National Perspective on Key Challenges in the LNG Industry

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BGE

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Presentation Outline

- Presentation Focus: National Perspectives of Key LNG Challenges
- BGE Overview
- LNG Background and Industry Activities
- Previously Identified R&D Projects
- The Challenges
- Summary

BGE Overview

- BGE
- Founded in 1816, Baltimore Gas and Electric Company (BGE) is the nation's oldest gas utility. BGE, a subsidiary of Exelon Corporation and is Maryland's largest gas and electric utility.
- BGE celebrated our 200th year anniversary in 2016 as the first gas utility in the U.S. It began in 1816 when Rembrandt Peale lit the first gas lamp in Baltimore, and it continues over two centuries later.
- Quick Facts
  - Service Area: electric, 3,057 square miles; gas, 810 square miles
  - Customers: 678,000 + natural gas; 1.25 million + electric
  - Employees: approx. 3,200
  - Natural Gas Pipeline Network: More than 7,100 miles
  - Owns/operates (1) LNG Peak Shaving Facility
  - Owns/operates (1) LPG-Air Peak Shaving Facility

LNG Background and Industry Activities

- The US LNG industry surged in 1965 when a series of plants were built in the U.S. The building boom continued through the 1970s. These plants were not only used for peak shaving, but also for base-load supplies for places that never had natural gas previously.
- During the 1970's a number of import facilities were built in anticipation of the need to import energy.
- Peak Shavers (without liquefaction) were being supplemented by the build-up of base load import terminals, but now several of these peak shaving facilities are or have already installed liquefaction facilities
- The shale gas boom in U.S. enabled by hydraulic fracturing has many of the import facilities seeking to install large scale liquefaction trains and converting to export facilities. The first U.S. LNG export was completed in early 2016. Several other greenfield export terminals are also be pursued with some being constructed
- LNG is also being leveraged to support gas transmission and distribution activities to offset gas outages during planned maintenance, inspections, and MAOP testing where necessary
- The use and development of LNG facilities to supply LNG as an alternate transportation fuel has risen dramatically speared by environmental efforts to reduce greenhouse gas emissions as well as economic advantages in some cases

LNG Background and Industry Activities

- US LNG Plant Statistics - 2018 Annual Reporting Data:
  - 157 Total LNG facilities
  - 131 Intrastate facilities / 26 Interstate facilities, 35 new facilities since 2010 driven largely by new base load and mobile/temporary facilities
  - 41% peak shaving, 14% satellite, 18.5% base load (import/export terminals, etc..), 24% mobile/temporary, 2.5% other (vehicle fuel production, etc.)
  - 90 Different owner/operators, 10 new operators since 2010
  - Avg. In-service Age - 1980
  - Oldest Plants (3) – 1965
  - Newest Plants (7) – 2018 (1 peaking, 3 baseload (1 export, 2 import), 2 mobile/temp, 1 other (fueling)

R&D LNG Projects Selected Previously

- Resulting from discussions during the 2016 and 2018 R&D Forums, the following LNG facility related project were selected:
  - Perform Gap Comparison of Process Safety Management Consensus Standards and Regulatory Requirements
  - Review of Control System Testing Frequency
  - Development of a Risk Based Approach and Criteria for Hazard Detection Layout
  - Efficacy Review and Treatment of Hazard Mitigation Measures
- PHMSA has also sponsored a number of other studies/research outside the R&D Forum
- What are the challenges and what still remains to be addressed/researched?

General Challenges

- Streamlining the regulatory process as the industry is experiencing unprecedented activity at both traditional and non-traditional facility types
  - Peak Shaving Facilities (with and without storage) performing upgrades and replacement projects
  - Marine terminals – Large scale export, siting, design, construction, operations and maintenance
  - Transportation fuel facilities, siting design, construction, operations, and maintenance
- Managing older facilities and newer facilities both present challenges in designing/engineering, and managing maintenance at these new facilities utilizing outdated codes/standards
- Analysis Paralysis
  - Consensus standards incorporated by the Federal Regulation Part 193 are being updated at a pace faster than PHMSA can evaluate their merits
  - Mandated use of out of date code editions
- Influence perceptions that LNG facilities place the public at risk. These perceptions have delayed authorizations to proceed with a project
- Performing facility upgrades without jeopardizing grandfathering

Opportunities to Address the Challenges

- There is not a one size fits all fix to these challenges, options to compliance are necessary to allow flexibility in the codes and standards (prescriptive vs. performance/risk based)
  - **An example of flexibility can be found in the NFPA 59A 2019 at 18.10.7 which states:**

18.10.10.7 All other relief valves protecting hazardous fluid components shall be randomly inspected and set-point tested at the intervals specified in 18.10.10.7.1 and 18.10.10.7.2.

N **18.10.10.7.1** Inspection intervals shall be in accordance with either of the following:

(1) In-service inspected annually of the external portions of the valve and its installation in accordance with Section 2 of ANSI/NB-23, *National Board Inspection Code, Part 2, Inspection*, on in-service inspection requirements for pressure relief devices, including listed conditions that can be observed on the valves externally

(2) In accordance with API 510, *Pressure Vessel Inspection Code: In-service Inspection, Rating, Repair, and Alteration*

N **18.10.10.7.2** Set-point testing intervals shall be in accordance with either of the following:

(1) At intervals not exceeding five years, plus three months

(2) At a frequency in accordance with API RP 576, *Inspection of Pressure-Relieving Devices*

Opportunities to Address the Challenges

- Revise Codes and Standards to address any industry events as appropriate to reduce risk of reoccurrence
- Establish, enhance guidelines for inspections of various types of LNG Storage Tanks
- Evaluate LNG storage tank resistance to external loads
- Review of regulations to allow for steel full containment LNG storage tanks by PHMSA (included in NFPA 59A (2019))
- Evaluate and establish design/configuration/performance criteria for concrete outer tank liners
- Review/validate failure rate determinations/data for various tank configurations

Opportunities to Address Challenges

- Promote R&D projects during this and future forums
- Participating as a Technical Advisory Committee member if asked by an awarded R&D project contractor
- Participate in the consensus standards development process (API, ASME, NFPA, etc.)
- Participate in industry organizations (AGA, INGAA, etc.)
- Participate in the regulatory process
  - Provide comments to proposed regulations when posted in the Federal Register
  - Contribute to the preparation of and support for petitions to promote a change in the regulations when deemed appropriate

Summary

- The LNG industry has an outstanding safety record
- While that record is outstanding, it is not perfect
- We must take opportunities like this R&D Forum to enhance the design, operation, maintenance and safety of our LNG facilities

I hope our panel discussions assist you during the sessions to generate discussions that lead to identification of possible projects that will enhance the safety of all our specific sectors.

- THANK YOU!