

Liquefied Natural Gas



NYSDEC Proposed Regulation 6 NYCRR Part 570



History of LNG Law

- 1973 – Tragic Staten Island event was a maintenance accident, not an LNG explosion
- 1976 LNG Law passed
 - ECL Article 23 Title 17 Added
- 1978 Statewide Moratorium Enacted
- 1997 Law for Energy Board Evaluation
 - A report was issued in 1998



1998 Report Results

- Safety of LNG Similar to Other Fuels
- 1973 Accident Not Due to LNG Storage
- No Other States Prohibit LNG
- Opportunities for Cleaner Fuel
- Discontinue Moratorium
- Repeal Law



Drafting of Regulation

- Multi-agency workgroup formed
 - Environmental Conservation,
 - Public Service,
 - Transportation,
 - Department of State,
 - Office of Fire Prevention and Control
- Draft substantially complete in 2008
- Impediments to Completing Regulation



Impediments to Regulation

- Routing of Intrastate Transportation of LNG
 - Intrastate vs. Interstate Transportation
 - Practicability of Routing
- Evaluation of Local Fire Response Capabilities
 - Input from Office of Fire Prev. & Control
- Concerns about Safety Issues



2011 NYSERDA Report

- Other States Rely Upon Building/Fire Codes and Standards, Not Permits
 - *NYS Fire Code references NFPA 52 and NFPA 59A (Fire Code 3001.1/3201.1)*
- Texas Licenses Operators
- Project Approximately 21 Facilities in the First Five Years (all associated with transportation)
- Other facility types possible but none expected in first five years



Recent Developments

- Price Divergence of Petroleum and Natural Gas
- Development of More Advanced Engines
- Reduced Emission Profiles
- Economic Demand for Facilities
- About 150 LNG fueling facilities operating or planned nationally



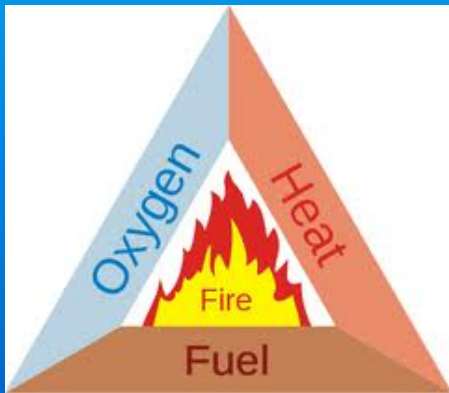
Addressing Impediments

- Routing Requirement
 - Allow intrastate transportation to supply facilities with LNG only if route certified by DOT



Addressing Impediments

- Local Emergency Response Evaluation
 - Permit application to require extensive information on local capabilities
 - DEC to enlist assistance of the Office of Fire Prevention and Control to review capabilities and make recommendations



Key Definitions



- LNG “facility” means any structure/ facility that stores LNG or converts LNG to gas
- “Tank system” means a stationary device designed to store LNG
- On-board LNG fuel tank in an LNG-fueled vehicle/vessel is not an LNG facility



Key Definitions



- LNG Transportation activity means the loading, unloading, or transport of LNG.
- “Interstate transport of LNG” means
 - the transportation of LNG between a point in NYS and a point in another state or foreign country, in either direction; or
 - between points in NYS through another state or foreign country; or
 - between points in other states or foreign countries through NYS.



Re-Cap

- Permit – before preparing property for facility
 - Submit application, EAF and possible EIS
 - Public notice and possible hearings
 - Good for maximum of 5 years
 - Evaluation and, if needed, training of local responders
- Inspection and compliance



Comments in Opposition

- The anti-fracking community believes the program will add to the infrastructure for gas; increase demand and lead to fracking
- Danger from LNG explosions
- Methane emissions too high



Comments in Support

- Implementation of the program will reduce greenhouse gas and other air emissions
- other environmental benefits - groundwater
- Program will put NY on the same footing as 49 other states, with economic benefits



Addressing Concerns

- Part 570 contains does not address production of natural gas; Title 17 dates back many years and does not relate to HVHF – any increase in demand would be *de minimis*
- Only state with a permit program – any issues can be addressed on a case-by-case basis as DEC reviews applications



New York's Proposed New Liquefied Natural Gas Facility Regulations
(6 NYCRR Part 570)

A Dialogue

Presented by: The Environmental Law Section
New York State Bar Association
Annual Meeting, New York, N.Y.
January 31, 2014

Speakers:

David H. Keehn, Esq. N.Y.S. Department of Environmental Conservation

David Vandor, Expansion Energy

Steven C. Russo, Partner, Greenberg Traurig LLP

Moderator:

Michael J. Lesser, Of Counsel, Sive Paget & Riesel, P.C.

LNG Background:

Natural Gas Hits the Road, Bradley Olson, Bloomberg Businessweek May 6 – May 12, 2013, pp. 60-63,

<http://www.businessweek.com/articles/2013-05-02/why-natural-gas-powered-vehicles-are-catching-on>

- Currently, the U.S. natural gas supply can meet U.S. consumption for 100 years.
- 1,000 NG refueling stations are operating in the U.S.
- There are approximately 120,000 NG powered vehicles in the U.S. (15.2 million globally).
- Industry is investing heavily in the manufacture and supply of NG vehicles.
- The concentration of these efforts is on fleet, delivery and long haul vehicles.
- Regarding LNG, efforts are underway to create “America’s Natural Gas Highway” a corridor of LNG refueling stations along major long haul trucking routes.

New York State Department of Environmental Conservation (NYSDEC) Online Resources

NYSDEC Proposed LNG Rule Home Page

<http://www.dec.ny.gov/regulations/93069.html>

NYSDEC Proposed 6 NYCRR Part 570 Regulations (Full Text)

<http://www.dec.ny.gov/regulations/93166.html>

NYSDEC Proposed Part 570 Public Information Page

http://www.dec.ny.gov/docs/remediation_hudson_pdf/lng1030pres.pdf

NYSDEC Proposed Part 570 Press Release

<http://www.dec.ny.gov/press/93559.html>

NYS Part 570 Promulgation Support Study

http://www.dec.ny.gov/docs/remediation_hudson_pdf/lngnyserdareport1.pdf

SEORA Negative Declaration, Proposed Part 570 Regulations
http://www.dec.ny.gov/docs/remediation_hudson_pdf/part570seordocs.pdf

Information about Opposition to Proposed LNG Facility Regulations

New Yorkers Demand DEC Withdraw Proposed Liquefied Natural Gas (LNG) Regulations in 50,000+ Comments Hand Delivered to Agency Headquarters, New Yorkers Against Fracking, 12/4/13
<http://nyagainstfracking.org/new-yorkers-demand-dec-withdraw-proposed-liquefied-natural-gas-lng-regulations-in-50000-comments-hand-delivered-to-agency-headquarters/>

50,000+ Demand DEC Withdraw Flawed LNG Regulations
EcoNews, 12/4/13
<http://www.dec.ny.gov/regulations/93166.html>

Information about Advocates for Proposed LNG Facility Regulations

NYLCV Press Release on LNG Facilities, 10/31/13
<http://www.nylcv.org/newsroom/releases/9843>

LNG for NY, Facts and Links
http://www.lngforny.com/lng_facts.php

Selected 2013 LNG NYS Legislation

S 3846, Sen. Lanza, Enacted 5/7/13, (Extends LNG Facility Moratorium)
<http://public.leginfo.state.ny.us/menugetf.cgi>

S 1119, Sen. Maziarz, Passed Senate but not Assembly (exempts LNG Facilities with 40,000 gallon or less capacity from Moratorium,
<http://public.leginfo.state.ny.us/menugetf.cgi>

Historical Background

40th Anniversary of 1973 LNG Explosion on SI that Killed 40 (Staten Island Advance)
http://www.silive.com/news/index.ssf/2013/02/40_years_ago_today_staten_isla.html

History of US LNG Accidents
<http://www.ch-iv.com/links/history.html>

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Proposed Express Terms (Full Text) - 6 NYCRR Part 570

Liquefied Natural Gas

Sec.

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§ 570.1 Introduction

(a) **Purpose.** The purpose of this Part is to establish criteria for the siting of liquefied natural gas (LNG) facilities and to require such facilities to obtain a permit from the department pursuant to Article 23, Title 17 of the Environmental Conservation Law and to protect the public health and the environment of New York State (the State).

(b) **Applicability.** This Part applies throughout New York State subject to restrictions as identified in section 570.9 of this Part. Unless specifically exempted pursuant to subdivision (d) of this section, owners and operators of liquefied natural gas facilities must comply with this Part. LNG transportation activities do not require a permit issued under this Part. However, intrastate transportation of LNG to supply a permitted facility is prohibited unless the intrastate transportation route has been certified as set forth in subdivision 570.4(a) of this Part. Storage or transportation of natural gas in the vapor state, under pressure or not, is not subject to this Part.

(c) **Definitions.** For the purposes of this Part, the following definitions apply:

(1) "Aboveground storage tank" or "AST" means any tank that is not an underground storage tank.

(2) "Authority having jurisdiction" means the local government, county government, or State agency responsible for the administration and enforcement of applicable regulation or law.

(3) "Department" means the New York State Department of Environmental Conservation.

(4) "Facility capacity" means the sum of the tank design capacities for each tank at the LNG facility.

(5) "Intrastate transport of LNG" means the transportation of LNG other than as is described in the definition of "interstate transport of LNG."

(6) "Interstate transport of LNG" means the transportation of LNG between a point in New York State and a point in another state or a foreign country, in either direction; or between points in New York State through another state or foreign country; or between points in other states or foreign countries through New York State.

(7) "L/CNG," also known as "liquefied to compressed natural gas," means LNG which may be dispensed from its container as either a liquid (LNG) or as compressed natural gas (CNG).

(8) "Liquefied natural gas," or "LNG," means natural gas or synthetic gas composed primarily of methane (CH₄) cooled to its liquid state. For the purposes of this Part, liquefied natural gas shall not mean liquefied petroleum gas.

(9) "Liquefied natural gas facility" or "LNG facility" means any structure or facility used to store liquefied natural gas in a tank system, or other storage device or to convert liquefied natural gas into natural gas.

(10) "Liquefied natural gas transportation activity" or "LNG transportation activity" means the loading, unloading, or transportation, by whatever means, of liquefied natural gas.

(11) "NFPA" means the National Fire Protection Association, or its successor.

(12) "Natural gas" means a fuel consisting of a mixture of mostly methane (CH₄) gas, other hydrocarbon gases, and trace amounts of non-hydrocarbon gases, which is stored and transported in a vapor state and under a wide range of pressures.

(13) "Non-conforming facility" means a liquefied natural gas facility in actual use and operation on September 1, 1976, which is exempt from the requirements of section 23-1707 of the Environmental Conservation Law but is subject to the requirements of the LNG-related Department orders issued on January 19, 1979.

(14) "Operator" means any person who operates, controls, or supervises an LNG facility or

who is responsible for the operation.

(15) "Owner" means any person who owns or has legal or equitable title to an LNG facility.

(16) "Out-of-service," in relation to an LNG facility or portion thereof, means no longer in use.

(17) "Permit" means an "environmental safety permit" issued by the Department pursuant to Article 23, Title 17 of the Environmental Conservation Law.

(18) "Person" means any individual, corporation, partnership, association, cooperative or otherwise, trust or estate, governmental agency, authority, public benefit corporation, municipality or agency thereof, board or commission, or other public or private legal entity.

(19) "SEQRA" means the State Environmental Quality Review Act set forth in Article 8 of the Environmental Conservation Law, and implemented by Part 617 of this Title.

(20) "Spill" or "spillage" means any escape of LNG in liquid form from the containers employed in the normal course of storage, transfer, processing, or use of LNG.

(21) "Statement of compliance" means a two-part document containing the following components. In part one, a State-licensed Professional Engineer authorized to practice in the State consistent with the State Education Law, on behalf of an applicant for a permit, attests by signature and seal that the design of the proposed LNG facility meets the applicable provisions of Federal Pipeline Safety standards, applicable provisions of the Public Service Commission's regulations in Title 16 of the New York Codes, Rules, and Regulations (NYCRR), and the Uniform Fire Prevention and Building Code of the State. In part two, the owner of the facility attests that the facility will be operated in accordance with all applicable regulations, standards, and requirements.

(22) "Tank design capacity" means the nominal amount of liquefied natural gas that a tank is designed to hold as determined by the tank manufacturer. If a certain portion of a tank is unable to store LNG (for example, electrical equipment or other interior components take up space), the design capacity of the container is thereby reduced.

(23) "Tank" means the main storage container of a tank system. Each section of a compartmented tank will be treated as an individual tank.

(24) "Tank system" means a stationary device designed to store LNG that is constructed of non-earthen materials that provide structural support. This term includes all associated piping and ancillary equipment.

(25) "Tank working capacity" means the portion of the design capacity of a tank that may be filled before engaging the overfill prevention device, reduced by an allowance for freeboard and LNG expansion.

(26) "Underground storage tank" or "UST" means a tank for which ten percent or more of the tank design capacity is beneath the surface of the ground. This term does not include a tank situated in an underground vault or other area making the tank fully available for inspection.

(d) **Exemptions.** For the purposes of this Part, the following exemptions apply

(1) An on-board LNG fuel tank in an LNG-fueled vehicle or vessel shall not constitute an LNG facility.

(2) LNG delivery tank trucks, when attached to a natural gas pipeline for the purpose of short-term pipeline-pressure regulation, shall not constitute LNG facilities if such tank trucks remain connected to the pipeline for less than 72 hours per event, and no more frequently than one such event during any thirty (30) day period.

(3) The movement of LNG within the boundaries of a liquefied natural gas facility shall not constitute intrastate transport of LNG.

(4) The movement of an on-board LNG fuel tank in an LNG-fueled vehicle or vessel shall not constitute intrastate transport of LNG.

(5) A non-conforming facility may continue to operate, without the need to obtain a permit, provided that:

i) there is no increase in the on-site LNG facility capacity within the boundaries of the facility,

ii) the facility sends a statement of compliance to the Department within one year of the date of promulgation of these regulations, and every five years thereafter, and

iii) the facility remains in compliance with the terms of the LNG-related Department orders issued January 19, 1979.

(6) The delivery of LNG to alleviate an emergency, as defined in subdivision 621.2(j) of this Title, shall not constitute intrastate transport of LNG, and for the duration of such emergency, the equipment used to convert LNG into natural gas shall not constitute an LNG facility, unless such equipment is already an LNG facility under this Part. In an emergency, the requirements of section 621.12 of this Title must be met.

(e) **Severability.** If any provision of this Part or its application to any person or circumstance is held invalid, the remainder of this Part, and the application of those provisions to other persons or circumstances shall not be affected.

(f) **Enforcement.** Any person, who violates any of the provisions of this Part, or any order issued by the Commissioner, shall be liable for civil, administrative and criminal penalties as are provided for by law.

§ 570.2 **Permit Requirements and Application Procedures**

(a) **Permit Requirements.** A permit issued pursuant to this Part must be obtained prior to the preparation of a site for, construction of, or operation of a liquefied natural gas facility. Facilities with a valid permit must be operated in conformance with the permit and any terms, limitations, and conditions therein. Nothing in this Part exempts a facility from compliance with any other applicable State, federal, or local requirements.

(b) **Permit Application Contents.** A complete application for a permit issued pursuant to this Part must conform to the format provided by the Department and must include, at a minimum:

- (1) the location of the proposed facility;
- (2) a description of reasonable alternative locations for the proposed facility;
- (3) the need for the proposed facility;
- (4) specification of the tank design capacity for each tank and the facility capacity;
- (5) the expected sources of natural gas or liquefied natural gas for the facility;
- (6) a written summary and maps showing the routes to be used to supply the facility with LNG;
- (7) a description of the possible environmental impacts of the proposed facility and the facility features or procedures to mitigate those impacts;
- (8) a statement of compliance;
- (9) a report, prepared by an independent qualified person, that evaluates the capability and preparedness, or lack thereof, of fire departments in the vicinity of the proposed facility who would respond to a release of LNG or fire involving LNG. If this report concludes that any additional training, personnel, or equipment would be needed for local fire departments to effectively respond to a release or fire involving LNG, the report shall detail the deficiencies and provide a detailed cost estimate and schedule for remedying any deficiencies;
- (10) proof of liability insurance carried by the applicant which covers the proposed LNG operations;
- (11) a written listing of the NFPA requirements that would apply to the LNG facility in accordance with paragraph 570.2(d)(1) of this Part and an explanation of how the LNG

facility would be in compliance with those requirements;

(12) for the proposed facility property and for surrounding properties within one-half mile of the facility property boundaries, the current zoning classifications, actual land use, and population (from most recent census); and

(13) such other information as the Department shall determine to be necessary to render a decision about issuing a permit for the facility.

(c) Permit Application Forms.

(1) Facility owners must submit an application for a permit on application forms provided by the Department unless an alternative means of application is approved by the Department. Forms are available at <http://www.dec.ny.gov/>, all Department offices, or by writing the New York State Department of Environmental Conservation, Division of Environmental Remediation, 625 Broadway, Albany, New York, 12233-7020.

(2) A permit application submitted by a corporation must be signed by a principal executive officer of at least the level of vice-president or by a duly authorized representative. A permit application submitted by a partnership or a sole proprietorship must be signed by a general partner or proprietor. An application submitted by a municipal, state, or other public entity must be signed by either a principal executive officer, ranking elected official, or other duly authorized employee, and must be accompanied by a copy of the ordinance, resolution or order authorizing the individual to act on the public entity's behalf.

(3) Applications that do not conform to the requirements of this Part will be determined to be incomplete pursuant to Part 621 of this Title.

(d) Criteria for Siting and Operation of Facilities.

(1) All LNG facilities must comply with all applicable provisions of the August 29, 2012 (2013 edition) of NFPA 59A, "Standard for the Production, Storage, and Handling of Liquefied Natural Gas." In addition, LNG facilities that store and dispense LNG or L/CNG for use by vehicles must comply with all applicable provisions of the December 17, 2012 (2013 edition) of NFPA 52, "Vehicular Fuel Systems Code."

(2) Facilities that transfer LNG to trucks or rail cars must also comply with the applicable provisions of the October 1, 2011 edition of the United States Department of Transportation's Pipeline Safety Regulations, 49 CFR Part 193, Subchapter D. The installation, operation and maintenance of facilities that transfer LNG to and from marine vessels shall be designed, built and operated in accordance with 49 CFR Part 193,

Subchapter D and/or the July 1, 2011 edition of the United States Coast Guard's Navigation and Navigable Waters Regulations, 33 CFR Part 127, as applicable.

(3) The Department will determine if the information provided in the facility permit application required by subdivision (b) of this section indicates the need for additional training, personnel, or equipment to enable local fire departments to respond effectively to any release or fire involving LNG at the facility. If the Department concludes that additional training, personnel, or equipment is needed, it shall be provided by the applicant before beginning operation of the facility.

(4) When determining whether to issue a permit under this Part, the Department shall consider the physical, flammability, and explosivity characteristics of LNG and the following factors:

- (i) compliance with the requirements of paragraphs one through three of this subdivision;
- (ii) risks to persons and property in the area neighboring the facility; and
- (iii) risks from transportation accidents.

(e) **Permit Issuance.** The procedures and processes identified in Part 621 of this Title govern the issuance of permits to LNG facilities.

(f) **Duration of Permit.** The date of expiration of any permit issued pursuant to this Part will be five (5) years from the date the permit is issued unless the Department determines that a shorter period is appropriate.

(g) **Renewal of Permit.** A permit issued pursuant to this Part may be renewed by the Department for additional five-year terms, or a shorter period if appropriate, in accordance with Part 621 of this Title, upon a written request on a form approved by the Department, and filed with the Department at least thirty (30) days prior to the permit expiration date. A request for a renewal must also include a statement of compliance.

(h) **Public Participation.** Any hearings, comments, or participation by federal, State or local government bodies or members of the public, relative to any permit proceedings, will be conducted in accordance with procedures established in Parts 621 and 624 of this Title.

(i) **Modifications of Permits and Change of Ownership.** A permit issued pursuant to this Part is issued to the facility owner, and includes the names of the facility owner and facility operator. A permit is valid only for the facility's specified owner and operator, and the specific conditions stated in the application and permit. Changes of ownership require the

new owner to submit an application for permit transfer pursuant to section 621.11 of this Title, and the payment of a fee per subdivision (k) of this section. Changes in facility operator require proper notice to the Department. No payment of a fee is needed for a permit modification to reflect a change in facility operator. Permit modifications, including physical or operational changes to an existing LNG facility are subject to procedures established in Part 621 of this Title. In addition:

(1) any proposed changes at an LNG facility subject to this Part involving any increase in on-site LNG facility capacity, modifications to the site boundaries of the facility, or a material change of any permit terms or conditions will be treated as a new application pursuant to Part 621 of this Title.

(2) the upgrading and maintenance of mechanical systems and other equipment, conducted during the term of a valid permit, that will not increase the on-site facility capacity, and is conducted within the previously approved site boundaries, does not require a permit modification.

(j) **Permit Suspension or Revocation.** Permits issued to liquefied natural gas facilities may be suspended or revoked by the Department. The processes and procedures identified in Part 621 of this Title will be utilized by the Department in suspending or revoking a permit. For matters involving the potential endangerment of public safety, nothing in this section restricts the authority having jurisdiction from taking any action it might otherwise be empowered to take.

(k) **Program Fees.** In addition to any fees or costs associated with the SEQRA process, the owner must submit with each application for a permit, permit renewal, or permit transfer, a five-year fee as follows:

LNG Facility Program Fees	
Facility Capacity	Five-Year Fee
(1) less than 1,100 gallons	\$100.
(2) 1,100 gallons to 10,000 gallons	\$500.
(3) 10,001 gallons to 70,000 gallons	\$1,000.
(4) 70,001 gallons and greater	\$2,500.

§ 570.3 **Site Inspections and Training of Local Fire Department Personnel**

(a) Department staff, or any duly designated representative of the Department, may inspect any LNG facility and site for permit compliance. Nothing herein shall prevent the Department, or any duly designated representative of the Department, from making unannounced inspections when deemed necessary.

(b) Each applicant for a permit shall offer an emergency response training program for local enforcement, fire, and hazardous material response personnel of the authority having jurisdiction. The applicant shall offer, at applicant's cost, relevant training prior to commencing operation of the LNG facility and annually thereafter using an appropriate training program approved by the New York State Fire Administrator within the Division of Homeland Security.

(c) The Department may evaluate facility compliance either with its own personnel or by contract with one or more persons qualified to monitor compliance and certify with respect thereto or by a combination of the foregoing means as deemed necessary by the Department. Costs for any contractual inspection services will be paid by the permittee as a condition of the operating permit.

§ 570.4 **Transportation of LNG**

(a) The intrastate transportation of LNG to LNG facilities permitted under this Part is prohibited unless the route has been certified by the New York State Department of Transportation.

(b) The interstate transportation of LNG within the State shall be conducted in accordance with all applicable State and federal requirements for the transport of hazardous materials, including the requirements as set forth by the State departments of transportation and motor vehicles. The interstate transportation route of LNG within the State does not require certification by the New York State Department of Transportation.

§ 570.5 **Non-Conforming Facilities.** All non-conforming LNG facilities may continue to operate pursuant to LNG-related Department orders issued January 19, 1979. However, any increase in capacity at a non-conforming facility requires a permit issued pursuant to this Part.

§ 570.6 **Permanent Closure of Out-of-Service LNG Storage Tanks.** The holder of a permit for an LNG storage tank located at an LNG facility where the storage tank or facility is to be permanently closed must submit plans to the Department at least thirty (30) days prior to permanent closure of the tank or facility. In addition, such permanent tank closure shall comply with the container purging procedures of NFPA 59A and the following requirements:

- (a) material removed from tanks must be disposed of in accordance with all applicable State and federal requirements;
- (b) tanks must be protected from flotation in accordance with good engineering practices;
- (c) all gauge openings or connecting lines must be capped, plugged or disconnected to prevent unauthorized use or tampering;
- (d) aboveground storage tanks designated as permanently closed must be vented to the atmosphere and stenciled with the date of such closure;
- (e) underground storage tanks must be filled to capacity with a solid inert material or removed; and
- (f) compliance with the requirements for permit relinquishment in subdivision 621.11(d) of this Title.

§ 570.7 **Financial Assurance.** Financial assurance, which may take the form of trust funds, surety bonds, letters of credit, insurance, documentation of financial capability, or other acceptable financial assurance, may be required by the Department to ensure proper closure of facilities. The form and amount of such financial assurance, if any, will be established by the Department.

§ 570.8 **Reporting of LNG Spills.** The reporting requirements of this section apply to spills of LNG at an LNG facility or non-conforming facility that result in, or may reasonably be expected to result in, a fire with potential off-site impacts or that cause, or may reasonably be expected to cause, an explosion.

- (a) Spills of LNG must be reported to the Department within two (2) hours of discovery as described in subdivision (b) of this section. Notification must be made by calling the telephone hotline (518) 457-7362 for calls from out of State or (800) 457-7362 for calls from within the State. Only one report is required for each spill. The owner or operator of an LNG

facility where an LNG spill has occurred must also submit a written report to the Department within 48 hours of the incident or discovery thereof, documenting the cause of the spill, the amount of LNG spilled, and the curative measures to prevent future spills.

(b) The reporting requirements of this section apply to any of the following persons who is aware of a spill:

(1) a facility owner or operator;

(2) any employee, agent, or representative of a facility owner or operator; and

(3) any person in a contractual or agency relationship with an owner or operator of a facility who delivers LNG, inspects, tests or repairs any portion of a facility, or who otherwise has responsibility for the handling or management of the LNG, and/or its spillage.

§ 570.9 **Moratorium.** The provisions of this Part shall not affect any statutory moratorium imposed restricting the issuance of permits under this Part.

§ 570.10 **References.** Citations used in this Part refer to the publications listed below and copies may be purchased directly from the publishers at the addresses shown. These publications are available for inspection at the New York State Department of Environmental Conservation, 625 Broadway, Albany, NY 12233-7020, at the New York State Department of State, One Commerce Plaza, 99 Washington Avenue, Albany, NY 12231-0001, at the New York Legislative Library, Capitol, Room 337, Albany, NY 12224, and at the following law libraries:

Supreme Court Law Library/Civil Branch
851 Grand Concourse
Bronx, NY 10451
(First Judicial Department)

Supreme Court Law Library
72 Clinton Street
Plattsburgh, NY 12901
(Third Judicial Department)

Supreme Court Law Library
360 Adams Street
Brooklyn, NY 11201
(Second Judicial Department)

Supreme Court Law Library
Steuben County Courthouse
Bath, NY 14810
(Fourth Judicial Department)

The provisions of the Code of Federal Regulations which have been incorporated by reference in this Part have been filed in the Office of the Secretary of State of the State of New York, the publication so filed being the booklet entitled: Code of Federal Regulations, title 49, Part 193 and title 33, Part 127, revised as stated in subdivisions (c) and (d) of this section, published by the Office of the Federal Register, National Archives and Records Administration. Copies of the Code of Federal Regulations are also available at many public libraries and bar association libraries.

(a) "NFPA 52" means National Fire Protection Association, "Vehicular Fuel Systems Code," December 17, 2012 (2013 Edition), NFPA, 1 Batterymarch Park, Quincy, MA 02269-9101, and at the following internet address:
<http://www.nfpa.org/categoryList.asp?categoryID=124>.

(b) "NFPA 59A" means National Fire Protection Association, "Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)," August 29, 2012 (2013 Edition), NFPA, 1 Batterymarch Park, Quincy, MA 02269-9101, and at the following internet address:
<http://www.nfpa.org/categoryList.asp?categoryID=124>.

(c) "49 CFR 193" means Part 193 of Title 49 of the Code of Federal Regulations, United States Department of Transportation Pipeline Safety Regulations, Subchapter D, October 1, 2011, Superintendent of Documents, U.S. Government Printing Office, 732 N. Capitol Street, NW, Washington, D.C. 20401 or <http://www.gpoaccess.gov/>.

(d) "33 CFR 127" means Part 127 of Title 33 of the Code of Federal Regulations, United States Coast Guard's Navigation and Navigable Waters Regulations entitled, "Waterfront Facilities Handling Liquefied Natural Gas and Liquefied Hazardous Gas," July 1, 2011, Superintendent of Documents, U.S. Government Printing Office, 732 N. Capitol Street, NW, Washington, D.C. 20401 or <http://www.gpoaccess.gov/>.

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Promulgation Support Study, September 20, 2011**

By:

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Expansion Energy LLC,
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(The complete text may be accessed via the NYSDEC website at:

http://www.dec.ny.gov/docs/remediation_hudson_pdf/lngnyserdareport1.pdf or via the NYSDEC
Liquefied Natural Gas Part 570 Homepage at: <http://www.dec.ny.gov/regulations/93069.html>)

**NYS Liquefied Natural Gas (LNG) 6 NYCRR Part 570
Promulgation Support Study**

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Introduction

Expansion Energy LLC (XE) has been retained by the New York State Energy Research and Development Authority (NYSERDA) to provide supporting information and analysis to NYSEDA and the New York State Department of Environmental Conservation (DEC) in DEC's ongoing efforts to promulgate rules (6 NYCRR Part 570 [Part 570]) to regulate liquefied natural gas (LNG) facilities pursuant to Article 23, Title 17 of the New York State Environmental Conservation Law (ECL). A summary of XE's scope of work can be found in Appendix A. The primary goals of this project are to: 1) document the regulatory approach to regulating the storage of LNG taken by several representative states; 2) project the number of LNG facilities that may be built in New York State (NYS) after promulgation of Part 570; 3) project the number of jobs that would be created to own and operate regulated LNG facilities; and 4) project the costs associated with complying with Part 570. These various projections will be used by DEC to complete the support documents for the rulemaking process as required by the State Administrative Procedures Act.

The purpose of Part 570 is to require owners of LNG facilities to obtain a permit from DEC for the siting, construction, and operations of LNG facilities. Additionally, the rules will provide inspection criteria for such facilities and more generally, requirements to protect the public health, safety and welfare, the lands, waters, air and the environment of New York State. The ECL charges the NYS Department of Transportation with creating certified routes and criteria for the safe transportation of LNG.

According to a representative of the Clean Vehicle Education Foundation, most states in the United States (U.S.), including those bordering NYS, use legislatively empowered "code committees" to select LNG-related codes to be enforced, but in some instances allowing a degree of "flexibility" by local jurisdictions. With only Texas (TX) as the exception, all U.S. jurisdictions use codes developed by the National Fire Protection Association (NFPA). In contrast to the widely used "code committee" format, California (CA) is the only state XE found that has adopted NFPA standards by reference. TX has adopted codes similar to those in NFPA but promulgated within its own legislative framework rather than by reference to NFPA. The TX codes are essentially the same as the NFPA codes and will be mentioned throughout this report but not analyzed in detail. In summary, NFPA 52 and 59A are consistently ("universally") used throughout the U.S.

The promulgation of Part 570 will establish protocols in NYS for the deployment of LNG facilities, based on NFPA codes, following the code enforcement standards found in most jurisdictions nationwide, but specifically following the CA model of "referencing" NFPA codes by a statewide statute. Those NFPA codes represent a detailed, rigorous, and comprehensive set of standards for the construction and operation of LNG facilities.

The first part of this report defines LNG and offers a brief history of LNG facility deployments; defines the "state of the art;" and reviews the history of LNG incidents. The second part uses several methodologies to project the number of LNG facilities that are likely to be deployed in NYS during the first five years after the promulgation of Part 570. Part Two also projects the number of new jobs that will likely be created by the LNG industry during those first five years, and analyzes the costs to prospective LNG facilities for complying with the rules promulgated by Part 570.

Task 1: Defining the “State-of-the-Art”

1A. LNG –Definition and Brief History

LNG is a dense, low-pressure, cryogenic, liquid phase of natural gas, mostly consisting of methane. It is distinct from liquid petroleum gas (LPG, generally called “propane”), which consists mostly of heavier hydrocarbons (rather than methane) and which is stored and transported in pressurized vessels as an ambient temperature liquid. The DEC draft rules do not include LPG.

“LNG facility” is defined in DEC’s draft rules as “any structure or facility used to store liquefied natural gas in a tank, vault or other storage device, to dispense liquefied natural gas, or to convert liquefied natural gas into natural gas.” (Emphasis added by XE.) The definition excludes on-vehicle LNG fuel tanks. Every LNG production plant that will follow the promulgation of Part 570 and every LNG dispensing site will constitute an LNG facility because they will all have some amount of on-site storage capacity.

The phrase “tank, vault or other storage device” in the above quoted DEC draft rules can be construed to be included by the word “container” defined in Section 3.3.9 of NFPA 52, as “a pressure vessel, cylinder, or cylinder(s) permanently manifolded together used to store CNG [Compressed Natural Gas], GH2 [Gaseous Hydrogen], LNG or LH2 [Liquid Hydrogen]” and which includes the following container types:

3.3.9.1 Cargo Transport Container – (A mobile unit designed to transport LNG...)

3.3.9.2 Composite Container

3.3.9.3 Fuel Supply Container – (A container mounted on a vehicle to store LNG, but which is not defined as an “LNG facility” in the DEC draft rules)

3.3.9.4 Fueling Facility Container – (“Primary storage for vehicular fueling,” also known as LNG storage “tanks.”)

Throughout NFPA 52, the terms “tank” and “container” are used interchangeably.

Similarly, NFPA 59A defines Cargo Tank Vehicle as “a tank truck or trailer designed to transport liquid cargo,” and defines Container as “a vessel for storing liquefied natural gas.” Another term used commonly in the industry is “storage vessel.”

Natural Gas in any form (compressed as CNG or liquefied as LNG) is one of the cleanest burning hydrocarbon fuels, producing lower levels of carbon dioxide (CO₂), oxides of nitrogen (NO_x), and particulate matter than heavier hydrocarbon fuels such as diesel. The commercial use of LNG can be traced back to the mid-20th century. LNG’s primary attribute, compared to the natural gas routinely delivered by the nation’s extensive natural gas pipeline system, or compared to the CNG carried on the roof of municipal bus fleets, is LNG’s density. LNG at a pressure of only 65 pounds per square inch, absolute (psia), but chilled to -245° F, has a density of 25.6 pounds per cubic foot. Colder LNG at -260° F will have a density of more than 26 pounds per cubic foot. Those densities are more than twice the 10.65 pounds per cubic foot density of CNG contained in high-pressure (up to 3,600 psia) tanks, at ambient temperatures. Thus, the purpose of liquefying natural gas is to increase its density in comparison to CNG, reducing its volume and the size and weight of the container it is stored in. In other words, a given volume of LNG will contain more than twice the heating value of the same volume of CNG.

The first commercial use of LNG began in the 1950s, mainly for the international shipping of LNG from gas producing regions to gas consuming regions. Within the U.S., LNG was used as a means to “peak-shave” natural gas use. Peak-shaving consists of liquefying and storing natural gas during the off-season

(summer), vaporizing and releasing it back into the pipeline during the peak demand (winter) periods. Also in the 1950s the San Diego Gas and Electric Company began to research the use of LNG for vehicle use.

During the 1960s, the international use of LNG expanded, as did the industry's technical understanding of the safe production, storage, transport and dispensing of LNG. By the 1970s, in response to oil shortages, LNG was seen as a viable alternative to diesel fuel. By the 1980s, heavy-duty vehicle engine technology was advancing, allowing for a wider range of vehicular options that could utilize LNG as a vehicle fuel.

During the 1990s U.S. reserves of natural gas increased, as did the import of oil from non-U.S. sources. As a result, after the 1990s, the historically tandem price fluctuations of oil and gas began to diverge, making natural gas (CNG and LNG) more competitive with standard fuels. That trend of increasing U.S. gas reserves (and increasing rates of production), and a growing gap between the price of natural gas and an equivalent "energy-containing" amount of diesel and gasoline, is likely to continue the growing use of LNG as a heavy-duty vehicle fuel.

On a worldwide scale, the most common reason for producing LNG is to allow it to be shipped in ocean-going tankers from production sources served by LNG export terminals (such as in Qatar) to import terminals in receiving countries (such as Japan), where the LNG is re-vaporized for insertion into local natural gas pipelines. Without liquefaction, such international trade and transport of natural gas, outside of pipelines, would not be possible. Nearby examples of LNG import terminal locations include Everett, Massachusetts; Elba Island, Georgia; and Cove Point, Maryland.

On the national scale, the U.S. has several LNG import terminals, which receive LNG from various "base load" production facilities throughout the world. The likelihood of new U.S. import terminal proposals has recently been substantially diminished because of increases in domestic natural gas reserves. New import terminals will have difficulty delivering LNG at prices that can compete with an abundance of lower priced north-American natural gas. Some existing import terminals and those that are in the planning stage are considering their options as export terminals. To the extent that exporting LNG from U.S. natural gas reserves is viable, it will likely first occur at existing terminals with amortized equipment rather than at newly built export facilities in NYS or in nearby states. In any event, any future proposal for LNG import or export terminals will require Federal Energy Regulatory Commission (FERC) review. That review will be the primary "permitting" process, rather than Part 570.

NYS has three peak-shaving plants that predate ECL Article 23, Title 17, two in New York City (NYC) and one on Long Island. Those facilities are "non-conforming facilities" and subject to requirements in DEC orders issued on January 19, 1979. Throughout the U.S. there are some 40 peak-shaving plants, including in Baltimore and Philadelphia.

Moving down in scale, and focusing on U.S. LNG facilities, there are several LNG production facilities (for example, in CA, AZ and TX) that produce LNG for use by vehicles based throughout the west and southwest. In terms of the total number of facilities, the most prevalent purpose for U.S. LNG facilities is the production and dispensing of vehicle-grade fuel. Forty-five to 50 U.S. LNG production and dispensing facilities serve that market, mostly in the western U.S. In almost every instance, the production-to-dispensing model relies on centralized LNG plants from which the LNG is distributed in specialized trailers to local storage and dispensing sites. At those dispensing sites, the LNG can be dispensed to heavy-duty vehicles as LNG, or to light-duty vehicles as CNG. XE knows of no example of an LNG production facility serving an individual fleet, "on site," at the home base of the fleet.

Several factors have accelerated the growth of LNG production and use in the U.S., including the following:

- The price of oil and the fuels derived from oil (diesel and gasoline) have begun to diverge from the price of natural gas, with natural gas being less costly, when the fuel costs are compared on an energy equivalent basis.
- The natural gas industry, including the LNG production and distribution portion, and the “alternative fuel vehicle” (AFV) industry have developed advanced engines, transport and storage equipment and cost-effective production systems to respond to a growing demand for AFVs.
- Public policies have been adopted on the federal and state levels to encourage the use of alternative fuels, especially domestic fuels, such as natural gas; and especially those fuels, including natural gas, that have a reduce emission profile.

Those factors will likely continue the growth of LNG production, transport, storage, and dispensing, especially for use as a vehicle fuel. DEC’s proposed adoption of Part 570 coincides with the growth of LNG as a vehicle fuel throughout the U.S. In order for vehicle-grade LNG to continue that market growth into NYS, DEC will need to adopt Part 570, which like all States (except TX) will rely on nationally recognized protocols for the regulation of LNG facilities.

1B. Regulatory Protocols

1B1. Controlling the Location of LNG Storage Facilities

Most U.S. jurisdictions rely on the NFPA codes for the regulation of LNG facilities, as they do for a variety of fire prevention codes, from electrical codes to the codes related to the storage and distribution of oxygen at hospitals. A member of the NFPA Technical Committee on Vehicular Alternative Fuel Systems (which wrote NFPA 52) stated that most states have established, by legislation, expert “code committees,” assigning the review and adoption of fire and building codes to the legislatively empowered code committee, thus avoiding the need for legislative action on each individual code to be adopted. By contrast, CA specifically incorporates NFPA standards, by reference, into its laws. For example, the CA Code of Regulations, Title 8, Section 455 incorporates NFPA 59A by reference.

The DEC draft rules follow the CA example by explicitly referencing NFPA 52 and NFPA 59A as the applicable codes that each LNG facility must comply with. Those codes will not replace, but rather add to local zoning controls, building codes and other codes (including other NFPA codes) related to electrical systems, pressure vessels, and the like. It should be noted that all existing CNG stations in NYS were almost certainly designed, deployed, and approved per NFPA 52, because that document covers all gaseous fuels, not just LNG, and because NFPA 52 is referenced by the International Construction Code.

Appendix B of this report is a summary table of the NFPA, federal, and TX rules and regulations for LNG facilities. That table is organized to mirror Section 1B of this report, with the key topics listed on the left, from 1) Site Planning through 6) Inspection & Enforcement.

NFPA 52, “Vehicular Gaseous Fuel Systems Code,” and NFPA 59A, “Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG),” are the de-facto “national” standards used by local jurisdictions in all states, except TX, for regulating the deployment and operations of all LNG facilities. TX has adopted specific legislation for the siting and operation of LNG facilities. The Texas Railroad Commission (RRC) administers the rules and regulations for the construction and operation of LNG facilities. Those rules and regulations are similar in scope to NFPA 52 and 59A. DEC draft rules

adopt NFPA 52 and NFPA 59A by reference, which is consistent with LNG rules in all other states in the U.S. The most current edition of NFPA 52 was issued in 2010, and the most current edition of NFPA 59A was issued in 2009.

A detailed review of the comprehensive scopes of NFPA 52 and NFPA 59A (see below) will show that the two codes are mutually supportive, often covering similar topics and prescribing the same standards, with NFPA 52 focusing on LNG related to vehicles and NFPA 59A focusing on LNG production, storage and handling. For most LNG facilities, the two NFPA codes will overlap, providing a comprehensive set of standards. Additionally, both NFPA 52 and 59A require compliance with other referenced NFPA codes and with standards by other entities. The following is a list of industry groups, outside of fire prevention, whose standards are referenced by NFPA 52 and 59A:

- American Gas Association (AGA)
- American Petroleum Institute (API)
- American Society of Civil Engineers (ASCE)
- American Society of Mechanical Engineers (ASME)
- American Society for Testing and Materials (ASTM)
- American Welding Society (AWS)
- Canadian General Standards Board (CGSB)
- Canadian Geotechnical Society
- Compressed Gas Association (CGA)
- Gas Research Institute (GRI)
- Gas Technology Institute (GTI)
- International Code Council (ICC)
- International Standards Organization (ISO)
- National Association of Corrosion Engineers (NACE)
- National Board of Boiler and Pressure Vessel Inspectors (NBBI)
- Society of Automotive Engineers (SAE)
- Steel Structures Painting Council (SSPC)
- U.S. Department of Transportation (USDOT)

Part 570, by requiring compliance with both NFPA 52 and 59A, will fully establish a comprehensive set of requirements, no matter what the “function” or scope of service provided at any LNG facility. As such, Part 570 incorporates, by way of NFPA 52 and 59A, the manufacturing, testing, maintenance and operating standards adopted by the expert groups listed above.

Part 570 will require a “statement of compliance,” signed by the owner of a proposed LNG facility and a NYS Professional Engineer, that the proposed facility “meets the provisions of the Federal Pipeline Safety standards, applicable provisions of the Public Commission’s regulations 16 NYCRR, and the Uniform Fire Prevention and Building Code of the State.”

The Federal Energy Regulatory Commission (FERC) has exclusive authority under the Natural Gas Act to authorize the siting of LNG import or export facilities. However, that authorization is conditioned on the applicant’s satisfaction of other statutory requirements. For example, substantial authority exists through current federal statutes for the states in which LNG import or export facilities are to be located to authorize or block (and “veto”) the development of LNG facilities. Examples of such authority held by the states include the Clean Water Act, the Clean Air Act and the National Environmental Policy Act (NEPA), which allows the states to contribute to the environmental review of any LNG proposal brought

to FERC. A more detailed outline of FERC’s LNG review role and how it interacts with the states can be found at FERC’s web site at <http://www.ferc.gov/industries/gas/indus-act/lng/state-rights.asp>.

For LNG facilities located on interstate natural gas pipelines, and which include certain operating characteristics, such as on-site LNG production, storage and re-vaporization of the LNG for re-insertion into the pipeline, the federal pipeline standards found at 49 CFR Part 193 and 33 CFR Part 127 apply. CFR stands for Code of Federal Regulations. 49 CFR Part 193 does not apply to: (1) “ultimate consumers of LNG;” (2) production facilities which do not store LNG; or (3) any LNG facility located in navigable waters. 49 CFR Part 193 incorporates a variety of standards by reference, as tabulated in Table 1 below.

Table 1: 49 CFR Part 193 References

Source and name of referenced material	49 CFR Reference
A. American Gas Association (AGA):	
(1) “Purging Principles and Practices” (3rd edition, 2001)	§§193.2513; 193.2517; 193.2615.
B. American Petroleum Institute (API):	
(1) API Standard 620 “Design and Construction of Large, Welded, Low-Pressure Storage Tanks” (11th edition February 2008, addendum 1, March 2009)	§§193.2101(b); 193.2321(b)(2).
C. American Society of Civil Engineers (ASCE):	
(1) ASCE/SEI 7–05 “Minimum Design Loads for Buildings and Other Structures” (2005 edition, includes supplement No. 1 and Errata)	§193.2067(b)(1).
D. ASME International (ASME):	
(1) 2007 ASME Boiler & Pressure Vessel Code, Section VIII, Division 1, “Rules for Construction of Pressure Vessels” (2007 edition, July 1, 2007)	§193.2321(a).
(2) 2007 ASME Boiler & Pressure Vessel Code, Section VIII, Division 2, “Alternative Rules, Rules for Construction of Pressure Vessels” (2007 edition, July 1, 2007)	§193.2321(a).
E. Gas Technology Institute (GTI) formerly the Gas Research Institute (GRI):	
(1) GTI–04/0032 LNGFIRE3: A Thermal Radiation Model for LNG Fires (March 2004)	§193.2057(a).
(2) GTI–04/0049 (April 2004) “LNG Vapor Dispersion Prediction with the DEGADIS 2.1: Dense Gas Dispersion Model For LNG Vapor Dispersion”	§193.2059.
(3) GRI–96/0396.5 “Evaluation of Mitigation Methods for Accidental LNG Releases, Volume 5: Using FEM3A for LNG Accident Consequence Analyses” (April 1997)	§193.2059.
F. National Fire Protection Association (NFPA):	
(1) NFPA 59A, (2001) “Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)”	§§193.2019; 193.2051; 193.2057; 193.2059; 193.2101(a); 193.2301; 193.2303; 193.2401; 193.2521; 193.2639; 193.2801.
(2) NFPA 59A, “Standard for the Production, Storage, and Handling of Liquefied Natural Gas (LNG)” (2006 edition, Approved August 18, 2005)	§§193.2101(b); 193.2321(b).

Note that Section E of the table above deals with Thermal Radiation Modeling, Vapor Dispersion, and the “Evaluation of Mitigation Methods for Accidental LNG Releases, Volume 5: Using FEMA3A for LNG Accident Consequence Analyses.” FEMA stands for Federal Emergency Management Agency. Those referenced models all deal with siting controls.

Also note that NFPA 59A is incorporated by reference in 49 CFR Part 193. In turn, DEC's draft Part 570 regulations incorporate 49 CFR Part 193 for LNG "facilities that produce and transfer LNG to trucks or rail cars or both and store 70,000 gallons or more of LNG in aggregate." 33 CFR Part 127 controls LNG facilities at the waterfront. Chapter I, subchapter D concerns pipeline safety. Section 193 is titled "Liquefied Natural Gas Facilities: Federal Safety Standards." DEC's draft of Part 570 incorporates 33 CFR Part 127 by reference for "the installation, operation and maintenance of facilities that transfer LNG to and from marine vessels."

Thus, all of the codes and standards available to federal and state regulators (including to DEC), are derived from a vast library of continuously updated research by independent entities, and all are cross-referenced in the NFPA and CFR codes that will be promulgated by Part 570.

When it comes to site planning, NFPA 52, NFPA 59A (as well as 49 CFR Part 193, and 33 CFR Part 127) focus on the arrangement of buildings, storage tanks and other equipment on the site of an LNG facility, but not on the site selection process for where an LNG "use" can be located. This "limitation" on the scope of those regulations is accepted by all the U.S. states that rely on the NFPA codes to regulate LNG facilities, because the question of "where" an LNG facility (or any other use) may locate is the purview of local land use controls (zoning regulations) which are the most commonly enforced administrative code in all jurisdictions (with the exception of TX), and stem from the police power of the state.

In the context of zoning controls, LNG facilities fit within a list of defined "uses," (or use categories) which include other fuel processing, storage, and dispensing uses, such as gasoline, diesel, propane storage and dispensing, and the like. Generally, such uses are allowed in "industrial" or "manufacturing" districts or in certain "automotive" commercial districts that permit the storage and sale of fuel and the maintenance of vehicles. Such uses are almost always prohibited from locating in residential zones or in districts that permit community facilities, such as schools and hospitals.

The exceptions are "pre-existing" non-conforming uses that were located in a neighborhood prior to the adoption of the current land use controls. Generally, those non-conforming uses can stay, (and be sold to new owners) but cannot expand or increase their "degree" of non-conformity. For example, if a non-conforming gasoline station in or next to a residential district proposed to add LNG dispensing to its services, it would likely be deemed an increase in its degree of non-conformity because more liquid fuel would be proposed for storage, and/or more liquid fuel would be proposed for aboveground storage. As a practical matter, such an addition of LNG storage and dispensing to any existing fuel dispensing site, (even one that conforms with the zoning ordinance), would need to be on a site large enough to allow compliance with the buffer standards in NFPA 52 and 59A, which are reviewed below.

The "edges" between industrial/manufacturing districts and residential and community facility districts most often include "buffers." Buffering techniques might include specific yard and setback requirements in the industrial/manufacturing district, when adjacent to less intensive uses. Buffering can also be achieved by placing light manufacturing and commercial uses between heavier manufacturing and residential districts. In other words, statewide and nationally, the most common and most effective tool for separating fuel processing, storage and dispensing facilities (including LNG facilities) from incompatible land uses is the local zoning ordinance.

Zoning ordinances are routinely amended by localities to respond to evolving land use patterns. Such amendments are undertaken within a predictable and transparent review process (including

environmental assessments of the proposed “land use action”), and are subject to judicial review. The adoption of Part 570 may trigger such amendments.

Based on the research conducted, it is believed that the adoption of Part 570 will not “open the floodgates” to new LNG facilities, especially in locations that are incompatible with existing land uses. First, the role of LNG within the overall energy production, storage and transport industry will continue to be limited to special applications and markets where the extra costs associated with the production, storage, and transport of LNG can be recovered by the “value added” aspects of its increased density. In other words, there are market driven limits to the commercialization of LNG that will, for example, yield much fewer LNG dispensing sites than gasoline stations. Subsequent sections of this report address the projected number of LNG facilities likely to be deployed in NYS during the first five years after the promulgation of Part 570.

As for compatibility with adjoining land uses, any proposed LNG facility will need to comply with existing land use controls, which also control all other fuel processing, storage and dispensing facilities. DEC’s permitting process, per Part 570, including the environmental review of each application, will confirm that the proposed location of an LNG facility complies with local land use controls. Some communities may, as an extra measure of “protection,” seek to amend their local zoning regulations to “zone out” LNG facilities, or to more rigorously restrict the location options available to proposed LNG facilities, compared to the land use restrictions placed on other similar uses. Such “exclusionary” zoning controls are subject to challenge in the courts and are not likely to prevail in jurisdictions that permit other (competing) fuel production, storage and dispensing facilities, but limit or exclude LNG facilities.

1B2. Controlling the Site Plan of LNG Storage Facilities

Instead of controlling where an LNG facility can be located, the NFPA and federal pipeline safety standards regulate the site plan of such facilities, especially with regard to the “buffer zone” between LNG storage tanks and property lines and/or nearby buildings. For example, site planning controls, including the regulations for the required distance between LNG storage tanks and property lines, can be found in Section 16.5.1 of NFPA 52, in Chapter 5 of NFPA 59A, and in Sections 193.2057 and 193.2059 of the federal pipeline safety standards. Similarly, Subchapters B and D of the LNG regulations of the Texas RRC contain site-planning controls as well as regulations related to the design and operation of equipment.

Section 16.5.1 of NFPA 52

Section 16.5.1 of NFPA 52 regulates the distance between LNG storage containers, between storage containers and buildings and between storage containers and a property lines, relative to the capacity of the storage container as measured in gallons. For example, LNG containers with capacities of up to **2,000 gallons** must be placed at least 5 feet apart, with a minimum of **15 feet** from any property line. For facilities with very small storage tanks, the minimum “buffer” zone between a tank and a property line is 10 feet.

Facilities with tanks up to **15,000 gallons** of capacity require a minimum of 5 feet between tanks, and a distance of at least **25 feet** to the property line. Storage tanks up to a capacity of **30,000 gallons** need to be placed at least **50 feet** from a property line, and tanks up to **70,000 gallons** in capacity need to be placed **75 feet** from a property line. Storage containers with capacities larger than 40 gallons are not permitted in buildings.

Thus, the smallest practical “lot area” for an LNG storage facility with straight property lines (a rectangular site, rather than a circular one), and assuming a 5 foot diameter vertical storage tank, is 35

feet by 35 feet. However, the addition of other equipment, such as dispensers, and the NFPA requirements for distancing certain safety equipment from the equipment they serve, will require larger sites. Also, most zoning ordinances include front, rear, and side yard controls, which do not permit (or strictly limit) the deployment of permanent structures / equipment in those yards.

A “typical” LNG fuel dispensing site, with a single 10,000-gallon storage tank, requiring 25 feet between the tank and any property line, and again assuming a vertical tank, will likely need a site that is significantly larger than 100 feet by 100 feet. This is to accommodate (1) the buffer zone between the storage tank and the property lines and any other equipment (or buildings) required for that fuel dispensing function; (2) distances required between safety equipment and the equipment they support; (3) required standards for the safe arrival and departure of vehicles; and (4) yard requirements inherent in the zoning ordinance.

Chapter 5 of NFPA 59A

Chapter 5 of NFPA 59A includes spill and leak control provisions, requiring one of three possible “impoundment” techniques for controlling spills, and preventing spills from reaching buildings, equipment, adjoining properties or waterways. Those impoundment methods can include natural barriers, dikes, walls, excavated “bowls,” or any combination of such techniques.

The volumetric capacity of those impoundment areas must be 100 to 110 percent of the capacity of the storage tanks being impounded, depending on the strength of the impoundment and its height. Chapter 5 specifies the construction standards for various impoundment designs; drainage standards to keep the impoundments free of water and to keep spilled LNG within the impoundment area until it vaporizes; and the distance of the impoundment perimeter from the edge of the tank(s) within the impoundment area.

Chapter 5 also regulates the “Radiant Heat Flux Limits to Property Lines” and to off-site “occupancies,” requiring that the applicant calculate the potential for fire damage to off-site areas in the event of a spill and fire. Mitigation measures, such as water curtains can be included in the site plan. The calculation of a “design spill rate and volume” of a potential LNG release is based on type of LNG container proposed for the site specific deployment and on the location of “container penetrations” (for valves, pipes, and the like), relative to the liquid level within the container.

The minimum distance from the edge of an impoundment area to a property line is **15 feet** for facilities with storage capacities of up to **2,000 gallons**, which is the same requirement as in NFPA 52. For facilities with capacities up to **18,000 gallons**, the required distance from the impoundment area to the property line is **25 feet**. (That standard allows 3,000 more gallons within that 25 feet buffer than the NFPA 52 standard.) For impoundment area capacities of up to **30,000 gallons**, the minimum distance to a property line is **50 feet**, which is consistent with NFPA 52. For capacities up to **70,000 gallons**, the minimum distance to property lines is **75 feet**, which is also consistent with NFPA 52. Facilities with more than 70,000 gallons of storage capacity are required to provide a distance to all property lines that is 0.7 times the diameter of the storage container, but not less than 100 feet.

Section 5.9 of Chapter 5 deals with “portable LNG facilities,” also known as “portable pipelines.” In addition to requiring that vehicles complying with USDOT standards be used as the “supply container,” and requiring trained staff at the site, this section also requires that “provisions shall be made to minimize the possibility of accidental discharge of LNG at containers.” The section allows the use of portable and temporary spill containment methods.

Sections 193.2057 and 193.2059 of federal pipeline safety standards (49 CFR Part 193)

As discussed above, the required thermal exclusion zone and the vapor dispersion zone is to be calculated per NFPA 59, and the modeling for thermal radiation and “vapor-gas dispersion distance” is to be done per the referenced Gas Technology Institute (GTI) standards.

1B3. Design and Operation of LNG Production, Storage and Dispensing Facilities

In addition to each jurisdiction’s zoning ordinance, specific controls relating to the buildings and the equipment that constitute the permitted land use are generally found in local, national, or international building codes that each jurisdiction has adopted. It is those building codes, enforced by local “code enforcement” officials, which contain (explicitly or by reference) standards related to fire safety, explosion prevention, and the general protection of life and property. The purview of local code enforcement officials may cover all applicable building and safety codes, or certain fire and explosion related matters might be delegated to the local fire department. NFPA codes supplement those more general building codes.

Draft Part 570 requires compliance by all proposed LNG facilities with NFPA 52 and NFPA 59A, as well as with 49 CFR Part 193 and 33 CFR Part 127 for certain larger LNG facilities. The design and operation of equipment, including for buildings, storage tanks, vaporization equipment, piping, valves, pumps and electric instruments, are covered in each of those referenced codes. Those design and operation controls are covered in Chapters 11, 12 and 16 in NFPA 52, and Chapters 6-11 and 13 of NFPA 59A, with each chapter’s main topics outlined below.

NFPA 52, Chapters 11, 12, and 16

Chapter 11 of NFPA 52 covers **LNG engine fuel systems** on ground-transport vehicles (with Chapter 17 covering marine vehicles). All safety aspects are addressed, as follows:

- Materials used in LNG equipment;
- The design of vehicular fuel containers;
- Controlling the filling of fuel containers;
- Structural integrity of containers;
- Standards for shut-off valves;
- Various other fuel container standards;
- Standards for pressure relief devices, pressure gauges and pressure regulators;
- Piping tubing and fittings standards;
- Valves; pumps and compressors;
- Vaporizers that convert LNG back to a gas;
- The integration and installation of LNG fuel tanks, piping and other equipment on a vehicle, with the vehicle’s engine and other vehicle components;
- On-vehicle pipes, tubing, fittings, valves, pressure regulators, gauges, electric wiring, labeling;
- On-vehicle fueling receptacle; and
- The testing of on-board LNG systems.

Chapter 12 of NFPA 52 covers **LNG fueling facilities**, where stored LNG is transferred to vehicles.

- General facility design standards, related to safety, security, and operating methods. Facilities that are to be unattended “shall be designed to secure all equipment from tampering,” including storage equipment and transfer equipment;

- Siting standards relative to such topics as overhead electric lines, other-than-LNG hazardous liquids, and the “points of transfer” where, for example, an LNG transfer point must be at least 25 feet from the nearest building not associated with the LNG facility;
- Spill containment;
- The construction of on-site buildings;
- Cargo transport unloading;
- Isolation valves associated with transfer piping;
- Methane detection systems;
- Depressurization of LNG hoses and loading arms for transfer piping and for the vehicle fuel dispensing systems;
- Vehicle fuel dispensing systems;
- Safety valves and relief valves;
- Corrosion control;
- Pumps, compressors and vaporizers;
- LNG-to-CNG (L/CNG) systems;
- Instrumentation and gauges;
- Emergency shutdown devices
- Electrical equipment; and
- Maintenance of equipment.

Chapter 16 of NFPA 52 covers stationary **LNG tanks** with a capacity of 70,000 gallons or less, covering the following topics at LNG fueling facilities. “Tanks” and “containers” are used interchangeably in Chapter 16. For example, the title of the chapter is “Installation Requirements for ASME Tanks for LNG,” but with section 16.1 using the phrase “LNG containers of 70,000 [gallons]”, section 16.3.1 using the phrase “inner and outer containers,” and section 16.3.3 using the phrase “inner tank and outer tank.”

- Securing containers against tampering;
- General standards for tank and container design, with reference to ASME standards, including the requirement that all containers be double walled;
- Standards for the vacuum insulation between the tanks;
- Pressure relief devices;
- Container seismic design standards;
- Container identification standards,
- Container foundation and support standards;
- The installation of containers;
- Automatic, failsafe product retention valves;
- Inspection, testing and purging of containers prior to start up;
- Piping within and to containers;
- Instrumentation, including in the event of power failure; and
- Gauges and pressure control devices.

Section 16.5.1 includes a table that codifies the minimum required distance between storage tanks and the minimum distance between any LNG storage tank and the facility’s property line. That topic was discussed above in Section 1B2.

NFPA 59A Chapters 6, 7, 8, 9, 10, 11 and 13

Chapter 6 of NFPA 59A covers **LNG process equipment** and includes the following topics:

- The installation of process equipment;

- Pumps and compressors;
- Flammable refrigerant and other flammable liquid storage; and
- General standards for the fabrication, pressure limits and other mechanical features of process equipment.

Chapter 7 of NFPA 59A covers **stationary LNG containers** including the following:

- Inspection prior to the operation of a facility;
- General standards related to pressure and cryogenic conditions, piping, gauges and foundations;
- Seismic design for field-erected and shop-fabricated containers;
- Wind, flood, and snow loads on containers;
- Foundations;
- Metal and concrete container standards;
- Construction, inspection and testing standards;
- Pressure relief devices; and
- Exposure to fire.

Chapter 8 of NFPA 59A covers **vaporization equipment and facilities**, which also covers topics related to “portable pipelines.”

- Classification of vaporizers and general design and materials standards;
- Piping and valves; and
- Relief devices.

Chapter 9 of NFPA 59A covers **piping systems and related components**.

- General piping standards;
- Seismic design;
- Materials and methods of construction assembly, including joints, fittings, bends and valves;
- Installation and welding;
- Pipe supports;
- Inspection, testing and record keeping;
- Corrosion control; and
- Operational standards.

Chapter 10 of NFPA 59A covers **instrumentation and electrical systems**.

- Gauges for LNG tanks and for refrigerant tanks, pressure and vacuum gauges;
- Temperature indicators;
- Emergency shutdown instruments;
- Electrical equipment, with reference to NFPA 70; and
- Electrical grounding and bonding.

Chapter 11 of NFPA 59A covers the **transfer of LNG and of refrigerants** used in the production of LNG.

- General standards;
- Piping systems, pumps and compressors;
- Marine shipping and receiving;
- Tank vehicle and tank car loading and unloading;
- Pipeline shipping and receiving;
- Hoses and transfer “arms;” and

- Communication equipment and lighting.

Chapter 13 of NFPA 59A covers **stationary LNG containers**. As mentioned above, the terms “tank” and “container” are used interchangeably.

- General standards;
- Container standards;
- Foundations and supports;
- Installation standards, including minimum standards for the distance between a container and a property line, as codified in Chapter 5;
- Spill containment;
- Inspection and testing of containers;
- Piping integral to containers;
- Instrumentation and gauges;
- Operation requirements and procedures manual;
- Emergency procedures;
- Maintenance and records; and
- Training of personnel.

The federal regulations for the design and operation of LNG equipment can be found in Subparts E and F of 49 CFR Part 193, and in Section 127.101 of 33 CFR Part 127. Those standards reference NFPA 59A, which has been covered above in this report. In the Texas RRC rules, design and operation controls, beyond those in Subchapters B and D, can be found in Subchapters E, F and G. The Texas RRC rules will not be analyzed in this report because TX represents a “special case” of a state adopting its own LNG regulations rather than referencing NFPA standards. CA enforces NFPA 52 and 59A and adds Cal/OSHA Titles 8 and 13, which deal with the safety of workers. Cal/OSHA means the California Occupational Safety and Health Administration.

1B4. Transportation of LNG in Bulk

The transport of Non-Radioactive Hazardous Materials (NRHM) is regulated by Federal Regulations, CFR 49 Part 397, which can be accessed at the following web site: <http://ecfr.gpoaccess.gov/>. The following is the definition of Hazardous Materials per section 397.65:

"A substance or material, including a hazardous substance, which has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, or property when transported in commerce, and which has been so designated. "

The term NRHM is defined in 397.65 as follows:

"A non-radioactive hazardous material transported by motor vehicle in types and quantities which require placarding, pursuant to Table 1 or 2 of 49 CFR 172.504. "

The term "Hazardous Materials" includes all of the following: (1) Hazardous Substances, (2) Hazardous Wastes, (3) Marine Pollutants, (4) Elevated Temperature Material, (5) Materials identified in 172.101, and (6) Materials meeting the definitions contained in Part 173. Class 1 covers explosives, Class 2 covers gases (including flammable, non-flammable and toxic), and Class 3 covers flammable liquids. LNG, like all other liquid fuels, fits Class 3, and is covered by the federal codes.

Section 397.3 allows for local jurisdictions to impose stricter rules, but requires that federal standards apply when the federal standards are stricter than local standards. The states establish, maintain and enforce specific NRHM routing designations, but which must comply with federal standards related to the following:

Information on TSA's "HAZMAT Endorsement Threat Assessment Program" can be found at http://www.tsa.gov/what_we_do/layers/hazmat/index.shtm. "The program was implemented to meet the requirements of the USA PATRIOT Act, which prohibits states from issuing a license to transport hazardous materials in commerce unless a determination has been made that the driver does not pose a security risk. The Act further requires that the risk assessment include checks of criminal history records, legal status, and relevant international databases." Other features of the program can be found at the web site cited above.

1B7. Emergency Response Procedures

Emergency response and shutdown procedures are regulated in section 12.11.3 of NFPA 52, which requires an ESD, which will, "in the event of a power or instrumentation failure" cause the system to "go into a fail-safe condition that can be maintained until the operators can take appropriate action to either reactivate or secure the system." Additionally, emergency response procedures are covered in the following sections of NFPA 59A: 10.6, 11.5.4, 12.2.2, 12.3, 13.18.3, 14.4.8 and 14.5.9, each of which is summarized as follows:

- **Section 10.6** replicates the standards of NFPA 52, section 12.11.3, which is quoted above;
- **Section 11.5.4** requires manual ESD systems at marine terminals;
- **Section 12.2.2** outlines a comprehensive set of fire protection standards, including ESD systems, and with a reference to NFPA 600, "Standard on Industrial Fire Brigades;"
- **Section 12.3** outlines standards for automatic ESD systems as well as requiring "manual actuators" to be located at least 50' from the equipment they serve;
- **Section 13.18.3** requires a set of emergency procedures, including the prompt notification of an emergency to local officials;
- **Section 14.4.8** outlines the emergency procedures required as part of the overall operation, maintenance and personnel-training program; and
- **Section 14.5.9** deals with emergency power systems, including their monthly testing.

The federal pipeline safety regulations address emergency response in 49 CFR section 193.2509 and in 33 CFR section 127.205. (The Texas RRC regulations deal with this topic in sections 14.2046, 14.2049 and 14.2510, which are not reviewed here in detail.) The following summarizes the emergency procedure topic covered by 49 CFR and 33 CFR.

49 CFR Section 193.2509

- Identification of potential types and places of future emergencies;
- Establish written manuals for emergency procedures;
- Establish protocols for controllable emergencies;
- Establish protocols for uncontrollable emergencies;
- Coordinating with local officials;
- Cooperating with local officials regarding evacuations; and
- Informing local officials as to the location and types of fire control equipment, potential hazards at the plant, communication and control capabilities, and the status of each emergency.

33 CFR Section 127.205

- Each transfer system must have a manually operated Emergency Shutdown System; and
- The system must operate automatically when LNG concentrations exceed "40% of the lower flammable limit."

In NYS, outside of NYC and to some extent outside of Nassau and Suffolk Counties, the training of firefighters and emergency responders is the responsibility of NYS OFPC, which was recently combined with several other State agencies to form the Division of Homeland Security and Emergency Services. The NYC Fire Department has its own training system, which is fully independent of OFPC. With regard to Nassau and Suffolk Counties, OFPC provides specialized training that supplements each county's local training system.

OFPC provides training courses to first responders in NYS. The courses cover all types of containers at all scales, for all types of flammable, explosive and hazardous liquids and gases. The Flammable Gas workshops, covering propane and natural gas, familiarize students with transport vehicles, and distribution systems. Students at the fire academy are also taught (and practice) proper procedures for dealing with leaks of flammable fluids and fires caused by such fluids. The Flammable Liquids course covers procedures at bulk fuel storage facilities. Spill control and firefighting is covered in the Operations and Technician courses. Cryogenic fluids are also covered, with an emphasis on containers and the hazards associated with super cold fluids. Issues related to rail transport are covered in many of the OFPC courses. The agency is currently developing a Rail Tank Car Specialist course consistent with NFPA 472, Chapter 12.

Firefighters are encouraged to work with local industry specialists to prepare appropriate emergency response plans. The training includes identifying hazardous products, evaluating potential emergencies, and developing tactics to deal with those emergencies that are consistent with safe work practices. In the past, when a local fire department requested help for the planning of a specific facility, OFPC conducted a site visit and worked with the local entities to create the emergency response plan.

NYS's career firefighters must complete 229 hours of basic training, including 16 hours of Hazardous Materials training. After basic training, career firefighters are required to complete 100 hours of "in service" training annually. Details of the minimum training requirements are available at: <http://www.dos.state.ny.us/fire/pdfs/standards/Part426LawBook.pdf>.

Some career departments add training to the "Hazmat Technician" level to the basic program. Others offer it only to individuals who will be assigned hazardous material response duties. Advanced training is usually taken voluntarily, but some departments require it for promotion or assignment to specific duties. Both career and volunteer fire departments must comply with OSHA 1910.120 paragraph q, which requires training to the Operations level, complete refresher training, and annual competency demonstration. OSHA means the federal Occupational Safety and Health Administration.

An entity that has deployed several LNG facilities in TX has informed XE that for "large-scale" LNG projects, applicants for permits have been known to fund the training of first responders. Section 570.3 (c) of the draft Part 570 regulations requires that "each applicant for a permit shall offer an emergency response training program for local enforcement, fire, and hazardous material response personnel of the authority having jurisdiction."

1B8. Inspection of LNG Facilities and Enforcement of Applicable Rules and Regulations

NFPA 52 covers inspection of LNG facilities and the enforcement of applicable rules and regulations in sections 9.9.1.4, 16.7 and 16.8.

Section 9.9.1.4 covers **pipng systems**.

- ASME and other standards are referenced; and
- Standards for manifolds, joints, threading, bends, and fittings are stated.

It should be noted that the Building Code of New York State, which contains fire prevention standards, does not contain LNG-specific standards. However, the quote above suggests that all LNG facilities, by their special nature, would undergo “Special Inspection” by third party inspection entities.

According to senior staff at Chart Industries, most U.S. jurisdictions with LNG facilities inspect those sites on an annual basis. Those inspections mostly focus on pressure vessels. The codes in place during the time that the facility was deployed are generally used as the standard for the inspection, rather than newer version of the applicable codes.

Section 570.3(a) of the draft Part 570 allows for the unannounced inspection of any LNG facility for permit compliance, at any time, and as often as deemed appropriate by DEC or its designated representative.

1C. Regulatory Relief

The Texas RRC LNG regulations offer exceptions related to LNG safety rules in Section 14.2052. Subsection (h) states the following:

“After [a public] hearing, the Commission may grant exceptions to this chapter if the Commission finds that granting the exception will not adversely affect the safety of the public.”

XE is not aware of any other national or local codes that offer regulatory relief to LNG facilities. As such, no jurisdiction makes a distinction between LNG facilities operated by small businesses, government agencies, or “minor facilities” that might store less than a specified threshold quantity of LNG.

1D. LNG-Related Incidents /Accidents

The LNG industry has an excellent safety record, due to several factors. First, all LNG containers, large and small, stationary or transportable, are required by technical standards related to the vessel’s ability to resist heat gain and by NFPA standards to be double walled. The space between the inner and outer container is insulated to keep the LNG in its liquid state. That universal double-wall design is substantially stronger and more resistant to spills than the standard single-walled design used for all other fuels such as propane, diesel and gasoline. Secondly, the LNG industry, and the codes that regulate it, have continued to evolve technical solutions and protocols for the safe production, storage, transport, and dispensing of LNG. Also, the risks associated with LNG (as distinct from the risks associated with other flammable and explosive fuels and various toxic fluids) are well understood and have been incorporated into the applicable codes that regulate LNG facilities.

There have been many studies undertaken to assess the potential hazards of LNG, some by entities opposed to the deployment of LNG facilities, some by the LNG industry, and others by more “neutral” entities at the behest of public agencies, regulatory authorities, and policy makers, seeking to understand the risks posed by LNG facilities. Sandia National Laboratories prepared two such reports, one in 2004 and a second one in 2008, titled “Breach and Safety Analysis of Spills Over Water from Large Liquefied Natural Gas Carriers,” which can be found at the following site:

http://fossil.energy.gov/programs/oilgas/storage/lng/SANDIA_2008_Report_-_Large_LNG_Vessel_Sa.pdf.

The earlier study looked at LNG tankers that transport from 125,000 to 145,000 cubic meters of LNG in multiple (separated) cargo tanks on a single ship. The 2008 report looked at LNG tankers that can carry

up to 265,000 cubic meters of LNG, also in multiple compartments. The following is one of the noteworthy conclusions of the 2008 Sandia study, which focused on ships carrying up to 265,000 cubic meters of LNG:

“Even with the increase in thermal hazard distances from pool fires for the larger ships, the most significant impacts to public safety and property are still within approximately 500 m of a spill, with lower public health and safety impacts at distances beyond approximately 1600 m.”

A concise (but not comprehensive) history of LNG can be found at the following web site:

<http://www.centreforenergy.com/AboutEnergy/ONG/LiquifiedNaturalGas/History.asp>

A web-based search of LNG incidents and/or accidents yields several sites that compile such information. A fairly comprehensive and neutral compilation of such incidents can be found on the web site of the California Energy Commission (CEC) at <http://www.energy.ca.gov/lng/safety.html>

A review of those incidents indicates that most were related to the operations of export/import terminals and the ships serving those facilities rather than to smaller, more widely deployed LNG facilities. For example, none of the approximately 40 LNG facilities servicing LNG fleets in CA have experienced any explosions, fires, spills or leaks. Also largely absent from the compilation by the CA Energy Commission are incidents related to the transport and transfer of LNG (from transport truck to stationary storage tank). Admittedly, the “volume” of LNG transport, as measured in total gallons or vehicle miles, is very low when compared to the transport of other hydrocarbon fuels, such as gasoline, diesel and propane. Still, the lack of transport-related LNG incidents indicates that the applicable NFPA standards are working and that double-walled tanks are inherently safer than the single-walled tanks that are used to carry other fuels.

The CA compilation is organized under two categories: 1) **Explosions and Fires**; and 2) **Spills and Leaks**. Rather than reproduce here that compilation’s nineteen events with the narrative that describes each event, the following is the date and place/name of the eleven “Explosions/Fires” and the 8 “Spills/Leaks” that have occurred worldwide since 1944, which are described more fully on the above-referenced CEC web site. Note that LNG spills and leaks can happen without causing an explosion or fire, and that explosions and fires can occur at LNG facilities even in the absence of LNG, as they can at any natural gas facility; fuel production, storage and transfer facility; and industrial site or large-scale construction site.

1D1. Explosions and Fires

- October 1944, Cleveland, Ohio: failure of a low-nickel (3.5%) storage tank at a peak-shaving plant
- 1964 and 1965 Methane Progress, Arzew, Algeria: on-board an LNG ship, via lightning strike
- 1969, Portland, Oregon: during the construction of an LNG tank, not yet containing LNG
- January 1972, Montreal East, Quebec, Canada: valve failure at a peak-shaving plant
- February 1973, Staten Island, New York: explosion in empty tank during tank repairs
- October 1979, Cove Point, Maryland: due to natural gas leak
- April 1983, Bontang, Indonesia: at base-load plant due to excess pressurization of heat exchanger
- August 1987, Nevada Test Site, Mercury, Nevada: by accidental ignition during vapor cloud testing
- June 2004, Trinidad, Tobago: due to gas turbine failure
- July 2004, Ghislenghien, Belgium: due to gas pipeline failure, likely caused by contractor
- March 2005, District Heights, Maryland: explosion in house due to difference in chemical composition of NG derived from imported LNG, compared to domestic NG.

The 1973 Staten Island explosion in NYS occurred in tank empty of LNG that was undergoing maintenance. The tank was warmed, purged of the remaining combustible gases with inert nitrogen, and then filled with fresh recirculation air. A construction crew entered the tank to begin repair work in April of 1972. In February 1973, an unknown cause ignited the tank's Mylar liner and polyurethane foam insulation. The rapid rise in temperature caused a rise in pressure, lifting the tank's concrete dome, which then collapsed killing 37 construction workers inside. NYC Fire Department investigation concluded that the accident was a construction accident, not an LNG accident.

1D2. Spills and Leaks

- Early 1965, Methane Princess Spill: during ship-to-shore transfer
- May 1965, Jules Verne Spill, Arzew, Algeria: due to overflow from cargo tank
- 1971, La Spezia, Italy: due to vapor cloud escape
- July 1974, Massachusetts Barge Spill: 40 gallons leaked during a transfer operation
- September 1977, Aquarius Spill: overflow from tank, likely because of gauge failure
- March 1978, Das Island, United Arab Emirates: due to pipe connection failure
- April 1979, Mostafa Ben Bouliad Spill, Cove Point, Maryland: valve failure during transfer resulted in a minor spill
- April 1979, Pollenger Spill, Everett, Massachusetts: due to a valve fracture

Missing from the above CEC list was a 2004 incident at the Skikda, Algeria LNG Export Facility. A description of that incident can be found at <http://www.ch-iv.com/links/history.html>, where several other incidents (on the CEC list) are also described. (The date of the Cleveland incident on the CH-IV web page is shown as 1994, but should be 1944.)

Also missing from the CEC list are several incidents found on a PDF produced by CEC that is available at the following web page:
http://www.slc.ca.gov/division_pages/DEPM/DEPM_Programs_and_Reports/BHP_Deep_Water_Port/RevisedDraftEIR/1aCabTransport/Appendices/C3_Public%20Safety.pdf

It should be noted that the NFPA rules and regulations are regularly updated by expert panels, in response to new technologies, new deployment and operating models, and especially in response to adverse incidents, including those listed above. For example, the 1944 Cleveland incident substantially advanced the industry's (and the regulators') understanding of the need for 9% nickel steel (and other such standards) to combat brittleness in cryogenic storage tanks. Each of the incidents listed above likely generated the next round of code improvements.

For example, the Clean Vehicle Education Foundation (CVEF), which is a member of the NFPA Technical Committee on Vehicular Alternative Fuel Systems, investigates all LNG related incidents and provides information to all of the NFPA 52 committees. A new NFPA 52 is normally issued on a 3 to 4 year cycle, reflecting input by the various committees including from CVEF. However, if a change to NFPA 52 is needed prior to the normal cycle, a Tentative Interim Amendment (TIA) can be issued to address a specific issue. A similar process exists for updating NFPA 59A.

As mentioned above, LNG trailers are double-walled steel containers, which, unlike single-walled vessels used to store or transport other fuels, tend to better withstand collisions and other adverse effects. Over the last 20 years or so, there have been several LNG trailer accidents (collisions), none of which has resulted in loss of life or major property damage. Chart Industries recalls an incident some year ago where an LNG trailer in the U.S. developed a leak in its on-board "plumbing" (valves and pipes), which

caused a fire when a temporary solution to stop the leak was attempted. The fire burnt out safely with no loss of life and no property damage beyond the trailer.

Some entities that have lobbied against the deployment of LNG facilities have suggested that a catastrophic release of LNG will create a “boiling liquid expanding vapor explosion,” or BLEVE. In independent laboratory tests and in open-ocean combustion tests, there have been no documented cases of LNG BLEVEs.

Any catastrophic failure of an LNG containment vessel can result in a “rapid phase transition” (RPT) or the rapid conversion from liquid to vapor, but which will not cause ignition. Instead the RPT will further damage the containment vessel. Any ignition that might occur would need to be initiated by a heat source. Opponents of LNG suggest that LNG tankers (ships and trailers) are potentially explosive “bombs.” The history of LNG transport includes events that have resulted in the loss of containment (spillage) as well as fires, but not the explosion of a containment vessel.

After 9/11/2001, local and state public safety officials commissioned studies to evaluate the fire and explosion risks associated with a potential terrorist attack on LNG ships destined for the Distrigas import terminal at Everett, Massachusetts (near Boston). Those studies concluded that a 5-meter hole in a ship would spill 25,000 cubic meters of LNG, which if ignited, would burn off in 37 minutes, with no explosion.

Regulations

New York's Proposed New Liquefied Natural Gas Facility
(6 NYCRR Part 570)

A Dialogue

Presented by: The Environmental Law Section

New York State Bar Association

Annual Meeting, New York, N.Y.

January 31, 2014

New York Proposes To Green Light LNG Fueling Stations

By [Steven C. Russo](#) on September 18th, 2013 Posted in [Energy, Oil & Gas](#)
<http://www.environmentalenergylawblog.com/2013/09/articles/energy/new-york-proposes-to-green-light-lng-fueling-stations/>

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New York State has not exactly been a haven for the natural gas industry these past few years, serving as the epicenter of the anti-fracking movement. It is also one of the few states that does not permit Liquefied Natural Gas (LNG) fueling stations, due to the application of an out-of-date 1970s statute. That may soon change, however, as the New York State Department of Environmental Conservation (DEC) recently issued proposed regulations that would finally authorize the siting and construction of LNG fueling stations. See [6 NYCRR Part 570 \(proposed\)](#). The proposed regulations tout the environmental benefits of LNG as an alternative to diesel as fuel in heavy-duty trucks. DEC is also responding to new interest expressed by the long-haul trucking industry in employing LNG engines as an alternative to diesel engines. While LNG engines are expected to cost more than diesel engines, the existing price differential between LNG and diesel can save as much as \$30,000 per year in fuel based on the number of miles driven by the typical 18-wheeler. This price differential would more than pay for the increased cost of LNG engines.

As brief background, New York has the most stringent LNG-related requirements in the nation. In response to an explosion at an liquefied natural gas (LNG) facility in Staten Island in 1973, the State enacted into law [ECL §§ 23-1701 et seq.](#), which strictly regulates the siting of LNG storage facilities, the intrastate transportation of LNG, and treats the transportation of LNG differently than other hazardous and/or volatile substances. The siting and storage of LNG and intrastate LNG transportation routes have been prohibited in NYC since 1999. See L. 1999, ch. 25. These prohibited activities have been extended every two years since 1999. The siting of storage facilities in other areas of the state is prohibited until DEC issues regulations. ECL § 23-1719(1). Moreover, the ground transportation of LNG must be along "intrastate routes" certified to meet certain safety criteria by the NYS Department of Transportation, including that all local fire departments along such routes are properly trained to address LNG-based discharges. See ECL §§ 23-1713(3); 23-1715; 23-1717. To date, given the stringency of these requirements, DEC has never issued regulations under this statute.

The proposed regulations would specifically prohibit the "intrastate transportation" of LNG until the establishment of approved routes. 6 NYCRR § 570.4(1). "Interstate transportation" of LNG, by contrast, would be authorized so long as it was conducted "in accordance with all applicable State and federal

requirements for the transport of hazardous materials, including the requirements as set forth by the state departments of transportation and motor vehicles." *Id.* § 570.4(b). In this context, the proposed regulations define the term "interstate transportation" to mean "the transportation of LNG between a point in New York State and a point in another state or a foreign country . . ." *Id.* § 570.1(c)(6). In other words, so long as the transportation of LNG is initiated outside of New York, it essentially would not be regulated by New York. This appears to be DEC's way of avoiding having to promulgate "intrastate transportation" requirements contained in the law and points to the focus of the proposed regulations to "interstate" facilities such as LNG fueling stations.

The proposed regulations otherwise specify the criteria that must be included in an application for siting and constructing an LNG storage facility. In this respect, the application must include, among other things, an explanation of (i) the need for the proposed facility; (ii) specification of the tank design capacity for each tank and the facility capacity; (iii) the expected sources of natural gas or liquefied natural gas for the facility; (iv) a description of the possible environmental impacts of the proposed facility and the facility features or procedures to mitigate those impacts; and (v) a report, prepared by an independent qualified person, that evaluates the capability and preparedness, or lack thereof, of fire departments in the vicinity of the proposed facility who would respond to a release of LNG or fire involving LNG; and (vi) a written listing of the NFPA requirements that would apply to the LNG facility. *See* 6 NYCRR § 570.2(b). At first glance, the regulatory criteria appear to closely follow the statutory criteria specified at ECL § 23-1709(2), (3) and do not appear difficult to meet.

It remains to be seen if the definition of "intrastate transportation" employed by DEC in the proposed regulation would be challenged by environmental groups given the link some have made between horizontal hydraulic fracturing for the purpose of extracting natural gas and all other matters that promote the use of natural gas. Indeed, in the past legislative session, the New York State Assembly refused to introduce a bill passed by the New York State Senate that would have exempted LNG filling stations from the requirements of ECL §§ 23-1701 *et seq.*, strongly suggesting that all measures related to natural gas in New York will remain controversial.

[DEC's website announces](#) that a public hearing will be held with respect to the proposed regulations on October 30, 2013 at DEC's Albany office, and written comments will be accepted until November 4, 2013.

<http://www.environmentalandenergylawblog.com/2013/09/articles/energy/new-york-proposes-to-green-light-lng-fueling-stations/>