

Critical Issues Forum

LNG — A Safe Alternative Fuel

FRANK KATULAK

Imagine a clean, non-toxic fuel that could be safely and efficiently used to heat homes and generate electricity, one that is naturally abundant and comes from locations around the world, not just the Middle East. This fuel wouldn't pollute land or water resources if it accidentally spilled while being transported and could not catch fire or explode in its liquid state, unlike other fossil-fuel counterparts.

That's LNG, or liquefied natural gas. LNG is not new. It has been successfully transported and used for decades. With 113 facilities, the U.S. has more LNG operations than any other country. So attractive are LNG's characteristics, that the U.S. has embarked on a major initiative to expand LNG importation and use in the next decade and beyond as demand for natural gas continues to rise, while traditional domestic sources of natural gas and other fuels plateau.

But glancing at recent news stories about LNG, one might conclude that

the U.S. is literally playing with fire — that LNG is one of the most hazardous materials in existence or that its ships are natural targets for terrorists. How the industry got to this point will one day be fodder for a business school case study. In the meantime, let's look at the undisputable facts about LNG safety.

LNG receiving and storage facilities, many of which are in populated areas, have an exceptional safety record by any measure. There was one tragic incident more than 60 years ago during the industry's infancy, and it was a critical learning

experience for the industry and government. Since then, well-developed design, construction, and safety codes have been established and in use. Small LNG vapor releases and minor fires have been reported at U.S. LNG operations, but the impact was limited. Incidents are rare, and primarily characterized as construction accidents where no LNG was directly involved.

That is a record unmatched in the fuel industry. Yet despite this achievement, members of the media, activists, some academics and political leaders have come down with what one children's book author called a bad case of the "what ifs" regarding terrorism and LNG. In many cases, their concern does not seem to apply to other fuels, critical infra-

characteristics of LNG. As a liquid, it cannot burn, much less explode. When it is warmed and turned back into natural gas, it is flammable within a limited range — in concentrations of 5–15% with air, and will not explode in an unconfined environment. Then there are the methods and equipment employed to transport LNG safely. Standards, codes and regulations have evolved to ensure safe and secure operations, utilizing multiple layers of protection.

It's ironic that so much debate has evolved about the relative safety of LNG transport and storage, when LNG facilities might in fact be the most secure, extensively regulated maritime operations in existence. With that said, the LNG industry stands up well to

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scrutiny. Our company and others continue to work with the appropriate authorities to eliminate the chance of an incident of any

structure or populated venues that frankly could be infiltrated more easily and with devastating effect.

The problem with most of the theories about the consequences of an LNG incident is that they emphasize what could theoretically happen, and not what would likely happen in the real world. There's a big difference. While the potential consequences vary somewhat, credible independent scientific analyses show that even in a worst-case scenario, the most probable damage would be limited in size.

Much of that is due to the unique

kind, and we will gladly match our safety record and procedures with any other fuel industry.

But at some point, the debate should subside and decisions made. According to the Federal Energy Regulatory Commission, current natural gas supplies are adequate, but construction of new infrastructure will be needed by 2010 or there will be shortfalls. The lead-time for even the simplest LNG infrastructure projects to deliver more supply is 3–5 years. The LNG industry has proven it can operate safely and reliably. The time for action is now.

CEP



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LNG Importation — Is the Public Safe?

DR. JERRY HAVENS

We are all aware of the “energy problem” that exists for future generations. One of the alternatives being closely examined is liquefied natural gas (LNG). Today, there exist four LNG import terminals in the continental U.S. that are currently providing about 3.7 billion ft³/d of natural gas. As of last December, the Federal Energy Regulatory Commission has identified 52 potential LNG import projects for North America. Is there a near-term need for a more than ten-fold expansion in LNG import capability? And more importantly, what are the resulting public safety issues that should be considered along with the benefits of such an expansion?

The Dept. of Homeland Security has designated LNG infrastructure as a potential terrorist target. How should we prioritize our responses to such threats? It is evident that there are limitations on our ability to provide the public the assurances they are likely to demand. But it is certain that 9/11 has added a whole new dimension to the problem. No longer can we argue to the generations following that our safety record is sufficient reason for them to breathe easy. The LNG industry’s safety record is remarkable, but a malicious intent changes the rules.

Arguments and counter-arguments have been advanced about the “safety” of LNG importation relative to “other threats”. And the public has become conflicted as a result of the inconsistent information they have been provided. The year-long overdue report “Guidance on Risk Analysis and Safety Implications of a Large Liquefied Natural Gas (LNG) Spill Over Water,” was published last December by the Sandia National Laboratory for the Dept. of Energy in response to growing public concerns about the

safety of proposed LNG import projects and in response to a call from the scientific community to commission a study of the disparate information.

Although the report may fall short in the area of recommendations for methods to manage hazards, it provides a science-based assessment of the potential consequences of a terrorist attack on an LNG marine carrier. Its estimates of the potential consequences of a terrorist attack on an LNG carrier are sobering. The report notes that methods that are available to terrorists could cause a catastrophic release from a ship’s containment system, using a “credible spill” of 12,500 m³, or half of

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a single tank on a typical LNG carrier with five such tanks, as a “base case.”

Primary hazards to the public from such a spill include pool fires on the water, with thermal radiation fluxes that could cause second degree burns to unprotected skin in about 30 seconds, extending to distances of more than one mile. Furthermore, a flammable vapor cloud could occur in the unlikely event that the gas is not ignited immediately upon release, extending to distances between two and three miles. There is also the possibility of cascading failures of the ship’s containment system. Explosions of gas-air mixtures trapped in cavities and brittle fracture of steel resulting from contact with extremely cold LNG could lead to further failures. Additionally, failure, by melting or decomposition, of the foam plastic insulation used

on some carriers could result from the severe thermal exposure of such initial fires, leading to overpressurization and bursting of adjacent tanks. Although the report states that it is unlikely that more than two or three of the separate tanks could be released at one time, there remains a clear indication that such events could result in the total loss of the ship and the burning of its contents.

Given the possibilities for remote on-shore siting of LNG import terminals, as well as for offshore siting, the question now on the table is “how remote is enough?” In the last several years, there have been cries from some sectors that would discourage anyone to believe that

we can develop a siting policy that could provide for reasonable safety to the public.

The Sandia report goes a long way in providing information that will enable policy makers to site LNG import terminals in a manner respecting the public safety and the environment. It also calls for additional large-scale testing to provide more confidence in the modeling methods that are used to “scope” the potential consequences that must be considered.

But, therein looms another potentially contentious debate — how much more work needs to be done to determine the course of action to follow in LNG import terminal siting? I believe that we have more information about this issue with which to proceed than we have on many other public safety and environmental issues we face. One thing is certain, it will remain for the policy makers and scientists to use this information, with some common sense, to “get it right” on the public safety front. Otherwise, the repercussions could be tremendous.

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Professor Havens is a distinguished Professor of Chemical Engineering at the University of Arkansas, where he has taught for 34 years. His research has concentrated on consequence analyses for hazardous materials releases, with an emphasis on fire and explosion and atmospheric dispersion phenomenology. Dr. Havens directs the University’s Chemical Hazards Research Center, which has developed mathematical and wind tunnel dispersion models for analysis of episodic releases of hazardous materials. The models prescribed for LNG siting applications in 49 CFR 193 were developed by Dr. Havens and his colleagues.