

# National Perspective on Key Challenges in the LNG Industry



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BGE



# Presentation Outline

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

# BGE Overview

- BGE an Exelon Company
- 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 200<sup>th</sup> 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: 696,000 + natural gas; 1.3 million + electric
  - Employees: approx. 3,200
  - Natural Gas Pipeline Network: More than 7,650 miles (152 transmission, distribution mains)
  - 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, several 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 processes.
- In 2003, following a National Petroleum Council Report, several additional import terminals were constructed in anticipation of a supply shortfall to meet demand in the US, the FERC Gas Quality Interim Guidelines were developed to address end-use interchangeability and compositional impacts of some imports including impacts on domestic feedstock for LNG liquefiers.
- 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. (lower 48 states) LNG export was completed in early 2016. Since 2016 several others marine exports facilities have been constructed and gone into operation.
- 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 spurred by environmental efforts to reduce greenhouse gas emissions as well as economic advantages in some cases

# LNG Background and Industry Activities

- 168 Total LNG facilities
  - 72 Peak Shaver Facilities (52 with liquefiers)
  - 25 Satellite Facilities (1 with liquefier)
  - 28 Base Load
  - 40 Mobile or temporary
  - 8 Other
- Of the 94 Peak Shaver and Satellite Facilities:
  - 72 (77%) 1960's – 1970's vintage
  - 44 (47%) facilities in Northeast
    - Of the 48 Peak Shaver and Satellite in the Northeast, 40 (83%) 1965 – 1975 vintage
    - Of the 48 Peak Shaving and Satellite in Northeast, 12 (25%) have liquefiers
- Avg. Peak Shaving Plant In-service Age – (1982)
- Oldest Peak Shaving Plants (3 – 1965)
- Newest Plants (4) in 2021 - (1 peaking, 1 satellite, 2 baseload (1 export, 1 storage w/liquefaction))

# PHMSA LNG Related R&D Project Pursued Previously

- The following PHMSA sponsored LNG related projects were conducted as a result of the last few PHMSA R&D Forums
  - Cascading Effects of Vapor Cloud Explosions (VCE's)
  - Process Safety Management at LNG Facilities
  - Hazard Detection Layout
  - Hazard Mitigation Measures
  - VCE at Nil Wind Conditions
- While the above projects provided valuable information on the specific topic, some of project final reports indicted that more research might be pursued. We might consider circling back to these projects and see if there is an opportunity to gain additional important details on any the specific projects.

# General Challenges Faced by LNG Facilities

- Natural Gas pipeline constraints, lack of new pipeline construction particularly in the northeast place even greater reliance on our LNG facilities
- Streamlining the regulatory process is necessary 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, including variation in feedstock composition and managing maintenance at these new facilities utilizing outdated codes/standards
- Performing facility upgrades without jeopardizing grandfathering
- The pace at which technology (particularly control systems) updates is much quicker than facility owners can plan for upgrades
- Retaining a skilled and experienced personnel remains challenging as personnel look to move/rotate into new positions every 3-5 years. The perception that the fossil fuels industry is phasing out rapidly has driven some personnel to go to renewable energy sector and hampered recruitment efforts

# Specific and Emerging Challenges Facing LNG Facilities

- As the US and many countries around the world establish goals and plans to reduce our carbon footprint, we must recognize that there are many technical challenges ahead to achieve those goals.
- While there are several organizations, agencies performing various research projects on hydrogen, there is still much research needed to fully understand and address how hydrogen in the feedstock will very likely impact these facilities
- One such plan that has gained considerable traction is hydrogen enrichment of existing natural gas system infrastructure.
  - This plan has the potential to achieve a reduced carbon footprint but also brings with it a very real challenge for existing LNG liquefaction facilities to address
  - While there are a number of efforts by various agencies, industry organizations, and engineering firms to understand the potential impacts there remains an extensive list of research needed to fully understand the impact and begin planning to address the H<sub>2</sub> product in these facilities.
    - An example of one such project is being led by NYSEARCH under project T-790 titled “Impacts of Hydrogen Enriched Natural Gas (HENG) on Feedstock for LNG Liquefaction”



# Potential Impacts of H2 at LNG Facilities

- Potential impacts to be validated through further research to determine range of acceptability of hydrogen in the facility feedstock that doesn't result in the following:
  - Reduced liquefaction rates
    - Longer liquefaction seasons
    - Increased operating costs
  - Increased power requirements
    - Power supply system upgrades to support increased power demand if supply system (electric system grid) can support the additional load
    - Increased operating costs
  - Reduced compression efficiency in gas streams where H2 is present
    - Compression equipment replacement / add redundant compression (liquefaction and BOG processes)
  - Effects on facility materials
    - Lower operating temperatures
    - Hydrogen stress corrosion cracking (embrittlement)
    - Permeability of existing gaskets, seals, packing to minimize leakage
  - Safety systems
    - Gas / fire detection
    - Extinguishment
    - Area electrical classifications

# Potential Impacts of H2 at LNG Facilities

(continued)

- LNG product pump performance may be affected and impact the vaporization process
- Product density changes (increases) may place additional load on existing structures (storage systems)
- How to manage the H2 product after it is at the facility (pretreatment, post liquefaction removal, storage/transporting, move product away via dedicated H2 pipeline, use product as a fuel within the facility in heaters, turbine/engine driven compression units of electric generation)
- Effects on facility effluent streams and impacts to gas tariff and gas quality impacts (heavies and flash gas from liquefaction, boiloff from storage)

# 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 and/or final regulations when published 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, there is always room for improvement
- 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 discussion assists 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!