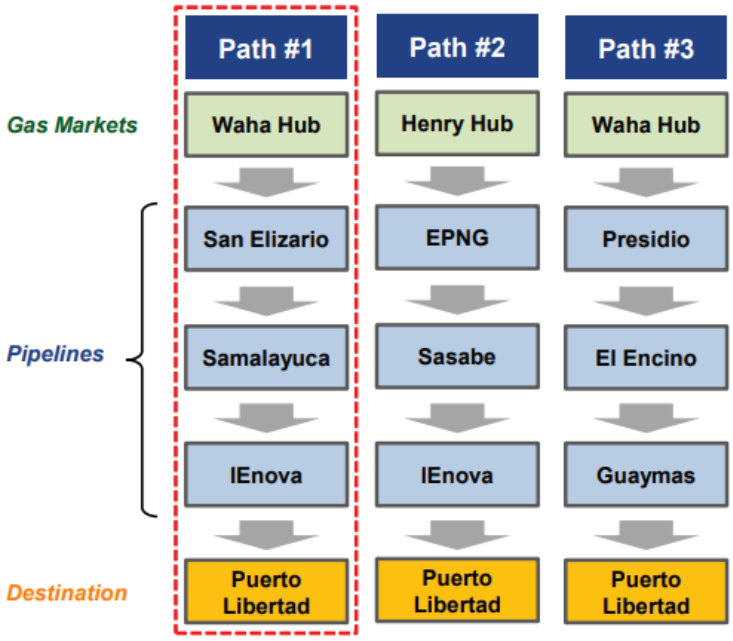

Figure 2: MPL Illustration of Potential Natural Gas Transportation Routes (Source: Original Application)

Liquefaction Facility

MPL is currently in the process of developing the MPL Facility (named Saguaro Energía).[23] During a first phase, MPL plans to build two liquefaction units.[24] It plans to build a third unit during a second phase of the project. MPL also plans to build two LNG storage tanks and a port terminal. Construction is planned

[18] Application at 6-7.
[19] Original Application at 6-10.
[20] *Id.* at 6 and Attachment 1.
[21] *Id.* at Attachment 1, p. 5.
[22] *Id.* at Attachment 1, p. 6.
[23] Saguaro Energía / Saguaro LNG website: Facility | Mexico Pacific, https://mexicopacific.com/saguaro-lng/saguaro-energia/ (last accessed Nov. 20, 2023).
[24] *Id.*

to involve partners Bechtel, Techint, ConocoPhillips, and Baker Hughes.[25] MPL has signed long-term supply contracts for a portion of its planned LNG production.[26]

In the Application, MPL states that its original request to export up to 621 Bcf/yr reflected estimates made in 2018 was based on the then-current design for the MPL Facility and the anticipated LNG output of the MPL Facility predicated on that design. The Application states that as MPL moved to final design and the negotiation of an engineering, procurement, and construction contract for the MPL Facility, the Applicant became aware of opportunities to improve on the liquefaction train design over that assumed in its Original Application.[27] MPL states that it found it could achieve significant improvements to facility efficiency and operational flexibility through improvements to the design of the liquefaction trains. At the time it submitted its Original Application, MPL had planned to install liquefaction trains capable of producing 4 million tonnes per annum (mtpa) (207 Bcf/yr), in three increments of 4 mtpa each, to yield a total liquefaction capacity of at least 12 mtpa (equivalent to 621 Bcf/yr). MPL now expects that the three natural gas liquefaction trains will have a total projected capacity of 17.6274 mtpa (912.22 Bcf/yr) rather than 12 mtpa (621 Bcf/yr).[28]

The Application states that the additional 425.57 Bcf/yr requested to be authorized for export to Mexico includes 291.22 Bcf/yr to be liquefied in Mexico and re-exported to both FTA and non-FTA nations, and up to 134.35 Bcf/yr for use as fuel for both pipeline transportation and/or liquefaction in Mexico.[29] MPL is requesting authorization to export to non-FTA nations the total incremental volume of LNG (*i.e.*, 291.22 Bcf/yr).

Target Markets

Also in Attachment 1 to the Original Application, MPL provided a map illustrating its planned destination markets, emphasizing markets in Asia (Figure 3).

[25] Saguaro Energía / Saguaro LNG website: Strategic Partners | Mexico Pacific Saguaro LNG website, https://mexicopacific.com/about/strategic-partners/ (last accessed Nov. 20, 2023).
[26] Global Construction Review, "Texas company to build $14bn LNG plant in Mexico" (May 5, 2023), https://www.globalconstructionreview.com/texas-company-to-build-14bn-lng-plant-in-mexico/ (last accessed Nov. 20, 2023).
[27] Application at 8.
[28] *Id.* at 3.
[29] *Id.*

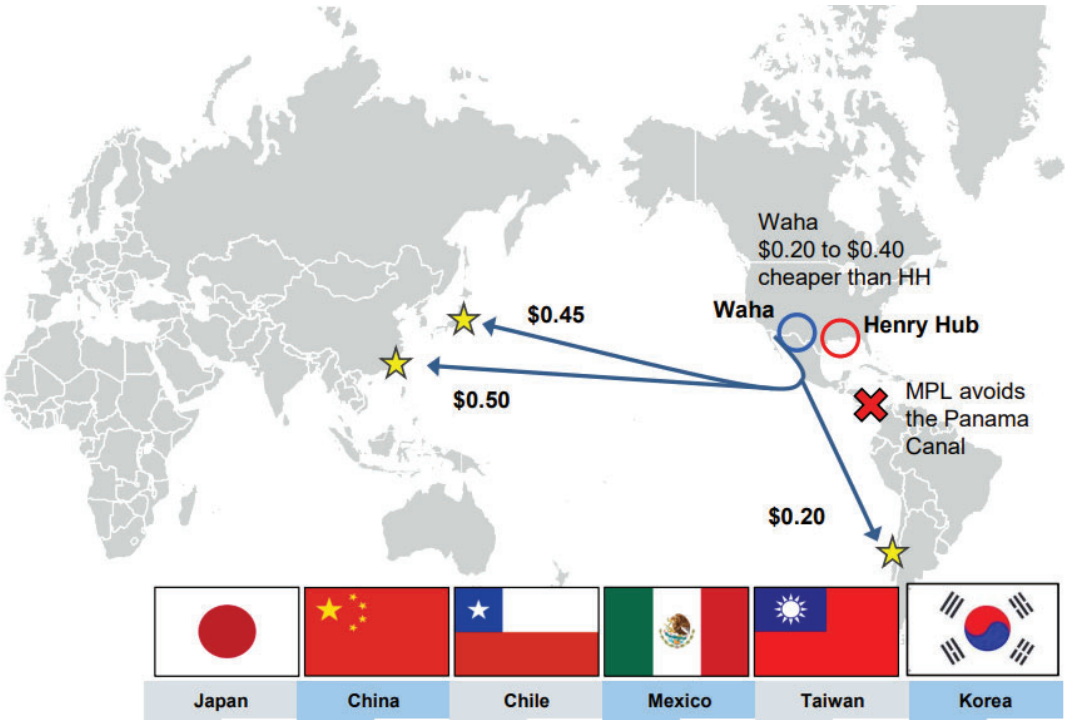

Figure 3: MPL's Illustration of Planned Destination Markets (Source: Original Application)

1.3.1.2 DOE's Proposed Action

DOE's proposed action is to authorize the exports described in the Application if DOE determines that such exports are not inconsistent with the public interest.

1.3.2 No Action Alternative

If the Application is not granted, DOE assumes, for the purposes of this EA, that the MPL Facility would not be operated and the potential environmental impacts from the MPL Facility would not occur. However, global demand for natural gas, including demand for LNG, is expected to experience growth, even accounting for the transition away from fossil fuels.[30] DOE therefore believes it is likely that some or all

[30] Several forecasting entities project continued growth in natural gas demand. For example, the Energy Information Administration (EIA) International Energy Outlook 2023 projects global natural gas consumption to increase by more than 29% from 2022 to 2050, in its Reference Case, even as it projects renewable power to become the largest electric generation source. *See* EIA, International Energy Outlook 2023, https://www.eia.gov/outlooks/aeo/data/browser/#/?id=20-IEO2023&region=6-0&cases=Reference&start=2020&end=2050&f=A&linechart=Reference-d230822.1-20-IEO2023.6-0&sourcekey=0. McKinsey has also projected LNG demand growth averaging 3.4% per year to 2035, with continued growth of 0.5% per year through 2050. The firm's accelerated transition scenario still shows an increase in demand only slightly lower by mid-century. *See* McKinsey, Global Gas Outlook to 2050, Summary Report, at 2 (Feb. 2021), https://www.mckinsey.com/~/media/mckinsey/industries/oil%20and%20gas/our%20insights/global%20gas%20outlook%20t

of the demand for LNG that the MPL Facility is intended to serve would be met by other LNG facilities, if the MPL Facility were not to be placed in service.

1.4 Scope of the Environmental Assessment

1.4.1 Extraterritorial Impacts

The environmental impacts subject to analysis in this EA are limited to those direct and indirect impacts that would occur in the United States and those that affect the global commons, such as global climate change resulting from emissions of greenhouse gases (GHGs). This EA does not analyze potential environmental impacts associated with elements of the Application that would occur within the sovereign territory of Mexico or any other country. These include the potential local and regional impacts of pipeline transportation of natural gas within Mexico to the MPL Facility, the construction and operation of the MPL Facility in Mexico (including LNG terminal operations), and terminal operations, transport, and use of LNG within receiving countries.

NEPA does not require an analysis of environmental impacts that occur within another sovereign nation that result from actions approved by that sovereign nation. Executive Order (E.O.) No. 12114 requires federal agencies to prepare an analysis of significant impacts from a federal action in certain defined circumstances and exempts agencies from preparing analyses in others. The E.O. does not require federal agencies to evaluate impacts outside the United States when the foreign nation is participating with the United States or is otherwise involved in the action.[31] The proposed MPL Facility to be used in connection with this application would be sited in Mexico and meets this criterion – it would have to be constructed and sited in accordance with all applicable Mexican laws, regulations, and standards. Additionally, aside from the life cycle emission of GHGs and the marine transport of LNG in international waters, the federal action would not affect the global commons.

1.4.2 Summary of Mexico's Environmental Review Process

The extent to which the MPL Facility and any associated pipeline facilities are constructed in Mexico is subject to review and approval by Mexican agencies under federal laws of that nation. While Mexico's review process falls outside the scope of this EA, DOE is providing information about the process for the public's information. The agencies in Mexico with potential jurisdiction over the activities proposed within Mexico, with respect to environmental and cultural impacts, are listed in Table 1.

---

o%202050/global-gas-outlook-2050-executive-summary.pdf. Other forecasters, such as the International Energy Agency and BP, also show increasing global demand for natural gas through at least 2030. *See* Economist Intelligence, *Fossil fuel demand to continue expanding this decade* (July 10, 2023), https://www.eiu.com/n/fossil-fuel-demand-to-continue-expanding-this-decade/.

[31] *See* E.O. 12114, *Environmental effects abroad of major Federal actions*, § 2-3(b) (Jan. 4, 1979), https://www.archives.gov/federal-register/codification/executive-order/12114.html.

Agency	Environmental, Cultural and Safety Assessments
Environmental and Safety Agency for the Hydrocarbon Industry (ASEA)	Manifestación de Impacto Ambiental/Environmental Impact Assessment (MIA); Estudio de Riesgo Ambiental/Environmental Risk Assessment (ERA); Registration of Industrial, Operational, and Environmental Safety Management Systems; Unique Regulated Registry Number; Technical Justification Study demonstrating that the ecosystem's biodiversity will not be jeopardized where natural vegetation will be removed
Energy Regulatory Commission (CRE)	Transportation permit for natural gas through pipelines, with any new pipeline engineering to be verified by a third party with a report that supports the permitted design
Secretary of Energy (SENER)	Evaluación de Impacto Social/Social Impact Assessment (EvIS), which identifies, characterizes, and assesses social impacts that could be caused by the project; Social Management Plan designed to implement specific measures required to address positive or negative social impacts
National Institute of Anthropology and History (INAH)	Archaeological Survey conducted before construction; archaeological clearance if INAH finds that archaeological vestiges exist.

Table 1. Mexican agencies responsible for environmental, cultural, and safety assessments for LNG and/or pipeline projects[32]

Mexico's primary statute governing environmental reviews of projects is the Ley General del Equilibrio Ecológico y la Protección al Ambiente/General Law of Ecological Balance and Environmental Protection (LGEEPA), which is administered by the Secretaría de Medio Ambiente y Recursos Naturales/Ministry of Environmental and Natural Resources (SEMARNAT). Within the SEMARNAT, the Agencia Nacional de Seguridad Industrial y de Protección al Medio Ambiente del Sector Hidrocarburos/National Agency for Industrial Security and Environmental Protection for the Hydrocarbon Industry (ASEA), is responsible for regulating and supervising industrial, operational, and environmental safety for projects related to the hydrocarbon sector, including the construction of natural gas pipelines and liquefaction facilities.

As part of ASEA's review of projects under LGEEPA, an MIA must be prepared. Similar to an Environmental Impact Statement (EIS) under NEPA, an MIA presents the results of comprehensive analysis and studies of potential environmental impacts associated with a project, including site preparation, construction, operation, and decommissioning, as well as an assessment of measures to mitigate environmental impacts and an analysis demonstrating compliance with Mexican laws and regulations, as well as prudent industry practices and international standards.

[32] Vista Pacifico LNG, S.A.P.I. de C.V., Environmental Assessment, VPLNG Mid-Scale Project (DOE/EA-2192), at 4 (Oct. 2022), https://www.energy.gov/sites/default/files/2022-10/FINAL%20Environmental%20Assessment%20-%20Vista%20Pacifico%2010-28-22.pdf.

ASEA also oversees a facility's continued compliance with applicable laws, regulations, and conditions governing safety, risk mitigation, technical processes, and the environment. In addition to review of the MIA and ERA, ASEA reviews and issues authorizations for projects, such as pipelines and liquefaction facilities, that will impact existing land use.

Project proponents of pipeline and liquefaction facilities must perform an EvIS, which identifies, characterizes, and assesses social impacts that could be caused by the project along with a social management plan to address those impacts. The EvIS is subject to review and approval of the Secretaría de Energía/Ministry of Energy. In addition, permits are required from the Comisión Reguladora de Energía/Energy Regulatory Commission to engage in activities that are subject to third-party access and those activities that are not subject to third-party access but require a permit, including the self-supply of electric energy, transportation, liquefaction, regasification, and storage of natural gas in Mexico.

2 Potential Environmental Impacts

2.1 Affected Environment

The affected environment is limited to the areas potentially affected by the Proposed Action that are within the scope of the EA, as identified in section 1.4.

2.1.1 Incremental Natural Gas Production

Potential natural gas sources for the MPL Facility include producing basins in the lower-48 states. The U.S. Energy Information Administration (EIA) projects that, by 2030, over 95% of natural gas produced onshore in the lower-48 states will be produced from "unconventional" resources, including gas from tight sandstone formations, gas from shale formations or gas associated with oil in tight formations, and gas from coal beds ("coalbed methane").[33] According to EIA's 2023 Annual Energy Outlook (AEO 2023), the share of onshore natural gas produced from these sources is expected to remain above 95% in 2050.[34] The most likely impacts associated with natural gas production would therefore relate to MPL Facility-induced incremental production of those resources. DOE's environmental study, *Addendum to Environmental Review Documents Concerning Imports of Natural Gas from the United States* (Aug. 2014) (Addendum),[35] which is incorporated herein by reference, identifies areas potentially affected by unconventional natural gas production, including water resources, air quality, induced seismicity, and land use.[36]

---

[33] *See* EIA, *Annual Energy Outlook 2023*, Table 14, *available at* https://www.eia.gov/outlooks/aeo/.
[34] *See id.*
[35] U.S. Department of Energy, *Addendum to Environmental Review Documents Concerning Exports of Natural Gas from the United States* (Aug. 2014), https://www.energy.gov/sites/prod/files/2014/08/f18/Addendum.pdf.
[36] The Addendum also addresses potential impacts on upstream GHG emissions (apart from their role in local or regional air quality), but those emissions are addressed holistically with emissions from other life cycle segments in section 2.1.4 ("GHG Emissions and Climate Change") below.

2.1.2 Incremental Cross-Border Pipeline Transportation of Natural Gas

As detailed in section 1.3.1.1, above, MPL anticipates that it will utilize natural gas pipelines, including those specifically enumerated in the Application and Supplement, to transport natural gas to the MPL Facility from the United States.[37] The Application states that the additional authorized export volume requested in the Application "will not involve or require the construction of any U.S. facilities that would yield environmental effects cognizable under NEPA."[38] Natural gas transported on behalf of the MPL Facility would increase utilization of pipelines, and therefore has the potential to cause incremental impacts in emissions related to pipeline operations. (These potential impacts are addressed in section 2.2.2.1, below.)

There is a significant and growing natural gas pipeline supply infrastructure between producing basins in the Southwestern and Gulf Coast regions of the U.S. and northern Mexico (Figure 4). Existing cross-border pipeline connections are highlighted in Figure 4, which was constructed with data from EIA and other public sources.[39] Appendix B provides details about the pipelines in Figure 4, including the border crossing location and average export data for 2022.

[37] Application at 9, Supplement.
[38] Application at 29.
[39] Table 1, Points of Entry/Exit, https://www.energy.gov/sites/prod/files/2015/08/f25/POEE%20List.pdf; Natural Gas Intelligence, 2023 Map of North American Pipelines, LNG Facilities, Shale Plays and Market Hubs, https://www.naturalgasintel.com/ngis-north-american-map-of-north-american-pipelines-lng-facilities-shale-plays/#options; EIA, U.S. Natural Gas Exports and Re-Exports by Point of Exit, https://www.eia.gov/dnav/ng/ng_move_poe2_a_EPG0_ENP_Mmcf_a.htm; https://ienova.gcs-web.com/static-files/1ba71478-c5cf-424c-9c2a-38ff0de6f0da.

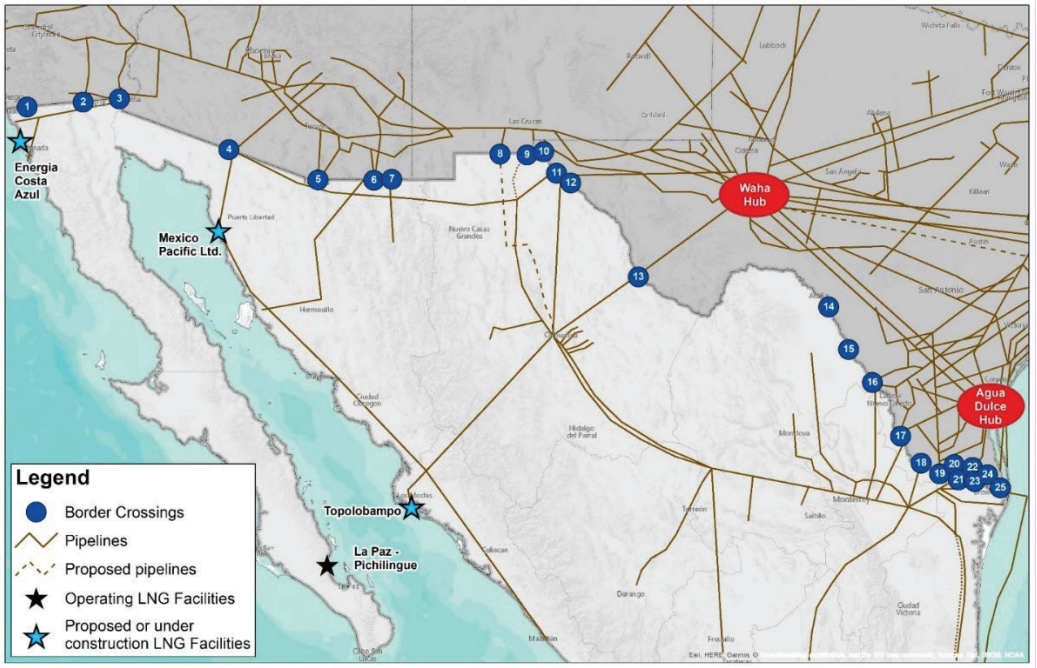

Figure 4: U.S. Natural Gas Pipelines with Cross-Border Connections to Mexico (Source: KeyLogic, constructed using information from EIA and other public sources.)

2.1.3 Marine Transportation of LNG

Exports from the MPL Facility would occur via ocean transport. The potentially affected environment in marine transportation of LNG includes resources that could be impacted by a release of the LNG cargo, in liquid or gaseous form, as well as routine shipping-related risks, such as fuel leaks and engine emissions. These resources include the ocean environment and the atmosphere in the area around an LNG vessel at sea.

2.1.4 GHG Emissions and Climate Change

Rising atmospheric GHG concentrations are altering global climate systems with the potential for long-term impacts on human society and the environment. The region of influence (ROI) for GHGs differs from other resource areas considered in this EA, as the concerns about GHG emissions are primarily related to climate change, which is global and cumulative in nature.

Increasing GHG concentrations in the atmosphere are linked to a range of ongoing and potential changes to global climate. Assessments of future climate change are dependent on predicted trends in GHG emissions, which depend on future policy and other actions to reduce GHG emissions. Climate change is linked to rising surface temperatures, changing levels of precipitation, reduction in sea ice cover, increasing ocean temperature, and rising sea levels. Climate change can result in changes in ecosystems, as well as an increase in the frequency and severity of extreme weather events, and can impact human health and society.

2.2 Potential Impacts

2.2.1 Natural Gas Production

The natural gas to be liquefied and exported by the MPL Facility would be produced from natural gas wells in the lower-48 states. As noted in section 2.1.1, a majority of onshore natural gas produced in the lower-48 United States is from unconventional resources.

2.2.1.1 Proposed Action

On August 15, 2014, DOE published the Addendum.[40] DOE prepared the Addendum to be responsive to the public and to provide the best information available on a subject that had been raised by commenters in LNG export application dockets. The Addendum addresses unconventional natural gas production in the lower-48 states. It does not attempt to identify or characterize the incremental environmental impacts that would result from LNG exports to non-FTA countries.[41]

The Addendum determined that the current rapid development of natural gas resources in the United States likely will continue, with or without the export of natural gas to non-FTA nations.[42] Nevertheless, a decision by DOE to authorize exports to non-FTA nations could accelerate that development by some increment. The Addendum reviewed the academic and technical literature covering the most significant issues associated with unconventional natural gas production, including impacts to water resources, air quality, GHG emissions, induced seismicity, and land use.

The Addendum shows that there are potential environmental issues associated with unconventional natural gas production that need to be carefully managed, especially with respect to emissions of volatile organic compounds and methane, and the potential for groundwater contamination. However, DOE does not have the ability to determine which specific natural gas resources would be produced to serve the MPL Facility.

2.2.1.2 No Action Alternative

In the No Action Alternative, LNG would not be supplied from the MPL Facility. In this case, DOE assumes that other LNG facilities would serve incremental international demand for LNG, supplying some or all of the volume planned to be supplied by the MPL Facility. Therefore, natural gas could be produced for liquefaction, in the United States or in another country.

If produced in the lower-48 United States for a North American project, any potential impacts related to incremental natural gas production would similarly occur in the No Action Alternative, which would therefore not have a currently identifiable environmental advantage over the proposed action. If produced

---

[40] *Supra* note 36.
[41] *See Sierra Club v. U.S. Dep't of Energy*, 867 F.3d 189, 198–99 (D.C. Cir. 2017) (upholding DOE's conclusion that, without knowing where local production of the incremental natural gas would occur, the corresponding environmental impacts are not reasonably foreseeable under NEPA).
[42] Addendum at 2.

outside of the United States for a foreign LNG project, it would be outside the scope of this analysis to assess impacts from natural gas production.

2.2.2 Natural Gas Pipelines

2.2.2.1 Proposed Action

DOE considered potential environmental impacts from natural gas pipeline transportation in the lower-48 states that may be caused by the MPL Facility's natural gas demand, roughly equivalent to 1.46% of U.S. pipeline system throughput in 2022.[43] All of the U.S. pipelines that could potentially transport natural gas to Mexico for the MPL Facility's use are under federal or state jurisdiction. They have been, or, in the case of any pipelines that may be under development, are being or will be evaluated by FERC and/or the relevant state regulatory authorities, for environmental and other impacts.[44]

Incremental pipeline throughput would not increase the flow of natural gas to levels above those permitted by FERC and/or state regulatory authorities, for existing or future pipelines. Incremental natural gas flow caused by the MPL Facility's demand would therefore not be expected to cause environmental effects that exceed permitted levels.

DOE also considered pipeline safety and accidental emissions. Potential impacts relevant to this EA are any impacts associated with the operation of pipelines that might be incrementally greater with marginally higher throughput due to the MPL Facility's demand. The Pipeline and Hazardous Materials Safety Administration (PHMSA) develops and enforces regulations for the safe, reliable, and environmentally sound operation of the Nation's pipeline transportation system.[45]

DOE reviewed PHMSA incident reports submitted by companies that operate U.S. pipelines connecting at border crossings between the U.S. and Mexico. DOE found that, from January 2010 through August 2023, these companies submitted a total of 94 incident reports for their entire operations (Table 2). These 94 incidents resulted in about 2 Bcf of gas emissions over this 13-year time period. The reasons for these incidents are presented in Table 2. "Equipment failure" is noted as the most common cause, accounting for 44% of the incidents.

---

[43] The Application requests authority to export up to 425.57 Bcf/yr. EIA reports that the U.S. natural gas transportation network "delivered about 29.1 [Tcf] of natural gas" in 2022 (425.57 Bcf ÷ 29.1 Tcf, or 29,100 Bcf = 1.46%). EIA, Natural Gas Explained: Natural Gas Pipelines, https://www.eia.gov/dnav/ng/ng_cons_sum_a_EPG0_vgt_mmcf_a.htm.

[44] For information about FERC's regulatory role for natural gas pipelines, see the web page at https://www.ferc.gov/industries-data/natural-gas/overview/natural-gas-pipelines#:~:text=FERC%20itself%20has%20no%20jurisdiction,needed%20pipelines%20and%20related%20facilities. For information regarding environmental reviews of any of the pipelines listed in Appendix B, see FERC's eLibrary at https://elibrary.ferc.gov/eLibrary/search.

[45] For information on PHMSA's role in ensuring the safe operation of natural gas pipelines, see https://www.phmsa.dot.gov/regulations.

Company	System	Incident Reports	Total Vol. Gas Released (MMcf)	Causes
West Texas Gas Inc.	Transport	4	7.5	Corrosion failure (1), equipment failure (1), excavation damage (2)
Tennessee Gas Pipeline (El Paso)	Transport	15	431.6	Corrosion failure (3), equipment failure (8), incorrect operation (1), failure of pipe material or weld (3)
El Paso	Transport	26	626.6	Corrosion failure (2), equipment failure (11), excavation damage (1), incorrect operation (3), failure of pipe material or weld (3), outside force damage (3), other incident (3)
ONEOK	Transport	12	305.6	Corrosion failure (3), equipment failure (4), excavation damage (1), incorrect operation (2), failure of pipe material or weld (2)
Kinder Morgan	Transport	25	731.9	Corrosion failure (3), equipment failure (15), excavation damage (2), failure of pipe material or weld (2), outside force damage (2), natural forces damage (1)
TETCO (Enbridge)	Transport	4	134.1	Failure of pipe material or weld (3), corrosion (1)
Enbridge	Transport	3	97.3	Equipment failure (1), excavation damage (1), other incident (1)
Valley Crossing	Transport	1	3.5	Equipment failure (1)
Southern California Gas	Transport	1	4.2	Natural forces damage (1)
San Diego Gas & Electric	Transport	1	0.04	Other incident (1)
Energy Transfer Co.	Transport	2	0.01	Natural forces damage (1), other incident (1)
Total		**94**	**2,342.35**	

Table 2. Data from PHMSA incident reports[46] from January 2010 through August 2023

[46] PHMSA, Distribution, Transmission & Gathering, LNG, and Liquid Accident and Incident Data, https://www.phmsa.dot.gov/data-and-statistics/pipeline/distribution-transmission-gathering-lng-and-liquid-accident-and-incident-data (last accessed Nov. 20, 2023).

Of these 94 incident reports, nine were reported to be located in counties associated with border crossing locations: one in Arizona and eight in Texas. These nine incidents are listed in Table 3. Judging by the locations of eight of the nine incidents, they could be (but are not necessarily) associated with equipment/operations supporting pipeline crossings. Five of these eight incidents were reported by Kinder Morgan at company infrastructure relatively close to the pipeline border crossing it operates near Laredo, Texas, all due to malfunction of control/relief equipment. However, as of August 2023, there have been no incidents reported to PHMSA at locations near that border crossing since April 2018.

Company	Incident Report No.	Date of Incident Report	County	Location	Nearby Border Interconnect (Pipeline Operator)	Total Vol. Gas Released (MMcf)	Cause
El Paso Natural Gas	20160090	11/12/2016	Cochise Co., AZ	Monument 90 Meter Station	Nogales (El Paso)	8.49	Malfunction of control/relief equipment
El Paso Natural Gas	20170025	3/24/2017	Hudspeth Co., TX	Cornudas Compressor Station	None	3.13	Malfunction of control/relief equipment
Kinder Morgan Tejas Pipeline	20180081	8/8/2018	Hidalgo Co., TX	Rio Grande 8” pipeline	Penitas (Kinder Morgan)	7.40	Excavation damage by 3rd party
	20180046	4/28/2018	Starr Co., TX	Rio Grande Compressor Station	Laredo (Kinder Morgan)	3.92	Malfunction of control/relief equipment
	20160053	6/29/2016	Zapata Co., TX	Operator property	Laredo (Kinder Morgan)	9.59	Malfunction of control/relief equipment
	20160057	7/6/2016	Starr Co., TX	Bob West Compressor Station	Laredo (Kinder Morgan)	6.11	Malfunction of control/relief equipment
	20150126	10/26/2015	Starr Co., TX	Bob West Compressor Station	Laredo (Kinder Morgan)	17.71	Malfunction of control/relief equipment
	20150058	4/29/2015	Starr Co., TX	Bob West Compressor Station	Laredo (Kinder Morgan)	10.60	Malfunction of control/relief equipment

Company	Incident Report No.	Date of Incident Report	County	Location	Nearby Border Interconnect (Pipeline Operator)	Total Vol. Gas Released (MMcf)	Cause
West Texas Gas	20180031	3/7/2018	Maverick Co., TX	Pipeline in Eagle Pass, TX	Eagle Pass (West Texas Gas)	0.24	Excavation damage by 3rd party
Total						**67.19**	

Table 3. Incidents reported by companies operating pipelines that connect to cross-border interconnections along the Mexico-U.S. border, from January 2010 through August 2023, that are located within the same county as a pipeline border crossing

Conservatively assuming the eight incidents close to the border crossings were directly related to operations at those crossings, a little more than 67 million cubic feet (MMcf) of gas would have been emitted during the time period from January 2010 through August 2023, mostly due to equipment malfunctions. According to EIA data, from January 2010 through August 2023, approximately 18.06 Trillion cubic feet (Tcf) of natural gas was exported via pipeline to Mexico.[47] That would equate to the accidental emission of less than one-one thousandth of one percent[48] of total exported gas during this period, well below current estimates of average methane emissions associated with natural gas transport across U.S. natural gas infrastructure.[49] This would be an upper bound estimate, based on an assumption that all of these emissions were directly associated with cross-border transport.

2.2.2.2 No Action Alternative

If the MPL Facility did not become operational, any potential local or regional impacts associated with incremental pipeline transportation of natural gas for the MPL Facility would not occur. If alternative incremental LNG production capacity were constructed in North America using natural gas from the lower-48 states, local or regional impacts would be similar to gas supplied to the MPL Facility (although perhaps at different locations in the United States), and the No Action Alternative would not have a currently identifiable environmental advantage over the Proposed Action. If incremental liquefaction

[47] EIA, U.S. Natural Gas Pipeline Exports to Mexico, https://www.eia.gov/dnav/ng/hist/n9132mx2M.htm (last accessed Nov. 20, 2023).
[48] The more exact figure is 0.000372%.
[49] The EPA's 2023 GHG Inventory (GHGI) states that methane emissions from U.S. natural gas transport and storage activities in 2021 totaled about 44.5 million metric tons CO_2-e (1590 kilotons of CH_4): https://www.epa.gov/system/files/documents/2023-04/US-GHG-Inventory-2023-Main-Text.pdf (Tables 3-66 and 3-67). This is equivalent to about 82.55 Bcf of methane. EPA Conversion tables: https://www.epa.gov/cmop/coal-mine-methane-units-converter#metricTons. This translates to a loss of 0.002 cubic feet of methane emitted to the atmosphere per cubic foot of natural gas transported—about 0.2%, since natural gas is mostly methane. Researchers have proposed that, based on comparisons of "top down" atmospheric measurements with the EPA's GHGI "bottom up" measurements, actual methane emissions may be 60 to 70 percent higher than the EPA estimates (https://www.iea.org/news/methane-emissions-from-the-energy-sector-are-70-higher-than-official-figures; https://www.edf.org/climate/methane-studies), so a worst case scenario might be 0.33%. A loss of 0.000372 percent is well below this figure.

capacity were developed outside of the United States, impacts associated with pipeline transportation would occur within a sovereign foreign country and would therefore be outside the scope of this analysis.

2.2.3 Marine Transport of LNG

2.2.3.1 Proposed Action

DOE considered potential impacts associated with the marine transport of LNG from production facilities to destination markets. As part of a NEPA rulemaking finalized on December 4, 2020,[50] DOE conducted a detailed review of technical documents regarding potential effects associated with marine transport of LNG.[51] These documents were identified in an accompanying Marine Transport Technical Support Document (Technical Support Document), which is incorporated herein by reference.[52] On the basis of the data referenced in the Technical Support Document, DOE concluded that "the transport of natural gas by marine vessels adhering to applicable maritime safety regulations and established shipping methods and safety standards normally does not pose the potential for significant environmental impacts."[53]

2.2.3.2 No Action Alternative

If the MPL Facility did not become operational, some or all of the volume of LNG the MPL Facility would have exported could be supplied to markets from other sources. Although varying with transportation distance (which could be shorter or longer), DOE finds that these impacts would be similar to those identified in the Marine Transport Technical Support Document.

2.2.4 GHG Emissions

2.2.4.1 Proposed Action

DOE's National Energy Technology Laboratory (NETL) conducted a study in 2014, updated in 2019 (collectively, GHG Studies), of GHG emissions attributable to LNG exports from the lower-48 states, to inform decisions on applications to export natural gas from the lower-48 states in the form of LNG to non-FTA countries. DOE has determined that the findings of the GHG Studies are applicable to assessment of the GHG emissions related to the exports proposed in the Application. DOE finds that its study of Life Cycle GHG emissions provides sufficient consideration of these emissions.

In 2014, NETL published *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States* (2014 LCA GHG Report).[54] The 2014 LCA GHG Report calculated the life cycle

---

[50] *See* U.S. Dept. of Energy, National Environmental Policy Act Implementing Procedures, Final Rule; 85 Fed. Reg. 78,197 (Dec. 4, 2020).
[51] *Id.* at 78,199.
[52] *See id*. at 78,198 n.16 (citing U.S. Dept. of Energy, Technical Support Document, Notice of Final Rulemaking, National Environmental Policy Act Implementing Procedures (10 C.F.R. Part 1021) (Nov. 2020)).
[53] *Id.* at 78,200; *see also id.* at 78,202. We note that, in the 2014 LCA GHG Report and 2019 Update, DOE also considered how emissions associated with the ocean transport of U.S. LNG in tankers contribute to total life cycle GHG emissions.
[54] U.S. Dept. of Energy, Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas From the United States, 79 Fed. Reg. 32,260 (June 4, 2014).

GHG emissions for LNG made from natural gas sourced from the lower-48 states and exported to markets in Europe and Asia. DOE commissioned this life cycle analysis (LCA) to inform its review of non-FTA applications, as part of its broader effort to evaluate different environmental aspects of the LNG production and export chain. The 2014 LCA GHG Report concluded that the use of U.S. LNG exports for power production in European and Asian markets would not increase global GHG emissions from a life cycle perspective, when compared to regional coal extraction in the global regions near the point of consumption, and consumption for power production.

In 2019, NETL published an update to the 2014 LCA GHG Report, entitled *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas From the United States: 2019 Update* (2019 Update).[55] The conclusions of the 2019 Update were consistent with those of the 2014 LCA GHG Report—that, "[w]hile acknowledging uncertainty, to the extent U.S. LNG exports are preferred over coal in LNG-importing nations, U.S. LNG exports are likely to reduce global GHG emissions on a per unit of energy consumed basis for power production."[56] Additionally, "to the extent U.S. LNG exports are preferred over other forms of imported natural gas, they are likely to have only a small impact on global GHG emissions."[57] Both the 2014 LCA GHG Report and the 2019 Update are incorporated herein by reference.

DOE finds it reasonable to apply the GHG Studies in reviewing the life cycle emissions related to exports proposed in the Application. The source of natural gas for the MPL Facility (the lower-48 states) is the same source analyzed in the GHG Studies. Pipeline transport within the U.S. would also be comparable. Emissions from pipeline transport including a segment in Mexico could differ from U.S. pipeline emissions estimates in the GHG Studies for two reasons: 1) the total transport distance may be longer due to the MPL Facility's location compared to a U.S. Gulf Coast location, and 2) GHG emissions from pipelines in Mexico may be different than emissions from U.S. pipelines. The extent of such a potential difference is uncertain, but a sensitivity analysis of pipeline emissions values in the GHG Studies can reasonably estimate a range of possible divergence from the GHG Studies' findings.

DOE also finds that the MPL Facility is reasonably comparable to the representative LNG Project analyzed in the GHG Studies. DOE assumes that marine shipments of LNG from the MPL Facility would have similar attributes to shipments from the U.S. Gulf Coast location analyzed in the GHG Studies. As noted above, the Application emphasizes exports to Asian markets, and so transport to that region is the focus of DOE's assessment here, although the Application allows for exports to other markets as well. The shorter distance to markets in Asia would lead to slightly lower marine transport emissions from LNG shipping from the MPL Facility, as compared to a Gulf Coast location. (If the MPL Facility were to export LNG to other markets, such as Europe, shipping distances could be longer and marine transport-related emissions commensurately greater, than LNG shipped from a Gulf Coast LNG terminal.) Emissions from end use would be similar regardless of destination.

---

[55] Nat'l Energy Tech. Lab., *Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States: 2019 Update* (DOE/NETL-2019/2041) (Sept. 12, 2019), https://www.energy.gov/sites/prod/files/2019/09/f66/2019%20NETL%20LCA-GHG%20Report.pdf.
[56] U.S. Dept. of Energy, Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas From the United States: 2019 Update – Response to Comments, 85 Fed. Reg. 72, 85 (Jan. 2, 2020).
[57] *Id.*

Results from the 2019 Update for each segment of the life cycle analysis, for that study's representative Asian market (Shanghai, China), are shown in Table 4 below.[58] Because the GHG Studies examined use of fuels for power generation as a basis of comparison, emissions rates are expressed in terms of the amount of carbon dioxide-equivalent (CO_2-e) of GHGs emitted per unit of electricity generated -- carbon dioxide-equivalent emissions per megawatt-hour (CO_2-e/MWh).

Process Element	100-yr GWP
Natural Gas Extraction	21
Gathering and Boosting	50
Processing	18
Pipeline Transport	60
Liquefaction	41
Tanker Transport	76
LNG Regasification	4
Power Plant Operations	416
Electricity T&D	2
Total	688
Low	663
High	763

Table 4. Life cycle GHG emissions (100-yr GWP) for U.S. LNG shipped from New Orleans to Shanghai, China for power generation (kg CO_2-e/MWh)[59]

GHGs in the GHG Studies were reported on the common mass basis of kilograms (kg) of carbon dioxide equivalent using the global warming potential (GWP) of each GHG from the 2013 Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). The 100-yr GWP is the timeframe used for comparison in this EA.

Segments related to natural gas production and processing and to regasification and end use would be the same for the exports proposed in the Application as in the GHG Studies. DOE evaluated the three segments that might have variation between these exports and the GHG Studies – these are shown in red in Table 4. Differences could result from 1) distance and conditions of pipeline transport from U.S. producing basins to the proposed MPL Facility location as compared to the U.S. Gulf Coast; 2) conditions of operation for an LNG plant in Mexico versus a U.S. Gulf Coast facility; and 3) distance and conditions of LNG tanker transport from the MPL Facility to Shanghai, as compared to tanker transport from New Orleans to Shanghai.

Therefore, differences in calculated emissions between the proposed MPL Facility and the GHG Studies model would primarily result from: 1) any difference in natural gas pipeline transport distance between U.S. producing basins and the liquefaction plants and differences in emissions between Mexican pipelines and U.S. pipelines; 2) differences in the emissions associated with liquefaction in Mexico versus the U.S.;

[58] 2019 Update, Exhibit A-2, p. A-2.
[59] Rows in red text are segments DOE evaluated that might have variation between the MPL Facility and the GHG Studies.

and 3) the difference in nautical distance traveled by an LNG tanker between liquefaction plants and Shanghai, China. We examine each of these categories below.

Pipeline Transport – In the GHG Studies, extracted and processed natural gas is transported via pipeline, where GHG emissions are associated with: 1) the combustion of a portion of the natural gas in compressors; 2) intentional venting; and 3) fugitive losses of natural gas. Emissions from these sources are a function of the length of the transport distance, the number of compressor stations (a function of the length of transport), and the associated natural gas storage capacity (a function of the throughput), as well as maintenance and operational practices. DOE believes it reasonable to assume that throughput is comparable in both scenarios, in which case the potential differences are reduced to the possible difference in pipeline transport distance from gas sources to the MPL Facility, and to possible emissions differences between pipeline operations in Mexico and in the United States.

Possible Differences in Pipeline Transport Distance

Analysis in the GHG Studies estimated that the average pipeline transport distance from natural gas extraction to an LNG terminal on the U.S. Gulf Coast was 971 kilometers (km) (about 600 miles), that being the average pipeline transmission distance for LNG exports from the United States.[60] This distance is based on the characteristics of the entire transmission network and the delivery rate for natural gas in the United States. The pipeline transport distance from U.S. production sources to the proposed MPL Facility could be longer. For example, the distance from the Permian Basin producing area, a likely source of gas for the MPL Facility, to Puerto Libertad, Mexico, is conservatively estimated at 800 miles. DOE examined this by assuming an approximately 33% increase in average transportation distance over the 600-mile estimate from the GHG Studies, for a total of 800 miles.

The GHG studies estimated that total expected life cycle GHG emissions of U.S. LNG exports to Shanghai, China from the Gulf Coast would be 688 kg CO_2-e/MWh (*See* Exhibit A-2 in the 2019 Update). The GHG studies estimated that 8.7%, or 60 kg CO_2-e/MWh, of these emissions would be from pipeline transport.[61] DOE assumed a linear relationship between distance and emissions -- that extending the transportation distance from 600 miles to 800 miles (a 33% increase) would increase the pipeline transport contribution to GHG emissions from 60 kg CO_2-e/MWh to 80 kg CO_2-e/MWh (also a 33% increase), with emissions rates from pipeline transportation held constant at levels estimated for U.S. pipelines in the GHG Studies.[62] This would increase total estimated life cycle emissions to approximately 708 kg CO_2-e/MWh, an increase of about 3%.[63] The higher pipeline transport-related emissions would be about 11.3% of the new total.

---

[60] Nat'l Energy Tech. Lab., *Life Cycle Analysis of Natural Gas Extraction and Power Generation* (DOE/NETL-2019/2039), at 4 (Apr. 19, 2019), https://www.netl.doe.gov/energy-analysis/details?id=3198.
[61] Using the 100-year GWP.
[62] In the GHG Studies, emissions profiles of transmission pipelines in other countries are held constant at the U.S. rate, with the pipeline transport distance being the determinant of emissions differences (2019 Update, Exhibit 5-5, at 13).
[63] An increase of 20 kg CO_2-e/MWh from a total of 688 CO_2-e/MWh: 20 / 688 = 0.029, or about 3%.

Possible Differences Between Pipeline Emissions in Mexico and the United States

DOE has not identified a direct estimate for the emissions from pipelines in Mexico. For this EA, DOE has assumed that pipeline emissions in Mexico would be the same as from pipelines located in the United States. This is the same assumption DOE made in the GHG Studies for pipeline emissions in all countries.

However, DOE recognizes that higher and growing divergence in emissions rates between Mexican and United States pipeline transportation are possible given policy and regulatory differences with the U.S. regulatory system. These include EPA requirements to report greenhouse gas emissions for pipeline transportation[64] (and other components of the natural gas supply chain) and FERC requirements for accounting for lost and unaccounted for gas.[65] And in the future, U.S. pipeline operators may be subject to regulatory emission limits,[66] with those pipelines that do not meet regulatory limits subject to a waste emissions charge established in the Inflation Reduction Act of 2022.[67]

At the same time, DOE notes that the average pipeline age in Mexico[68] is less than that of most U.S. pipelines, and therefore, in the near-term, Mexican pipelines may experience fewer age-related maintenance issues that could increase the risk of methane emissions.[69]

DOE notes that, in any case, the extent to which the Mexican pipeline emissions rate would influence total life cycle emissions is limited, given that pipeline transportation emissions would be approximately 11.3% of the total life cycle emissions for a delivery to Asia, based on the GHG Studies, with the longer pipeline transport distance described above.[70]

---

[64] EPA's Greenhouse Gas Reporting Program (GHGRP) covers emissions from different areas of the oil and gas industry through several of its subparts. The reporting is required of domestic natural gas market participants in different phases of oil and natural gas value chains, including extraction, production, transport, and use. https://www.epa.gov/ghgreporting.

[65] Pipelines subject to FERC's jurisdiction are required to disclose volumes of natural gas lost and unaccounted for during pipeline operations in FERC Form 2. https://www.ferc.gov/sites/default/files/2020-04/form-2.pdf.

[66] *See* Standards of Performance for New, Reconstructed, and Modified Sources and Emissions Guidelines for Existing Sources: Oil and Natural Gas Sector Climate Review, 86 Fed. Reg. 63,110 (Nov. 15, 2021).

[67] Inflation Reduction Act of 2022, Pub. L. 117-169, § 60113 (2022).

[68] *See* EIA, Today in Energy, "U.S. natural gas exports to Mexico set to rise with completion of the Wahalajara system" (July 6, 2020) ("Since 2016, Mexico has been expanding its natural gas pipeline system, which has supported continual growth in U.S. natural gas exports."), https://www.eia.gov/todayinenergy/detail.php?id=44278. For the U.S., *see* PHMSA, Gas Transmission Miles By Decade Installed, https://portal.phmsa.dot.gov/analytics/saw.dll?Dashboard (retrieved Sept. 23, 2022). The data in the table indicate that 9% of the natural gas transmission miles of pipeline in the U.S. were installed since 2010.

[69] *See* PHMSA, Pipeline Replacement Background (Apr. 26, 2021), https://www.phmsa.dot.gov/data-and-statistics/pipeline-replacement/pipeline-replacement-background ("[F]ollowing major natural gas pipeline incidents, U.S. Department of Transportation and the Pipeline Hazardous Materials Safety Administration issued a Call to Action to accelerate the repair, rehabilitation, and replacement of the highest-risk pipeline infrastructure. Among other factors, pipeline age and material are significant risk indicators.").

[70] Pipeline emissions, including estimated increased emissions due to the longer transport distance, would comprise about 12.4% of total life cycle emissions for the 2019 Update's representative European destination.

LNG Liquefaction – In the GHG Studies, LNG plant operations and associated emissions were based on the following assumptions:

- The LNG plant includes pre-treatment of the input pipeline-quality gas, liquefaction of the pre-treated gas, and on-site temporary storage of LNG before it is loaded onto an ocean tanker.
- The pre-treatment processes include: acid gas removal (removal of CO_2 and H_2S from the pipeline feed gas, to avoid freezing and plugging in downstream units); molecular sieve dehydration (removal of water to avoid freeze-up and unplanned shutdowns); and heavy hydrocarbon removal to protect the main heat exchanger from freezing and plugging, via adsorption or cryogenic distillation.
- The liquefaction plant employs a Propane Pre-Cooled Mixed Refrigerant (C3MR) process in combination with the pre-treatment technologies, represented through four different scenarios.
- Based on the publicly available data on U.S. plant export capacities and ship capacity assumptions, the residence time of LNG on site is estimated to be between 1.33 days and 1.60 days. During storage, boil-off gas (~0.02% to 0.1%) is assumed to be re-liquefied, which then enters back into the supply-chain.
- Pre-treatment and liquefaction energy requirements are assumed to be met through combusting a stream of natural gas as it leaves the pre-treatment facility and before it enters the liquefaction facility.

The Application did not provide technical details for the natural gas treatment and liquefaction processes to be employed at the proposed MPL Facility. Similarly, the original application for the MPL Facility, previously approved, provided no details regarding the natural gas treatment and liquefaction processes.[71] However, it is publicly known that the ConocoPhillips Optimized Cascade Process is planned for use in the MPL Facility.[72] The Optimized Cascade Process employs three, multi-staged, cascaded refrigerant circuits using pure refrigerants, brazed aluminum heat exchangers and insulated cold box modules, with optimized heat integration. The Optimized Cascade Process was one of the processes included in modeling for the 2019 Update, so the MPL Facility's gas pre-treatment and liquefaction processes are thus at least comparable in terms of emissions to those assumed in the GHG Studies.[73]

MPL provided additional information in response to questions posed by DOE regarding the GHG performance of the proposed MPL Facility.[74] Based on this information, the Applicant's proposed Facility

---

[71] Original Application, *supra* note 12.
[72] ConocoPhillips LNG Technology & Licensing, "Mexico Pacific Limited Announces Collaboration with ConocoPhillips LNG Licensing and Bechtel to Champion Low Carbon LNG" (Oct. 25, 2021), https://lnglicensing.conocophillips.com/mexico-pacific-limited-announces-collaboration-with-conocophillips-lng-licensing-and-bechtel-to-champion-low-carbon-lng/ (last accessed Nov. 20, 2023).
[73] ConocoPhillips website, "Optimized Cascade Process," https://lnglicensing.conocophillips.com/what-we-do/lng-technology/optimized-cascade-process/ (last accessed Nov. 20, 2023).
[74] Informational Questions for the Department of Energy's Environmental Assessment for Mexico Pacific Limited LLC's Application to Export LNG (Nov. 2, 2023). Responses provided in two letters, Response to Informational Questions (Nov. 9, 2023); and Clarification to November 9, 2023 Responses to Informational Questions (Nov. 15, 2023). All of this correspondence is available in DOE's electronic docket file at https://www.energy.gov/fecm/articles/mexico-pacific-limited-llc-mpl-fecm-docket-no-22-167-lng.

would be designed to operate a Baker Hughes turboshaft aeroderivative dry low emission (DLE) simple cycle gas turbine with an estimated efficiency of 40.5 percent. In comparison, the 2019 Update that modeled onshore LNG operations represented natural gas combined cycle power plants with an energy efficiency of approximately 50%. The proposed MPL Facility is also estimated to consume more fuel per unit of LNG produced, but within current industry standards, than the modeled facility in the 2019 Update. The difference in power production efficiency and quantity of fuel consumed per unit of LNG produced results in higher carbon dioxide emissions from on-site power production per unit of LNG ready for transport from the liquefaction plant. MPL also estimates a lower quantity of carbon dioxide emissions, 29 percent, from flaring on a per unit of LNG ready for transport basis, compared to the 2019 Update. This discrepancy is attributed to a reduction in the quantity of gas sent to flares compared to the 2019 Update's estimate per unit of LNG. The net result is a 54% increase in carbon dioxide emissions for the MPL Facility, as compared to the facility modeled in the 2019 Update.

At the same time, methane emissions from the proposed MPL Facility are estimated to be 21 percent lower than the 2019 Update's estimates, due to the use of dry gas seals on the liquefaction compressors combined with a compressor gas seal recovery system and other system design elements to minimize methane emissions. The net effect of increased carbon dioxide emissions and lower methane emissions is higher carbon dioxide-equivalent emissions per unit of natural gas liquefied and stored at the liquefaction plant; estimated to be a 51% increase. However, this estimated increase in liquefaction plant GHG emissions would not change the conclusions of the 2019 Update that exported natural gas from the United States, and by extension, from the proposed Mexican liquefaction operations, "[w]hile acknowledging uncertainty, to the extent U.S. LNG exports are preferred over coal in LNG-importing nations, U.S. LNG exports are likely to reduce global GHG emissions on a per unit of energy consumed basis for power production."[75] Additionally, "to the extent U.S. LNG exports are preferred over other forms of imported natural gas, they are likely to have only a small impact on global GHG emissions."[76] In DOE's modeling in the 2019 Update, liquefaction operations contribute roughly 10% to the total life cycle GWP. Even at the higher liquefication GHG emissions intensity for steady state operations proposed for the MPL Facility, the life cycle GHG emissions do not exceed the uncertainty bounds of the modeled results within the 2019 Update.

DOE believes it reasonable that, on a per-unit-volume-of-LNG-produced basis, GHG emissions from the proposed MPL Facility and the Gulf Coast LNG plant modeled in the GHG Studies would be similar. DOE notes, however, that modeling of liquefaction facility operation in the GHG Studies did not include carbon capture and storage (CCS) capability. Liquefaction facilities in the U.S. are eligible for tax credits to add CCS to operations, and some U.S. liquefaction facilities have stated their intention to pursue CCS capability that would reduce emissions from liquefaction operations.[77]

---

[75] U.S. Dept. of Energy, Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas From the United States: 2019 Update – Response to Comments, 85 Fed. Reg. 72, 85 (Jan. 2, 2020).
[76] *Id.*
[77] *See* Announcement from Sempra Infrastructure regarding the Cameron LNG project in Louisiana (May 22, 2022), https://www.sempra.com/sempra-infrastructure-signs-participation-agreement-totalenergies-mitsui-mitsubishi-carbon; *see also* announcement from NextDecade regarding the Rio Grande LNG project in Texas (Mar. 18, 2021), https://investors.next-decade.com/news-releases/news-release-details/nextdecade-launches-next-carbon-solutions.

LNG Tanker Transport – As discussed above, the Application emphasizes exports to markets in Asia, although it does not limit its request to those markets. Because of the Application's emphasis, DOE has focused its evaluation on transport routes to Asia, although exports to other markets could occur. The 2019 Update based LNG tanker transport emissions on fuel combustion emissions (both compressed boil off gas and supplementary diesel fuel), average speed assumptions, and the distance between New Orleans and Shanghai via various sea routes. The calculation assumed that the shortest distance would be 18,544 km (via the Panama Canal), while the distance via other alternate routes would vary from 25,436 to 31,722 km (Table 5). In comparison, the distance from Puerto Libertad, Mexico (the MPL Facility) to Shanghai is 12,834 km.[78] The shortening in routes that would occur if LNG were to be shipped from the Project, as opposed to New Orleans, appears in Table 5.

Departure Port	Route	Distance (km)	Shortening of Route with the MPL Facility
New Orleans	Via Panama Canal	18,544	31%
	Via Suez Canal	25,436	50%
	Via Cape of Good Hope	27,731	54%
	Via Strait of Magellan	31,606	59%
	Via Cape Horn	31,722	60%
Puerto Libertad (MPL Facility)	Direct cross-Pacific route	12,834	

Table 5. Distance by sea for LNG tanker travel from U.S. Gulf Coast and from the proposed MPL Facility to Shanghai, China, and calculated shortening of LNG tanker travel route for this representative Asian market

DOE believes it reasonable to assess marine transport-related GHG emissions as directly (*i.e.*, linearly) related to transport distance. Based on these calculations, the reduction in GHG emissions associated with LNG tanker transport would be between 31% and 60%, depending on the New Orleans to Shanghai route chosen for comparison. As the share of the scenario's emissions contributed by LNG tanker transport is approximately 11% (76 ÷ 688, from Table 4), this would translate to a reduction in overall emissions of between 3% and 7% due to the shorter tanker travel route. DOE notes, however, that LNG exports to some other markets, such as Europe, would entail greater shipping distances than the ones analyzed in the GHG Studies for those Markets, and commensurately greater GHG emissions from marine transport of LNG.

2.2.4.2 No Action Alternative

If the MPL Facility did not become operational, other LNG production capacity could be constructed in the United States or another country to serve some or all of the LNG demand the MPL Facility is intended to serve. Since it is uncertain where this production would take place, it is not possible for DOE to make a quantitative comparison of estimated life cycle GHG emissions. DOE acknowledges that the differences described could result in additional GHG emissions associated with Mexican LNG exports, as compared

[78] Calculated using online platform Maritime Optima. *See* https://app.maritimeoptima.com.

to alternative LNG sources and/or changes in natural gas production and consumption. However, DOE finds it not unreasonable to assume that GHG emissions would be broadly similar, and, given the global nature of climate change, would have similar incremental impacts.

3 List of States & Tribes Contacted

3.1 Tribes Contacted

California
Barona Reservation
Campo Reservation
Captain Grande (no longer in existence)
Cuyapaipe Reservation
Inaja and Cosmit Reservation
Jamul Indian Village
La Jolla Reservation
La Posta Reservation
Los Coyotes
Manzanita Reservation
Mesa Grande Reservation
Pala Reservation
Pauma and Yuima Reservation
Pechanga Tribe
Rincon Tribe
San Pasqual Reservation
Santa Ysabel Reservation
Sycuan Reservation
Torres-Martinez Tribal Lands
Viejas Reservation
New Mexico
N/A
Arizona
Cocopah Reservation
Fort Yuma
Pascau Yaqui Reservation
Tohono Reservation
Texas
Kickapoo
Ysleta Del Sur

3.2 States Contacted

State Governments
California
Arizona
Texas

4 List of Preparers

4.1 U.S. Department of Energy

Brian Lavoie, Sr. Natural Gas Analyst

Jennifer Wade, Director, Division of Natural Gas Regulation

Appendix A: Agency and Tribal Correspondence

SUBJECT LINE: Notice of Environmental Assessment to [state/Indian Tribe on the list]

--

To Whom it May Concern:

The U.S. Department of Energy recently announced that an environmental assessment (EA) under the National Environmental Policy Act (NEPA) is being prepared pursuant to the review of an application to export U.S. natural gas from a planned natural gas liquefaction project in Mexico. The application includes transfer by pipeline of natural gas from the U.S. to Mexico.

NEPA requires federal agencies to assess the potential environmental impacts of major federal actions significantly affecting the environment. Using the NEPA process, agencies evaluate the environmental and related social and economic effects of their proposed actions. An EA is a concise public document that provides sufficient evidence and analysis to determine to prepare an environmental impact statement or a finding of no significant impact.

The EA being prepared is related to the LNG export proceeding shown below:

Applicant	**DOE Docket**	**Notice of Environmental Assessment**
Mexico Pacific Limited LLC (MPL)	22-167-LNG	Notice of EA MPL - GC-FECM 10-23-23 FINAL_new_signed.pdf (energy.gov)

You are being contacted as a State or Tribe located near where the cross-border natural gas pipeline(s) that may service the planned liquefaction project is/are located. The planned liquefaction project states that it anticipates receiving the natural gas produced in the United States and exported to Mexico through existing and, potentially, future cross-border natural gas transmission pipelines, including an interstate pipeline owned by Sierrita Gas Pipeline LLC, and intrastate natural gas pipelines owned by Comanche Trail Pipeline, LLC, Roadrunner Gas Transmission, LLC and Trans Pecos Pipeline, LLC. MPL also asserts that, if the proposed border crossing pipeline owned by Saguaro Connector Pipeline, L.L.C. obtains the required authorization and Presidential Permit from the Federal Energy Regulatory Commission, MPL would expect to add that pipeline to the several existing pipeline routes over which MPL and its customers may transport natural gas from the United States to Mexico for delivery to the proposed facility.

DOE anticipates providing a draft of the EA later this fall, and a 30-day public comment period will then commence.

If you have any questions related to this notice or have updated contact information, please reply to this email.

Thank you,

Office of Resource Sustainability
Division of Natural Gas Regulation
Office of Fossil Energy and Carbon Management
U.S. Department of Energy
Email: fergas@hq.doe.gov
Website: https://www.energy.gov/fecm/regulation

U.S. DEPARTMENT OF ENERGY | Fossil Energy and Carbon Management

Engage and subscribe.

Appendix B: Natural Gas Pipeline Border Crossing Locations

Map number	Border Crossing Location	State	US pipeline	Mexican pipeline	EIA 2022 Avg. Exports (MMcfd)
1	Otay Mesa/Tijuana	CA	SDG&E, SoCalGas	Transportadora de Gas Natural de Baja California (Sempra)	0
2	Calexico/Mexicali	CA	SoCal Gas	Rosarito (Sempra)	67.5
3	Ogilby/Los Algodones	CA	North Baja, El Paso	Rosarito (Sempra)	334
4	Sasabe/Sasabe	AZ	Sierrita (Kinder Morgan)	Gasoducto Aguaprieta/Sonora Pipeline (Sasabe-Guaymas) (Sempra)	8.2
5	Nogales/Nogales	AZ	El Paso	Samayaluca-Sasabe (Carso Energy)	1.6
6	Douglas/Naco	AZ	El Paso	Naco-Hermosillo (CENAGAS)	136
7	Douglas/Agua Prieta	AZ	El Paso	Gasoducto la Caridad (Mexicana de Cobre)	
8	Columbus/Port of Palomas (Proposed)	NM	Proposed Paso Norte pipeline (Paso Norte Pipeline Group) to connect El Paso pipeline to border	Proposed Paso Norte pipeline to natural gas hub El Encino	0
9	San Jeronimo/San Jeronimo (Proposed)	NM	El Paso	Libramiento Juarez (Proposed)	0
10	El Paso/Juarez	TX	Norteno Pipeline (ONEOK)	Sistema Nacional de Gasoductos-SNG (PEMEX-CENAGAS)	257.5
11	San Elizario/San Isidro	TX	El Paso, Comanche Trail	San Isidro-Samalayuca, Samalayuca, Tarahumara (Chihuahua Corridor)	459.5
12	Clint/El Hueco	TX	Roadrunner (ONEOK)	SNG	75.3
13	Presidio/Ojinaga	TX	Trans-Pecos	Ojinaga-El Encino	617.8
14	Del Rio/Acuna	TX	West Texas Gas, Inc.	SNG	1.3
15	Eagle Pass/Piedras Negras	TX	West Texas Gas, Inc.	SNG	32.1
16	Laredo/Colombia	TX	Kinder Morgan	Nueva Era	310.8
17	Roma/Mier	TX	Kinder Morgan	Kinder Morgan	376.7
18	Rio Grande/Camargo	TX	NET Mexico	Los Ramones I (Sempra)	1,500
19	Penitas/Arguelles	TX	Kinder Morgan	SNG	0
20	McAllen/Arguelles	TX	HPL	SNG	127.5
21	Alamo/Reynosa	TX	Tennessee Gas Pipeline	SNG	68.7
22	Hidalgo/Reynosa	TX	Kinder Morgan	SNG	200.8
23	Rio Bravo/Rio Bravo	TX	TETCO (Enbridge)	SNG-Gasoducto Del Rio	206.7
24	Progreso/Rio Bravo	TX	TETCO (Enbridge)	SNG-Gasoducto Del Rio	
25	Brownsville/Matamoros	TX	Valley Crossing	SNG	901.3

Data sources include: Table 1, Points of Entry/Exit, https://www.energy.gov/sites/prod/files/2015/08/f25/POEE%20List.pdf; Natural Gas Intelligence, 2023 Map of Mexico's Natural Gas Pipelines, Market Hubs & LNG Facilities, https://www.naturalgasintel.com/ngis-north-american-map-of-north-american-pipelines-lng-facilities-shale-plays/; EIA, U.S. Natural Gas Exports and Re-Exports by Point of Exit, https://www.eia.gov/dnav/ng/ng_move_poe2_a_EPG0_ENP_Mmcf_a.htm; Infraestructura Energética Nova, S.A.B. de C.V. 2018 Annual Report, https://ienova.gcs-web.com/static-files/1ba71478-c5cf-424c-9c2a-38ff0de6f0da.