



NO SAFE HARBOR: SECURITY THREATS OF LNG

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Liquefied natural gas (LNG) is natural gas – primarily methane¹ – super-cooled to its liquid form at minus 259 degrees Fahrenheit. LNG has 1/600th the volume of vaporized natural gas, making it efficient for storage and transportation.² It is colorless, odorless, and nontoxic. When regasified, LNG can be used for the same purposes as conventional natural gas, including heating and power generation. LNG comprises fifteen percent of all gas used in New England.³

The United States imports most of its LNG, which is transported in large, double-hulled tankers. There are six LNG terminals currently in operation in the United States, although the construction of nearly twenty additional terminals is under consideration. According to the Energy Information Administration, there are 96 active LNG storage facilities in the United States.⁴ Several of these terminals and storage facilities are located in close proximity to population centers. In order to access the Distrigas LNG terminal in Everett, Massachusetts, for instance, LNG tankers must pass through Boston Harbor.

Vulnerabilities

As a liquid, LNG is not explosive, and LNG vapor is flammable only at a certain concentration when mixed with air. LNG is, however, considered a hazardous material due to its potential for combustion once regasified,⁵ and when these conditions are met, a devastating

fire or explosion can result.

One threat posed by liquefied natural gas shipment is the possibility of an LNG pool fire. Since LNG is lighter than water, spilled LNG will float on water, creating an “LNG pool” that expands away from the source of the spill. If ignited, the gas that rapidly evaporates off of the pool will ignite and burn, just above the spreading pool. LNG fires burn more hotly and rapidly than oil or gasoline fires, and cannot be extinguished. Rather, they burn until all LNG is consumed. The thermal radiation from LNG pool fires can cause serious injury and even death a considerable distance away from the fire itself.⁶ Jerry Havens, chemical engineer and former director of the Chemical Hazards Research Center at the University of Arkansas states:

If even one of the five tanks onboard an LNG ship spilled into the water, the fire it would produce would be up to a half-mile in diameter. The thermal radiation . . . could burn people a half mile from the fire’s edge.⁷

According to Dr. James Fay of the Massachusetts Institute of Technology, the average heat release rate of a LNG pool fire “is about twice the average thermal power consumption of all U.S. fossil fuel electric power plants.”⁸ This is the most serious threat posed by a spill of liquefied natural gas, and would be the goal of an intentional attack on LNG

infrastructure.

If LNG spills but is not immediately ignited, it will evaporate, forming a vapor cloud that may drift away from the original site. To catch fire, the vapor cloud must encounter an ignition source; if this occurs, the cloud will ignite. Otherwise, it will dissipate into the atmosphere.

A final risk associated with LNG spills is the possibility of a flameless explosion. When the highly cooled liquefied natural gas spills onto water, it can heat up and rapidly vaporize in a flameless explosion. The hazard zone around this type of explosion is smaller than that around a vapor cloud or pool fire.⁹

LNG and Terrorism

According to a study by Lloyd’s Register of Shipping, terrorists who blasted small holes in the inner and outer hulls of an LNG tanker could create a destructive series of explosions and fires. The ship, according to the study, “would become a total loss with a continuous fire that would be inextinguishable until all gas had been consumed.”¹⁰ In the case of the resulting fire, the hazard exclusion zones may be insufficient to protect people from the effects of the thermal radiation.

Although LNG infrastructure has not been subject to a terrorist attack to date, tankers and LNG facilities remain vulnerable targets. Similar oil and gas facilities have been successfully attacked and several LNG accidents highlight their

vulnerabilities.

- Federal warnings regarding al Qaeda threats to the U.S. since September 2001 have frequently mentioned energy infrastructure.¹¹
- An accidental explosion at an LNG plant in Algeria in January 2004 killed 22, injured 74, and caused \$800 million in damage.¹²
- According to Richard Clarke, the former counterterrorism czar for both President Bill Clinton and George W. Bush, “After the Millennium Terrorist Alert, we had learned that al Qaeda operatives had been infiltrating Boston by coming in on liquid natural gas tankers from Algeria. We had also learned that had one of the giant tankers blown up in the harbor, it would have wiped out downtown Boston.”¹³

Conclusion

As natural gas prices have increased in the past five years, the Bush administration has proposed expanding importation of LNG. In addition to increasing the threat to American harbors, the Union of Concerned Scientists notes that this expansion would lead to LNG dependency on many of the same countries upon which the United States is depends for oil.¹⁴ In light of the variety of security threats LNG poses, rigorous environmental and security impact assessments must be conducted and security recommendations must be implemented to decrease the associated risks before LNG can be promoted as an alternative to other fossil fuels. Moreover, it is worth noting that, according to Amory Lovins of the Rocky Mountain Institute, “all the energy now supplied by LNG and LPG¹⁵ can be replaced by much cheaper sources which do not compromise national security.”¹⁶ These alternatives include solar electricity, wind power, and biomass resources—all decentralized energy sources that virtually eliminate the terrorist threat associated with current energy infrastructure—and other, safer hydrocarbon-based fuel supplies like domestically produced natural gas.

Physicians for Social Responsibility’s Energy Security Initiative is dedicated to advancing a national energy policy that protects public health, defends the environment and strengthens national and global security. As terrorist organizations threaten energy infrastructure in the United States and worldwide, it is imperative to adopt a new strategy to meet America’s energy needs.

¹ Natural gas is primarily methane, with low concentrations of other hydrocarbons, water, carbon dioxide, nitrogen, oxygen, and sulfur compounds.

² Clayton M. “A prized energy source, or potent terror target?” *The Christian Science Monitor*. 6 April 2004.

³ McElhenny J. “Mayor plans to bill tanker company.” *Associated Press*. 30 October 2001.

⁴ Energy Information Administration. “U.S. LNG Markets and Uses.” Washington, D.C. January 2003. 1,11.

⁵ California Energy Commission. *Liquefied Natural Gas in California: History, Risks, and Siting*. July 2003. 2.

⁶ Fay JA. “Spills and Fires from LNG and Oil Tankers in Boston Harbor.” Working paper. Cambridge, MA: Massachusetts Institute of Technology. 26 March 2003.

⁷ Clayton.

⁸ Fay 3.

⁹ Havens J. “Ready to Blow?” *Bulletin of the Atomic Scientists*. July-August 2003. 17.

¹⁰ Quoted by LNG Watch. “Samoa LNG: What is it?” <http://www.lngwatch.com/facts.html>. Access 14 April 2004.

¹¹ Federal Bureau of Investigation. *The Terrorist Threat Confronting the United States*. Statement of Dale L. Watson, Executive Director for Counterterrorism and Counterintelligence before the Senate Select Committee on Intelligence. Washington, D.C. 6 February 2002.

¹² California Energy Commission. “Algerian LNG Plant Explosion.” http://www.energy.ca.gov/lng/news_items/2004-01_algeria_factsheet.html 22 March 2004. Accessed 12 April 2004.

¹³ Clarke, RA. *Against All Enemies: Inside America’s War on Terror*. New York: Free Press, 2004. 15.

¹⁴ Union of Concerned Scientists. “Renewable Energy Can Help Ease Natural Gas Crunch.” http://www.ucsusa.org/clean_energy/renewable_energy/page.cfm?pageID=1370. Accessed 16 April 2004.

¹⁵ Liquefied petroleum gas.

¹⁶ Lovins, Amory B. and L. Hunter Lovins. *Brittle Power: Energy Strategy for National Security*. Andover, Massachusetts: Brick House Publishing Company, 1982. 99.

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