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Chapter 2

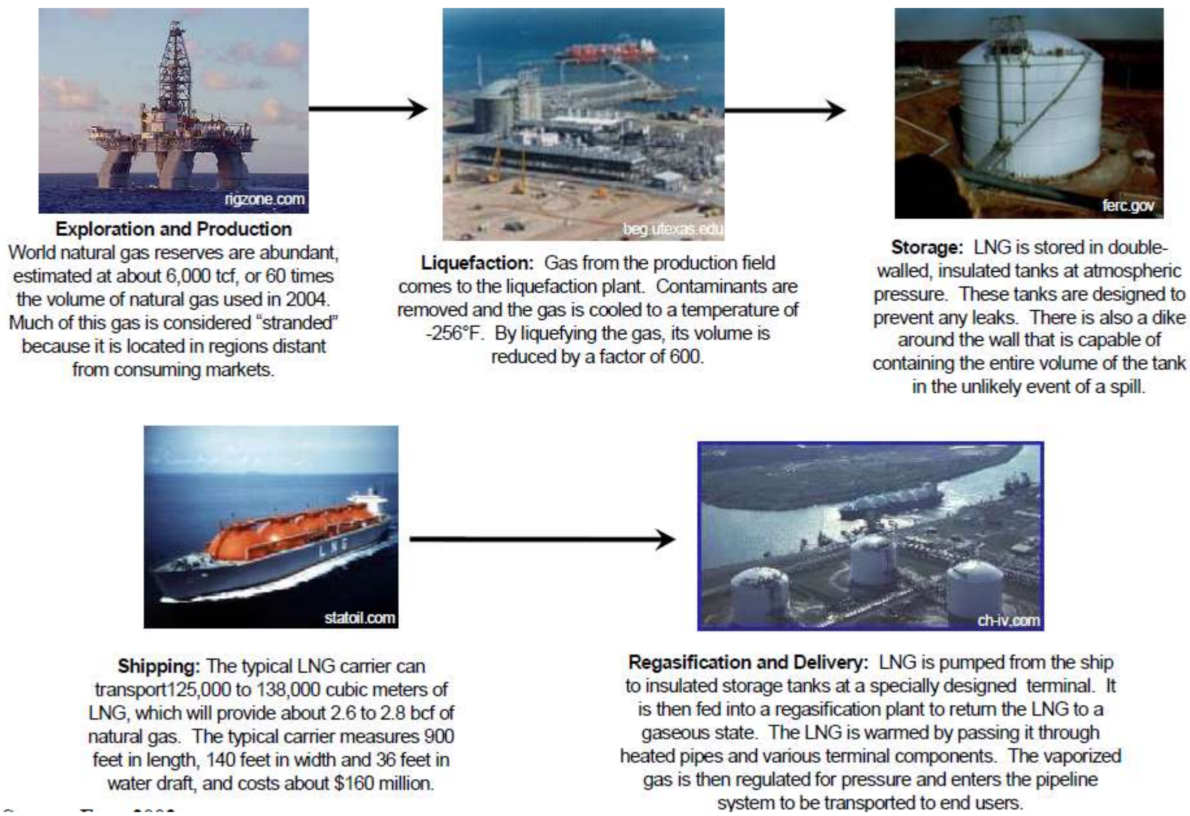
TECHNICAL BACKGROUND

CHAPTER TWO: TECHNICAL BACKGROUND

This chapter gives a technical overview of LNG export facilities. Section 2.A describes LNG infrastructure in general, as well as the main components of an LNG export facility. Section 2.B identifies how many terminals are in play, the FERC docket numbers for these terminals, and specifically identifies the projects in Louisiana and Texas, the states hosting the most LNG facilities thus far. Section 2.C discusses permitting from an applicant's perspective.

What infrastructure supports LNG export and what are the main pieces of equipment found in an LNG export facility?

LNG export terminals are simply one step in the process of moving gas from the subsurface to the ultimate consumer. The following excerpted figure depicts the steps gas takes in that process, from exploration and production to liquefaction to storage to shipping and then regasification and delivery:[36]



Upstream: Production

Exploration and production is the first stage of the process. Here, gas reserves are developed, wells are drilled, and production is initiated to extract the hydrocarbon. Some gas is produced "conventionally," in that the gas naturally flows upwards in a well without the need for enhanced extraction techniques. Much of the gas produced in the United States today requires the high-

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[36] Dismukes, *supra* note 1, 41 (image from Foss, M. M. Introduction to LNG. Center for Energy Economics, Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin. January 2003).

pressure addition of water, chemicals and sand for the gas to be forced to the surface, in a process known as hydraulic fracturing. The extracted gas is then collected for transportation.

Midstream (Transmission): Pipelines, Rail, Compressors

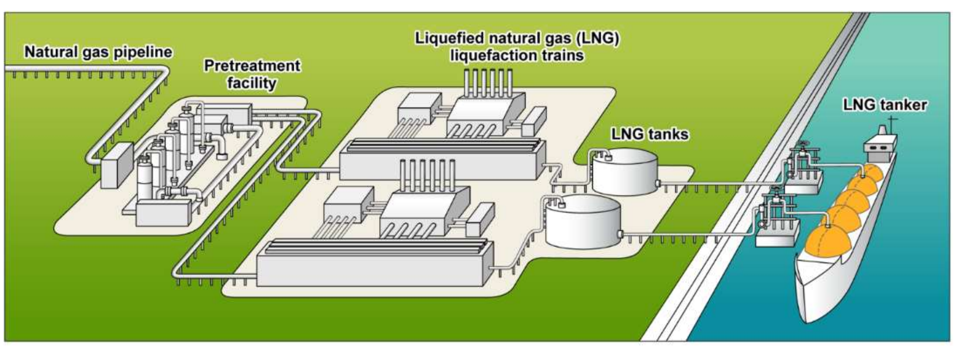
Gas is primarily transported by pipeline to a facility for processing, but it can be moved by rail or truck. Compressor stations are used to pump the gas along the pipeline and can be large sources of pollution, especially air pollution. EIP's 2020 report explains "compressor stations alone could add more than 8 million tons of greenhouse gases to the LNG sector's emissions footprint. That's almost equivalent to the carbon output of two new coal-fired power plants."[37] Some applicants for LNG projects will seek permits for the LNG pipeline separately from the export terminal; others will seek permits on the pipeline, compressors stations and terminal all at once. Regardless of how the project is divided, FERC is still the lead federal agency responsible for regulating the midstream infrastructure that transports gas interstate from production facilities to end-users.

A pipeline will also include valves, a header system, and metering and pig launcher/receivers. Mechanical "pigs" are used to clean the pipeline and some can monitor the health of the pipeline by identifying defects.[38] A header system is the portion of the pipeline that connects smaller diameter pipes into larger diameter lines.

Midstream (Processing): Liquefaction in an export facility

The processing and liquefaction of gas for export takes place at an export terminal. This terminal is typical located on the coast, so that compressed gas can easily be loaded onto massive tanker ships for export internationally. An LNG export terminal facility cools gas to a temperature near negative 260°F, converting it to a liquid state that reduces its volume by a factor of 600 or more, which facilitates shipping. The resulting product is an extremely cold, colorless, and odorless liquid[39] 45% the weight of water[40] and is classified as a hazardous material.[41]

The following illustration of some of the common components of LNG export facility is found in the 2014 study by the U.S. Government Accountability Office entitled *Federal Approval Process for Liquefied Natural Gas Exports*:[42]



Sources: GAO analysis of industry documents. | GAO-14-762

[37] Environmental Integrity Project, "Troubled Waters," 5.
[38] *"Pigging," Wikipedia*, https://en.wikipedia.org/wiki/Pigging.
[39] Odorants must be added to methane gas before it is distributed by utilities for end users, so the smell can alert people to natural gas leaks from heating systems, kitchen stoves or other appliances. U.S. Energy Information Administration, "Natural Gas Explained: Liquefied Natural Gas," https://www.eia.gov/energyexplained/natural-gas/liquefied-natural-gas.php.
[40] Dismukes, *supra* note 1, 45.
[41] 49 C.F.R. § 172.101. List of Hazardous Materials.
[42] U.S. Government Accountability Office, "Natural Gas: Federal Approval Process for Liquefied Natural Gas Exports," Sept. 2014, GAO-14-762, Fig. 1, 5, https://www.gao.gov/assets/gao-14-762.pdf.

More specifically, such a facility generally would include, but not be limited to:

- one or more pretreatment facilities to remove acid gases (hydrogen sulfide and other sulfur compounds, and carbon dioxide), water, heavier hydrocarbons and mercury so that the gas can be compressed.[43] Note that some preteatment facilities may not be located at the same facility as the liquefaction trains and the rest of the export facility;
- refrigeration and liquefaction facilities, including mixed refrigerant compressor turbines known as liquefaction "trains" (used to compress the gas into a liquid, can be powered by gas or electricity);
- warm wet flares, cold dry flares (used to burn excess gas and destroy volatile organic compounds that contribute to air pollution);
- acid gas thermal oxidation system (an air pollution control device);
- aboveground LNG storage tanks (typically with cryogenic pipeline connections to the liquefaction facility and berthing dock), plus one or more diesel storage tanks.
- an LNG boil off gas (BOG) compression system and/or flare (to process the gas that naturally regasifies from liquid form and keep the LNG tanks at a safe pressure);
- electric power facilities (such as an electrical transmission line and substation) to power facility equipment, including sometime the trains themselves;
- truck loading facilities with loading bays to haul off LNG and gas liquids condensate for domestic use;
- an LNG carrier berthing area with loading docks and a turning basin;
- an offloading facility to receive waterborne delivery of equipment/materials; and
- in some cases, a temporary concrete batch plan for use during construction.[44]

An LNG terminal facility relies on infrastructure to handle the waste streams in gas as well. For example, aqueous ammonia needed for acid gas removal arrives by truck. Pretreatment system condensate, oily wastewater and hydrogen sulfide "scavenger" is trucked out. Trucks may also be used to carry away heavier hydrocarbons for local consumption. Consequently, related infrastructure can include pipelines, roads, truck traffic, storage facilities, construction and maintenance dredging or filling activity, and vessel emissions associated with the project.

LNG destined for export is loaded into huge shipping tankers, which arrive at the export facility filled with ballast water for weight to compensate for the lack of LNG cargo. This ballast water may have

[43] Methane is the predominant component of natural gas, but there are always impurities that must be removed before liquefaction. Water and other impurities are removed before the gas is liquefied, keeping its methane content at approximately 95 percent. Pre-treatment removes the heavier hydrocarbons, liquids (water vapor), and impurities that can be present in the gas stream from the production process. Some of these natural gas liquids, like ethane, propane, and butane, have commercial value. These liquids are stripped and then sent via natural gas liquids (NGL) pipelines or trucks to individual industrial users or other market centers. Dismukes, *supra* note 1, 63.

[44] FERC, "Final Environmental Impact Statement for the Driftwood LNG Project," Jan. 2019, https://www.ferc.gov/sites/default/files/2020-05/01-18-19-FEIS.pdf; FERC, "Final Environmental Impact Statement for the Plaquemines LNG and Gator Express Pipeline Project," May 2019, 1-2 https://www.ferc.gov/sites/default/files/2020-05/05-03-19-FEIS.pdf; FERC, "Texas LNG Project, Final Environmental Impact Statement, Volume 1," March 2019, 2, https://www.energy.gov/sites/prod/files/2019/03/f60/final-eis-0520-texas-lng-2019-03-volume-1.pdf.

originated from international waters and may contain invasive species that could harm native species.

LNG tankers are specialized ships with insulated storage to keep the gas in its liquid form until is delivered to its destination.[45] Tankers are enormous—typically 975 feet long and 140 feet wide—and typically hold between 125,000 and 175,000 cubic meters of gas.[46] According to one study, "One tanker holds enough gas to fuel a typical steam electricity plant for one to two months, 51,000 residential gas customers in the GOM [Gulf of Mexico] Region, or 5 typical industrial facilities (using average consumption) along the GOM."[47]

Note that existing import facilities that add export capabilities typically add that capacity next to the existing import infrastructure.[48] Two such import facilities that have expanded to exporting LNG are Freeport LNG and Lake Charles LNG.[49]

Downstream uses of gas

LNG arriving for import internationally will be first regasified through the controlled addition of heat at an import facility, then distributed by pipeline, rail and truck to the downstream user. Gas has a variety of downstream uses. It may be used in the commercial and residential sectors for electrical power, heating buildings and water, cooking, drying, refrigeration, and lighting.[50] Gas has four main industrial uses: (1) industrial electricity generation; (2) boilers used to create processed steam; (3) to fuel industrial furnaces used to create process heat; and (4) feedstock (raw materials) for the creation of petrochemicals, fertilizer, and hydrogen.[51] It also may be used in the transportation sector as vehicle fuel.

How many terminals are in play, and where are they located?

This guide focuses on terminals built, permitted, or proposed in the terrestrial United States. As of February 2022, there are seven projects[52] built, two under construction, fourteen permitted,[53] five seeking initial permits, and two proposed but not yet in the application stage process (in the pre-file process).[54] The U.S. Energy Information Administration releases a detailed spreadsheet tracking the facilities that are existing, are under construction, and have been permitted by FERC and DOE (land-based facilities) or DOT MARAD (off-shore facilities).[55]

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[45] Dismukes, *supra* note 1, 41.
[46] The International Group of Liquefied Natural Gas Importers, "LNG Information Paper #3: 2019 Update: LNG Ships," 2019, https://giignl.org/wp-content/uploads/2021/10/giignl2019_infopapers3.pdf.
[47] Dismukes, *supra* note 1, 41.
[48] Paul O'Donnell, "Energy Transfer to take over LNG export project in Louisiana after Shell bails out," *Dallas News*, Mar. 30, 2020, https://www.dallasnews.com/business/energy/2020/03/30/energy-transfer-to-take-over-lng-export-project-in-louisiana-after-shell-bails-out/ (showing the export and import facilities at Lake Charles LNG side-by-side)
[49] Global Energy Monitor, "Freeport LNG Terminal," https://www.gem.wiki/Freeport_LNG_Terminal; Lake Charles LNG Project Team, "A World-Class Export Facility," https://energytransferlng.com/Proposed_Project.html.
[50] U.S. Energy Information Administration (EIA), "Natural Gas Explained: Use of Natural Gas," https://www.eia.gov/energyexplained/natural-gas/use-of-natural-gas.php
[51] EIA, "Natural Gas Explained;" Dismukes, *supra* note 1, 21-22.
[52] Projects may include expansions to existing terminals.
[53] By FERC and DOE (land-based facilities) or DOT MARAD (off-shore facilities).
[54] FERC, "North American LNG Export Terminals-Existing, Approved not Yet Built, and Proposed," Mar. 29, 2022, https://cms.ferc.gov/media/north-american-lng-export-terminals-existing-approved-not-yet-built-and-proposed-4.
[55] U.S. EIA, "U.S. liquefication capacity," (Release date: July 15, 2021), https://www.eia.gov/naturalgas/U.S.liquefactioncapacity.xlsx. If the previous link is broken, the spreadsheet was located at the bottom of this page: https://www.eia.gov/energyexplained/natural-gas/liquefied-natural-gas.php ("See detailed information

Most LNG facilities are located onshore or near shore within state waters. Less common but still potentially relevant are "deepwater ports," lying outside the boundaries of state waters. The standards and government agencies involved differ depending on which location category applies to the project. This guide focuses on onshore or near-shore LNG projects.

Most facilities fall under Louisiana or Texas's jurisdiction.[56] This guide focuses on the law relevant to those terminals.

What projects are in Louisiana?

Louisiana is seeing an escalating concentration of LNG onshore and near-shore export facilities and proposed projects. For quarterly updates on this information, see EIA's hyperlinked spreadsheet: https://www.eia.gov/naturalgas/U.S.liquefactioncapacity.xlsx

As of February 2022, the projects are as follows:

Table 2.1: Louisiana LNG Export Projects as Percentage of U.S. Total[57]

TYPE OF PROJECT AND STATUS	TOTAL # US PROJECTS	SITED IN LOUISIANA	LOUISIANA PROJECTS (WITH FERC OR MARAD DOCKET INFO)
LNG export terminals currently operating in the U.S.	7	2 (29% of US total)	Cheniere's Sabine Pass LNG Trains 1-5 (FERC No. CP11-72, CP13-552 & CP13-553) Sempra-Cameron LNG Trains 1-3 in Hackberry, LA (FERC No. CP13-25)
New or expanded LNG export terminals under construction	2	1 (50%)	Venture Global Calcasieu Pass in Cameron Parish, LA (FERC No. CP15-550)
LNG export facilities or expansion projects approved but not yet built	13	5 (38%)	Lake Charles LNG (FERC No. CP14-120) Magnolia LNG in Lake Charles, LA (FERC No. CP14-347) Sempra-Cameron LNG Trains 4 & 5 in Hackberry (FERC No. CP15-560) Driftwood LNG in Calcasieu Parish (CP17-117) Venture Global LNG in Plaquemines Parish (FERC Nos. CP17-66 & CP17-67)

about existing and under-construction large-scale U.S. liquefaction facilities (xls)."). Also see the "U.S. liquefication capacity" xls file at https://www.eia.gov/naturalgas/data.php#imports.

[56] Why is this? The short answer is that the Gulf states of Texas and Louisiana have the most existing infrastructure and large gas fields, and a relatively friendly regulatory environment. For more information, especially in terms of the import market. Dismukes, *supra* note 1, 57-68.

[57] Unless otherwise indicated, data is from "North American LNG Export Terminals-Existing, Approved not Yet Built, and Proposed," Mar. 29, 2022, https://cms.ferc.gov/media/north-american-lng-export-terminals-existing-approved-not-yet-built-and-proposed-4; *and* EIA, "U.S. liquefication capacity," Dec. 8, 2021, https://www.eia.gov/naturalgas/U.S.liquefactioncapacity.xlsx.

TYPE OF PROJECT AND STATUS	TOTAL # US PROJECTS	SITED IN LOUISIANA	LOUISIANA PROJECTS (WITH FERC OR MARAD DOCKET INFO)
LNG export applications pending before FERC	4	3 (75%)	Commonwealth LNG in Cameron Parish (FERC No. CP19-502) Venture Global CP2 Blocks 1-9 in Cameron Parish (FERC No. CP22-21) Venture Global Calcasieu Pass in Cameron Parish (FERC No. CP22-25)
LNG export projects in “pre-filing” status before FERC	2	2 (100%)	Port Fourchon LNG in LaFourche Parish (FERC No. PF17-9) Venture Global’s Delta LNG in Plaquemines Parish, LN (FERC No. PF 19-4) FERC terminated dismissed Pointe LNG’s pre-filing request in Oct. 2021 after it had failed to engage with other agencies and stakeholders for two years, and had not made any progress with FERC since July 2019.
Permitted floating LNG terminal	1	1 (100%)	Delfin, with four liquefaction vessels, planned for roughly 50 miles off the coast of Cameron Parish.[58] (FERC No. CP15-490; MARAD No. USCG-2015-0472)

Louisiana also is the nearest coastal state to the **Louisiana Offshore Oil Port** (**LOOP**), a deepwater port currently operating in the Gulf of Mexico about 18 nautical miles off the coast near Port Fourchone. The LOOP is owned and operated by Loop LLC.[59]

[58] MARAD and the DOE approved the project. DOE, “Record of Decision and Floodplain Statement of Findings for the Delfin LNG LLC Application to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries,” June 1, 2017, https://www.energy.gov/sites/prod/files/2017/06/f34/Delfin%20ROD%20-%2006-01-17.pdf. In November 2020, Delfin announced a preliminary 15-year sales deal with city gas distributor China Gas Holdings. Chen Aizhu, “Delfin signs China Gas deal, taps Chinese banks to fund 1st US floating LNG plant -CEO,” *Reuters*, Nov. 9, 2020, https://www.reuters.com/article/instant-article/idINL3N1NE29A.

[59] The LOOP provides tanker offloading and temporary storage for crude oil (most of the tankers using it are too large for inland ports). It handles 13% of the nation's imported oil, about 1.2 million bbls/day, and connects by pipeline to roughly half of the refining capacity in the United States. DOE, “Record of Decision and Floodplain Statement of Findings for the Delfin LNG LLC Application to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries.”

What projects are in Texas?

Texas is also seeing an escalating concentration of LNG export facilities:

Table 2.2: Texas LNG Export Projects as Percentage of U.S. Total[60]

TYPE OF PROJECT AND STATUS	TOTAL U.S. PROJECTS	SITED IN TEXAS	TEXAS PROJECTS (WITH FERC OR MARAD DOCKET INFO)
LNG export terminals currently operating in the U.S.	7	2 (29% of US total)	Cheniere's Corpus Christi LNG Trains 1-3 (FERC Nos. CP12-507 & CP12-508) Freeport LNG (FERC Nos. CP12-509, CP15-518, CP21-470)
New or expanded LNG export terminals under construction	2	1 (50%)	Golden Pass LNG in Sabine Pass, TX (FERC No. CP14-517, CP20-459)
LNG export facilities or expansion projects approved but not yet built	13	5 (38%)	Sempra-Cameron LNG Trains 4 & 5 (CP15-560) Port Arthur LNG Trains 1 & 2 (FERC No. CP17-20 & CP17-21) Freeport LNG Dev Train 4 (FERC No. CP17-470) Next Decade's Rio Grande LNG in Brownsville, TX (FERC No. CP16-454) Cheniere Corpus Christi LNG Stage III (FERC No. CP18-512 & CP18-513) *Annova's Texas LNG project – was approved by FERC but has abandoned in 2021.*[61] *(FERC No. CP16-480)*
LNG export applications pending before FERC	4	1 (25%)	Sempra's Port Arthur LNG Trains 3 & 4 (FERC No. CP20-55)
LNG export projects in "pre-filing" status before FERC	2	0 (0%)	*Galveston Bay LNG (FERC No. PF18-7)– withdrew from the pre-filing process in Jan. 2021 because a portion of the proposed site was used for federal dredge management and unlikely to be released for private use*[62]

[60] Unless otherwise indicated, data is from "North American LNG Export Terminals-Existing, Approved not Yet Built, and Proposed," Mar. 29, 2022, https://cms.ferc.gov/media/north-american-lng-export-terminals-existing-approved-not-yet-built-and-proposed-4; *and "U.S. liquefaction capacity"* (Dec. 8, 2021) https://www.eia.gov/naturalgas/U.S.liquefactioncapacity.xlsx.
[61] Andreas Exarheas, "Texas LNG project axed," *Rigzone*, Mar. 23, 2021, https://www.rigzone.com/news/texan_lng_project_axed-23-mar-2021-164960-article/.
[62] "NextDecade cancels proposed Galveston Bay LNG plant," *Oil & Gas Journal*, Feb. 1, 2021, https://www.ogj.com/pipelines-transportation/lng/article/14196590/nextdecade-cancels-proposed-galveston-bay-lng-plant; Letter re "Notice of Pre-Filing Withdrawal and Termination of Docket." FERC Docket No. PF18-7-000 (Galveston Bay LNG, LLC and Galveston Bay Header System) Accession No. 20210129-5374, Jan. 29, 2021.

What projects are elsewhere?

As of February 2022,[63] constructed and proposed LNG terminals located outside of Texas and Louisiana are as follows:

Table 2.3: LNG Terminals Located Outside of Texas and Louisiana

PROJECT NAME	PROJECT OPERATOR	LOCATION	PROJECT STATUS	PROP. DESIGN CAPACITY[64] (BCF/D)	(MTPA)	# OF TRAINS	IN SERVICE DATE
Delfin FLNG (FERC Nos: CP15-490)	Fairwood Group	Gulf of Mexico (floating facility)	Construction has not started / Still undergoing FEED[65]	1.6	12	4	expected 2023
Gulf LNG (FERC Nos: CP15-521)	Kinder Morgan et al.	Pascagoula, MS	Construction has not started / Still undergoing FEED	1.5	10.9	2	expected 2024
Eagle LNG (FERC Nos: CP17-41)	Eagle LNG Partners	Jacksonville, FL	Approved in 2019, Not yet under Construction	0.13	1	3	Construction expected 2022[66]
Alaska LNG (FERC Nos: CP17-178; PF14-21)	Alaska Gasline Development Corp. (AGDC)	Nikiski, AK	Pre-construction process	2.6	20	3	expected 2025
Cove Point (FERC Nos: CP13-113; PF12-16)	Dominion Energy	Cove Point, MD	Operating	0.82	6.23	1	Mar 2018
Elba Island (FERC Nos. CP14-103; PF13-3)	Kinder Morgan	Elba Island, GA	Operating	0.35	2.50	10	Sep '19–Mar '20, Aug '20

[63] Unless otherwise indicated, data is from "North American LNG Export Terminals-Existing, Approved not Yet Built, and Proposed," Mar. 29, 2022, https://cms.ferc.gov/media/north-american-lng-export-terminals-existing-approved-not-yet-built-and-proposed-4; and "U.S. liquefaction capacity," Dec. 8, 2021, https://www.eia.gov/naturalgas/U.S.liquefactioncapacity.xlsx.
[64] This is not always identical to the capacity approved by DOE or FERC. For this information, see EIA, "U.S. Liquefaction Capacity Spreadsheet," https://www.eia.gov/naturalgas/U.S.liquefactioncapacity.xlsx (Updated quarterly).
[65] "Front end engineering design" (FEED) is the initial stage in LNG project development, in which the basic engineering including technical requirements as well as approximate investment cost for the project have been completed
[66] Mike Mendenhall, "Eagle LNG wants extra year to start $542 million North Jacksonville export facility," *Jacksonville Daily Record*, May 20, 2021, https://www.jaxdailyrecord.com/article/eagle-lng-wants-extra-year-to-start-dollar542-million-north-jacksonville-export-facility.

PROJECT NAME	PROJECT OPERATOR	LOCATION	PROJECT STATUS	PROP. DESIGN CAPACITY[64] (BCF/D)	(MTPA)	# OF TRAINS	IN SERVICE DATE
Marcellus LNG Production Facility[67]	New Fortress Energy	Wyalusing, PA (landlocked export by truck and rail to marine loading facility in NJ)	Jurisdiction disputed / construction on hold (FERC Nos. CP20-522; CP20-524)	0.29[68]	2	2	Unclear
Already-constructed LNG import facility not yet permitted:							
San Juan LNG import facility	New Fortress Energy	San Juan, Puerto Rico	Operating but must apply to FERC for permitting (Currently disputing FERC jurisdiction, CP20-466, D.C. Cir. Case No. 21-1157)[69]	.14	1.1[70]	N/A	Constructed.

What lessons can be drawn from the previous boom in import terminal permitting?

A Louisiana State University report prepared for the Minerals Management Service of the U.S. Department of the Interior in 2008 identified the following considerations that LNG applicants might consider when deciding how many projects to pursue permits for. Although the report was anticipating a spike in the construction of import facilities, the logic applies equally to export facilities. According to the report:[71]

> *“**Permitting Challenges:** permitting can take time and is not a certain process. Some areas in the U.S., such as very populated areas of the eastern seaboard, have faced significant permitting opposition. Developers will often “hedge” this opposition by attempting to permit several projects at the same time. That way, if one project is rejected during the permitting*

[67] Corey Paul, “Small LNG developers wade into big fight at FERC over rail and export projects,” *S&P Global*, Nov. 5, 2020, https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/small-lng-developers-wade-into-big-fight-at-ferc-over-rail-and-export-projects-61062831.
[68] Environmental Integrity Project, “Troubled Waters,” 23.
[69] New Fortress began operating in April 2020 without a FERC permit, but in March 2021 FERC asserted jurisdiction over the project, which would trigger the requirement for the facility to participate in FERC’s NEPA review of the facility. New Fortress appealed that decision to the D.C. Circuit in May 2021. H. Weber, H. “New Fortress seeks US court review of FERC decision over Puerto Rico LNG facility,” *S&P Global*, May 26, 2021, https://www.spglobal.com/platts/en/market-insights/latest-news/natural-gas/052621-new-fortress-seeks-us-court-review-of-ferc-decision-over-puerto-rico-lng-facility.
[70] International Group of Liquefied Natural Gas Importers, “The LNG industry: GIIGNL Annual Report,” 2021, 48, https://giignl.org/wp-content/uploads/2021/11/GIIGNL_Annual_Report_November2021.pdf (reporting the facility as having 1.1 mtpa capacity).
[71] Dismukes, *supra* note 1, 50-51.

process, there are several other projects that have the potential to replace the failed application. If several applications are approved at one time, and there are limited capital investment opportunities, developers will likely develop the project with the highest expected return on investment.

Speculative Investments: *Permitting a project, while expensive, is far less costly than overall development cost. For potentially high-yield investments, spending the money to develop a project through the permitting process can be a worthwhile investment since it holds out the "option" of potentially developing on a site at a later date. Thus, many sites will be announced for development for their option value alone, though few will actually be developed. The development of a project of this type is a type of hedge that can be exercised as market or regulatory conditions change. These types of projects can also be spun-off or sold to other developers that may be willing to pay a premium for projects further along in the development process.*

Capital Requirements: *not all projects can be developed because many companies lack the capital, or have capital limitations, that prevent all proposed LNG facilities from being developed.*

Investment Prioritization: *in addition to capital requirements, there are also corporate investment prioritizations that rank order particular projects. These prioritizations can change as market conditions change.*

Changing Business Environment: *The internal rate of return of a particular project is directly impacted by the outlook of the environment in which this asset operates. Of particular concern for an LNG project is the outlook for natural gas prices over a long period of time. All LNG investments (production, liquefaction, transportation, and regasification) are long-lived and the return on this investment needs to be considered on a long-term basis. If the outlook for natural gas prices changes for the worse, projects can be abandoned prior, or even during any stage, of development. This is particularly true for those projects that are further back in the LNG development queue.*

One take-away from this analysis of companies' strategies is that although this means that there is always some hope that a project won't be constructed even if advocates' challenges are unsuccessful, it also means that to defeat one actual facility you may need to defeat multiple proposed projects.