

LNG Liquefaction Plant and Export Terminal on the Delaware River Between Philadelphia and Marcus Hook

A summary of published information with recommendations for LWV

Investors' objective: U.S. energy companies seek to profit by shipping LNG to Europe, which needs large new quantities of natural gas for heating and manufacturing because supplies from Russia have been almost entirely cut off. [1] There is currently a very high premium being paid for LNG in Europe. It is still to be seen how many years that premium will continue as Europe gets new gas suppliers in place and renewable sources become more available.

Background: Large amounts of fracked natural gas are available in the Appalachian Basin. Some of this is currently being brought from the Marcellus and Utica Shales to eastern Pennsylvania and New Jersey through pipelines operated by the Texas Eastern Transmission Co. (TETCO) and Transcontinental Gas Pipe Line Company (TRANSCO) interstate systems. Each of these supply pipelines can be accessed at a site along the Delaware River between Philadelphia and Marcus Hook by building short connecting pipelines: a two-mile pipeline to TETCO's Philadelphia Lateral pipeline in Brookhaven, PA [2] and/or a half-mile pipeline to TRANSCO's Marcus Hook Lateral pipeline near Chester.

What an LNG export facility would do. An LNG facility along the Delaware River would receive natural gas (in gaseous form) from one or both of the nearby existing pipelines, clean it to remove small amounts of gas other than methane, liquefy the methane by compressing it and refrigerating it to -260 deg F, thereby creating liquefied natural gas (LNG), and load the LNG directly onto carrier ships for export. In other words, "gas in" and "LNG out onto ships." There must be a safe means of transporting away the small amount of extraneous gases, which are highly flammable.

The outgoing LNG would occupy only 1/600th times the space of the incoming natural gas in the gaseous state. This is the great advantage of LNG – a critical advantage -- for transporting gas by truck, train, or ship where pipelines don't exist. In gaseous form, natural gas cannot be transported by truck, train, or ship; it takes up far too much space.

Competitive advantages. An LNG export facility in or near Chester would have two competitive advantages: closeness to the relatively lower-cost Marcellus and Utica shales for the incoming gas and shorter shipping routes to Europe than from the Gulf Coast, from which most U.S. LNG is now shipped. [2] [3] [4]

What's happening now: An LNG plant has been proposed along the Delaware River between South Philadelphia and Marcus Hook. Penn America Energy Holdings, LLC, a New York City-based firm, through its subsidiary Penn LNG, has proposed to build a new LNG liquefaction plant and export terminal along the Delaware River. At one time they talked about the site of a large warehouse in Chester, PA, or at one of several other sites along the river between South Philadelphia and Marcus Hook that they have not disclosed. This would require extensive permitting and encounter staunch public opposition.

Penn America Holdings and Penn LNG appear to exist only for this project. A web search for Penn LNG is routed directly to Penn America Holdings, and the Penn America Holdings website is dedicated entirely to this project.

The owner of the proposed warehouse site says the site is not for sale. The current owner of the warehouse property operates a business from the warehouse and stated publicly, three years ago, that he will not sell, now or in the future. [3] [5] Nevertheless, the Penn America Energy website is still referring to the warehouse location as “the proposed site.” [2]

Pipeline upgrade required. Texas Eastern Transmission System (TETCO) has said the capacity of its Philadelphia Lateral pipeline running 20 miles between Chester Springs and Brookhaven is insufficient to meet the needs of an LNG plant and other new customers. It has proposed a Greater Philadelphia Expansion Project to install a larger pipeline beside the existing pipeline, almost doubling its capacity. This would also require extensive permitting. The project was proposed long ago and has been on hold for over 20 years, probably for a lack of new customers willing to sign long-term agreements to receive gas through an expanded pipeline to justify the investment. [6] [7] The Transcontinental Gas Pipe Line Company (TRANSCO) has not commented on the capacity of their Marcus Hook Lateral pipeline.

Permitting: Penn LNG plans to “pre-file” with the Federal Energy Regulatory Commission for an environmental review by year-end and to receive project approval by 2024. Following approval, Penn LNG says design and construction would take four years. [1] [3] Exports would begin in 2028. [2] The six-year lead time adds financial risk due to uncertainty about market conditions six years in the future when the energy landscape is changing in many ways.

The permit from FERC is primary. This would include approval by the U.S. Coast Guard and the Pipeline and Hazardous Materials Administration (PHMSA) because FERC is the lead agency for the other two organizations in this approval process. Federal permits would also be required from the EPA for the Clean Water Act and from the National Oceanic and Atmospheric Administration (NOAA) for the Coastal Zone Management Act.

Permits would also be required from

- U.S. Department of Energy – temporarily discontinued
- Pennsylvania Department of Environmental Protection: several permits would be required depending on the site specifics (i.e., stormwater management), but these are key: a Clean Air Permit and perhaps a Water Obstruction and Encroachment Permit.
- Depending on the process used, the plant may require: National Pollution Discharge and Elimination System permits and water allocation permits from the Pennsylvania Department of Environmental Protection and the Delaware River Basin Commission.
- Army Corps of Engineers
- Municipal and county governments. [1]

The new connecting pipelines will require another set of permitting at various government levels/agencies. [1] [8] Penn LNG would also have to require a right-of-way for the new pipelines, which might or might not be difficult.

Several energy companies have petitioned FERC to declare their LNG project proposals “outside FERC’s jurisdiction”, based on a “categorical exclusion rule” about DOE reviews put in place by the Trump Administration. It appears unlikely that these petitions will be approved. [9]

Permitting Problems: Some of the required permits may be a problem for various reasons:

Chester is an environmentally disadvantaged community. The City of Chester has been designated a “disadvantaged community” as a part of a Biden Administration initiative called Justice40, established by presidential order. [11] This initiative promises “to deliver at least 40 percent of the overall benefits from Federal investments in climate and clean energy to disadvantaged communities.” The initiative uses a Climate and Economic Justice Screening Tool to identify disadvantaged communities: those that are “marginalized, underserved, and overburdened by pollution.” “These communities are located in census tracts at or above the thresholds in one or more of eight criteria.” Chester qualifies on six of the eight criteria, including legacy pollution, clean water, and wastewater infrastructure, and health burdens. There is extra pressure on government agencies to benefit disadvantaged communities like Chester. [10] [11] Not every federal program will deliver such benefits, and FERC, for example, will probably say that it cannot deliver such benefits; the benefits will have to be delivered by other agencies. Nevertheless, avoiding additional burdens on disadvantaged communities is as important as delivering benefits.

FERC recently proposed including impacts to disadvantaged communities when evaluating new natural gas projects, which is what the administration intended. But FERC has since gotten “pushback from the energy industry” and shelved its plan to consider disadvantaged communities. [10] In other words, only the industry’s interests will be considered. This age-old problem requires more pressure on FERC from the administration and the community.

There is risk of a fire or explosion at the plant. Very importantly, there is always a risk of intense fire and/or explosion where natural gas and LNG are involved. [12] [13] As with many other risks, these are low-probability but high-consequence events. Damage can be widespread. The thermal exclusion zone specifies a circle around the plant within which there would be skin injury, like an intense sunburn, in the event of a fire or explosion. The thermal exclusion zone is calculated for every LNG plant individually. The general size is suggested by a published report from 2016 about a proposed deep-water LNG port in the Gulf of Mexico. The thermal exclusion zone was a circle of 3 kilometers, or 1.9 miles, radius. [14, page 24] If the zone for the project proposed here were anywhere near this size, there would be a serious problem because the Chester site is only 250 yards away from a city neighborhood where the population density is 7,000 people per square mile. [1] A huge number of residences would be within the thermal exclusion zone. The law requires not that the owner of the LNG plant keep the thermal exclusion zone clear but “legally control all activities” in the zone, which could be impossible because the site would include so many private residences. [15]

The severity of fire or explosion appears to have been significantly underestimated. The Pipeline and Hazardous Materials Safety Administration (PHMSA) has recently heard disinterested expert testimony that current LNG plant explosion models vastly underestimate the worst-case explosion that could occur. The worst-case explosion could be ten times worse than currently planned, significantly increasing the thermal exclusion zone. This testimony was from Jerry Havens, a distinguished professor emeritus of chemical engineering at the University of Arkansas and former Director of the UA Chemical

Hazards Research Center. He developed computer models of LNG explosions under contract to LNG regulators. [16] [17]

The industry, Dr. Havens says, is building a generation of LNG infrastructure that fails to account properly for the risk of a massive accident. Current calculations are based on the properties of methane, which is lighter than air and disperses upward in the event of a leak. That was appropriate for the previous generation of LNG terminals designed for importing methane into the United States, where methane is the only gas present. But at export terminals, where incoming gas must be chilled to minus 260 degrees Fahrenheit, the production lines also contain “heavier hydrocarbons” such as ethane and propane that are highly flammable and would greatly worsen an explosion.

“Our regulatory process [FERC/PHMSA] is failing to satisfactorily consider fully the accident consequences that attend the operation of LNG export terminals that must be considered in the public interest,” Dr. Havens said in comments to PHMSA last year. Earlier this year, he formally petitioned PHMSA to end the use of the agency’s current disaster model to calculate the danger of fire and explosion on the grounds that it is very inaccurate. [17]

In the case of the Elba Island LNG import/export terminal near Savannah, Georgia, which FERC approved for enlargement, Dr. Havens said, “FERC is ignoring the findings of LNG safety research conducted at the direction of Congress that might influence the judgment of the acceptability to the public of a worst-case event.” Dr. James Fay, professor emeritus at MIT and an expert in LNG safety, said, “For all credible spills, including terrorist attacks on the storage tank and LNG tanker, the danger zone for humans extends almost four miles from the terminal site.” [18]

There is a risk of fire or explosion in transporting by-products away from the plant. Besides the risk of fire and explosion at the plant, the highly flammable ethane, propane, butane, isobutane, and pentane separated from the incoming natural gas must be transported away from the plant by pipeline, truck, or train, posing additional safety risks and requiring more permits. [19]

There will be air pollution in nearby neighborhoods. LNG plants release air pollutants that could threaten the health of residents, including sulfur dioxide, which damages the lungs; nitrogen oxides and volatile organic compounds, both of which contribute to smog; microscopic soot or particulate matter, which can trigger asthma and heart attacks; and carbon monoxide, which can inhibit oxygen intake to the heart and brain. [20, page 19] The condensate tank, where the compounds removed from the incoming natural gas are stored, is a particular problem. [21] The Biden administration’s Justice40 initiative has confirmed that the City of Chester already has high legacy pollution and health burdens.

A smaller LNG liquefaction plant in Providence, Rhode Island, has been found to have surprisingly little effect on air quality. Fields Point has an LNG liquefaction plant similar to the Penn LNG-proposed plant, which was recently added to an existing LNG storage facility. It is not an export terminal but a depot used at times of high demand. The Environmental Assessment prepared for the liquefaction plant addition includes an extensive, detailed assessment of impacts on air quality. [22, page 59] The conclusion is that “Operation of the modified Fields Point LNG Facility [with the addition of the liquefaction plant] would result in [only] minor air emissions increases over the existing facility.” The designation “minor” is based on a comparison to the EPA’s National Ambient Air Quality Standards (NAAQS). The existing plant was well-below to far-below the NAAQS for every air contaminant except ozone, for which the EPA standard was slightly exceeded. However, the entire Providence County area

slightly exceeds the EPA standard for ozone, indicating that the Fields Point plant is not the source of the problem.

Besides analyzing emissions at the plant site, an air dispersion analysis was performed to evaluate the impacts on air quality at locations away from the plant caused by the wind. The results of the air dispersion analysis predict air quality impacts away from the plant that are generally well below the applicable NAAQS thresholds.

The Penn LNG-proposed plant is more significant than Fields Point, but an environmental assessment might come to the same conclusions.

There is a risk of LNG ship collisions in the river. The huge ships that would be used for LNG export would be at some risk in this high-traffic area of the Delaware River. A 1973 study by the U.S. Department of Commerce concluded that “there were ‘unacceptable risks’ in carrying LNG by tanker up the crowded Delaware River, and recommended that approval [for LNG sites on the New Jersey side of the river] be denied.” [23] Made 50 years ago, this recommendation seems to have been overcome because an LNG export terminal has been approved for Gibbstown, NJ. Another concern about moving large LNG carrier ships under the Commodore Barry Bridge between Chester and Bridgeport, New Jersey, with the risk of fire or explosion, must have also been overcome. However, in the event of a collision, people along the coasts of the river would be threatened. The thermal exclusion zone of an LNG carrier ship would have to be calculated.

Summary of issues: There are many important issues with the proposal for a new LNG plant in or near Chester.

In the bigger picture, exporting LNG from the Mid-Atlantic Coast, where the gas comes from the Marcellus and Utica Shales, requires more fracking and more gas extraction. There are issues with the environmental and health impacts of fracking [24] [25], and with increased extraction of fossil fuels when the world needs to transition from fossil fuels to renewables. The International Energy Agency, a 31-nation group including the U.S., has called for an immediate halt to new oil and gas fields as critical to achieving net zero emissions by 2050. [26] The Intergovernmental Panel on Climate Change (IPCC) has called for the world to decrease global oil and gas production and consumption by 30% by 2030. [27] Analysis by the International Institute for Sustainable Development has shown that this requires that no new oil and gas fields be developed, no exploration be conducted, and some areas retired before the end of their economic lifetime. [28] Neither of these warnings will result in an end to new oil and gas fields until they result in a consensus for that action. Remarkably, a comprehensive Princeton University study has defined five “paths to net zero in 2050,” which do not require an immediate halt to new oil and gas fields. (Growing reductions of fossil fuel use are necessary in the future on all the paths.) [29] These are much more significant issues than the ones directly connected to a new LNG liquefaction plant.

Some oppose LNG exports, which are growing steadily, on narrower grounds: they raise gas prices in the U.S. [29]. On the other hand, U.S. LNG exports, now the largest in the world, are not expected to satisfy the international market for three to six years, keeping global prices high. [30] But if global prices fall in six years, the profits of a new LNG export facility on the Delaware River would be reduced. The LNG price and profit forecast are uncertain.

Turning to issues specifically related to this project, which will not be stopped by warnings of global warming, there are environmental and safety issues:

First, the weight of Chester's Environmentally Disadvantaged Community designation is unknown. In the past 20 years, FERC has granted 1,021 project approvals to the oil and gas industry while rejecting only 6, a greater than 99% approval rate. [30] This has led FERC critics to say the agency is a "rubber stamp" for the oil and gas industry, putting profit above all other considerations. Remarkably, FERC noted recently that it would consider the Environmental Justice designation in its decisions, but that plan has been shelved under pressure from the oil and gas industry, restoring the status quo. [10] This could be the subject of community pressure.

Second, the thermal exclusion zone surrounding the plant would almost surely include residential neighborhoods. It would even cover part of Interstate 95, a mile away. Expert testimony about the thermal exclusion zone may well make it much more significant. It appears impossible for Penn LNG to gain legal control over the whole thermal exclusion zone, which the law requires. Penn America could address this problem by selecting another, more isolated site, but they need to be faster to reveal the other sites they are considering. Other sites would have to have at least a moderately convenient pipeline service.

There are presently two LNG export terminals on the East Coast, at Cove Point, MD, on the Chesapeake Bay and Elba Island, GA, four miles outside Savannah. Both of these are at a safe distance from populated areas. Both were formerly LNG import facilities and already had pipeline connections to major networks. These were far better locations than the Delaware River south of Philadelphia.

Third, a new LNG plant will create air pollution, which may impact the surrounding community. That community already has high legacy pollution and health burdens. The air pollution will include sulfur dioxide, nitrogen oxides, volatile organic compounds (VOCs), carbon monoxide, and particulate matter or soot.[19] [20] However, a detailed evaluation of the Fields Point LNG liquefaction (not export) plant near Providence, RI found only a very small impact on air quality. Contrary to community concerns, air pollution may not be an issue. [21] An environmental assessment is needed.

Fourth, Penn LNG would have to acquire a right-of-way for a new one-half to the two-mile connecting pipeline through residential neighborhoods. This would involve serious safety concerns. Courts have given pipeline companies the right of eminent domain. FERC is responsible for hearing landowner appeals for rehearings, but in the last twelve years FERC has denied every homeowner request. [29] This could be the subject of community pressure.

Fifth, TETCO says its nearby Philadelphia Lateral pipeline cannot supply a new LNG plant. Their Greater Philadelphia Expansion Project, which is on hold, would have to be permitted and completed. This would add a second, more extensive pipeline beside the existing Philadelphia Lateral, running 20 miles through Philadelphia suburbs. There would be environmental concerns. The other option, TRANSCO's Marcus Hook Lateral, has not been mentioned by Penn LNG, and its capacity is not published.

There is also a logistics issue:

The site being discussed most prominently, presently a warehouse site, is unavailable. Perhaps Penn LNG will bid much higher than expected for the land in an effort to change the owner's mind. Maybe the City of Chester could take it by eminent domain, but community opposition would make this difficult.

Penn LNG may have to find another site, preferably more isolated. The Penn America Energy website is still referring to the warehouse location as the “proposed site.”

With all these issues, it is possible that the project will have to start in a different place.

Summary: *LNG sells at high prices in Europe because Russia has cut off supplies. Many U.S. investors are therefore interested in the profit opportunity of LNG export plants. The Delaware River has attracted the attention of some investors, like Penn LNG, because it has a shorter shipping time to Europe (8 vs. 12 days) than the Gulf Coast, presently the largest exporter of LNG to Europe. The Chester area has deepwater ports on the Delaware River which are close to two natural gas pipelines, TETCO’s Philadelphia Lateral and TRANSCO’s Marcus Hook Lateral. However, the possible sites are in or near a densely populated city, and the project poses serious risks from fire and explosion, not only from the plant itself but from the connecting pipeline needed to supply it and the transportation of highly flammable by-products. There are also possible health impacts from air pollution.*

Moreover, one of the nearby pipelines has insufficient capacity and would need to be enlarged, posing new environmental risks along its 20-mile path through suburban Philadelphia. Thus, sites along the Delaware River, while they have a competitive advantage in comparative closeness to Europe, have safety, health, and environmental problems that offset the shipping time advantage. If the shipping time advantage were to prevail and the project was to go forward, there is great investment risk because the earliest cargoes to Europe from this plant would be in six years (per Penn LNG), when LNG prices in Europe are unpredictable.

A role for the League of Women Voters: The LWV could take on issues that are not Chester-specific and would be hard for Chester community groups to address. First, FERC has shelved its decision to consider the Environmentally Disadvantaged Community designation in its approval decisions. Second, there is disinterested expert testimony that the plant explosion risk is far greater than what is being planned. This would greatly expand the thermal exclusion zone, which will almost surely include residential neighborhoods. Third, air pollution is a serious concern. Fourth, FERC has a record of denying every homeowner objection to placing a pipeline by eminent domain. Fifth, environmental impacts of Texas Eastern’s Greater Philadelphia Expansion project must be examined. The expansion project has not been launched, probably because there have not been enough new users in the Chester area willing to sign a long-term (15-year) purchase agreement to justify the investment. If and when the project is launched, there will have to be an Environmental Impact Statement with 45 days for public comment.

The League could say it has reviewed the project plans and has concerns about several aspects that involve the public interest:

- *Will the City of Chester receive extra consideration because it has been designated an Environmentally Disadvantaged Community by the Biden Administration’s Justice40 initiative?*
- *What would be the impact of a plant fire or explosion on the City of Chester? What about the expert testimony that the “thermal exclusion zone” should be much larger? Would the nearby residential neighborhoods be safe? Would there be a threat to cars on I-95, only a mile away, or to aircraft flying low overhead on the path to landing at Philadelphia International airport?*
- *What are the environmental impacts of laying new connecting pipelines through residential neighborhoods of Chester? Will homeowners’ objections to placement of a connecting pipeline be seriously considered?*

- *Will air pollution be seriously evaluated as having an impact to nearby neighborhoods?*
- *What are the environmental and safety impacts of Texas Eastern's proposed Greater Philadelphia Expansion Project to almost double the capacity of its Philadelphia Lateral pipeline running 25 miles from Chester Springs to Brookhaven in order to serve a new LNG plant?*

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