# PHMSA Research, Technical and Policy Perspectives

**Working Group #5**

***Liquefied Natural Gas***

Sentho White

**Pipeline Research and Development Forum**

**September 11-12, 2018**



# LNG

- Program Objective: Research will examine standards and develop technology for the reduction of risk at every type of LNG facility during operations, maintenance, and transfers, purging, startup, and shutdown activities.
- PHMSA's Research Portfolio:
  - 6 Awarded Projects since 2002
  - $2.1M PHMSA + $220K Resource Sharing
  - Prior results support rulemaking and NFPA 59A. Emerging program area so no tech transfer to report yet.

Large Export Plant

Courtesy Southern LNG


Courtesy Russo on Energy

Small Peak Shaving

# PHMSA Funded LNG Research

| | Project ID and Title | Status | Contractor | PHMSA | Resource Share |
|---|---|---|---|---|---|
| 1. | DTRS56-04-T-0005, Modeling and Assessing a Spectrum of Accidental Fires and Risks in a LNG Facility | Closed | Technology & Management Systems, Inc. | $213,030 | $220,539 |
| 2. | DTPH5615T00005L, Comparison of Exclusion Zone Calculations and Vapor Dispersion Modeling Tools | Closed | CH-IV International | $217,810 | N/A |
| 3. | DTPH5615T00008L, Statistical Review and Gap Analysis of LNG Failure Rate Table | Closed | Gas Technology Institute | $418,058 | N/A |
| 4. | Consistency Review of Methodologies for Quantitative Risk Assessments for LNG Facilities | Newly Awarded | Gas Technology Institute | $858,584 | N/A |
| 5. | Performance Gap Comparison of Process Safety Management Consensus Standards and Regulatory Requirements for LNG Facilities | Newly Awarded | Gas Technology Institute | $295,529 | N/A |
| 6. | Review of Control System Testing Frequency | Newly Awarded | CH-IV International | $149,996 | N/A |
| | | | **Totals:** | $2,153,007 | $220,539 |



# New/Ongoing Research

**Review of Control System Testing Frequency**

**Main Objective:** This project will review the testing intervals prescribed for control systems in 49 CFR Part 193.2619 as the duration for these control systems may be overly conservative on LNG import, export, and peakshaving jurisdictional facilities. The project will also consider risks associated with the impact of potential material and equipment degradation, impact of worker safety and human factors, and comparison to other relevant codes and standards. The project results will include a recommendation to optimize testing frequency such that time intervals are sufficient for plant reliability and operation but not overly conservative.

**Results:** July 31, 2019

**PHMSA:** $149,996



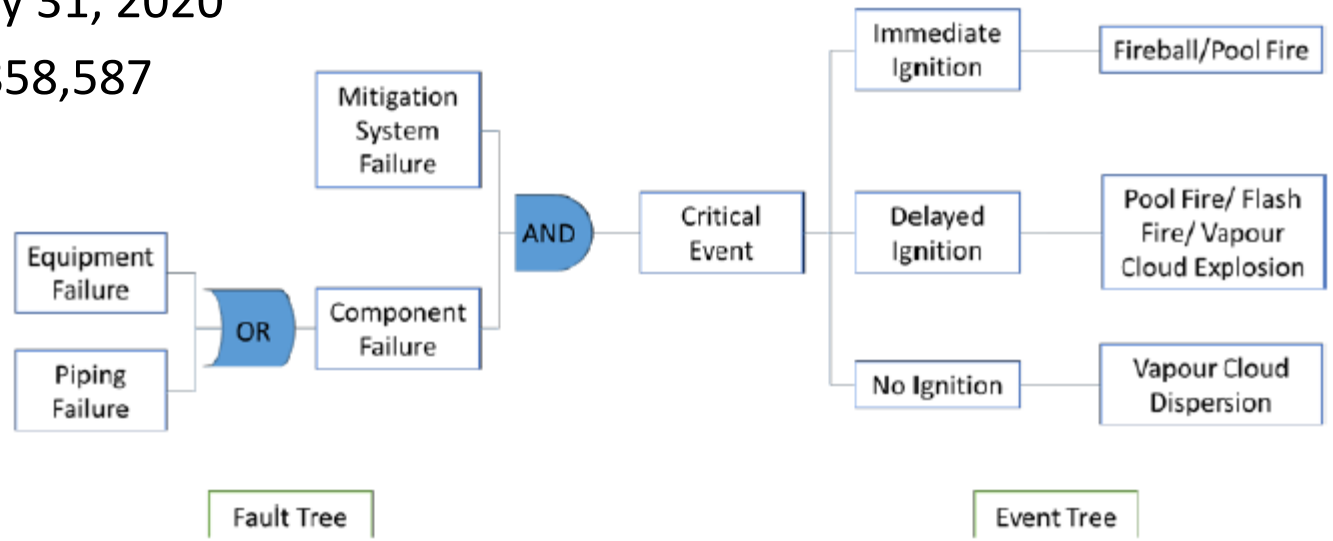
# New/Ongoing Research

**Consistency Review of Methodologies for Quantitative Risk Assessment**

**Main Objective:** This project will develop a methodology and guideline to establish consistency, guidance, background knowledge, and best practices to perform Quantitative Risk Assessments (QRAs) of LNG facilities, and demonstrate it on two representative generic LNG facilities (peak shaving and export).

**Results:** July 31, 2020

**PHMSA:** $858,587





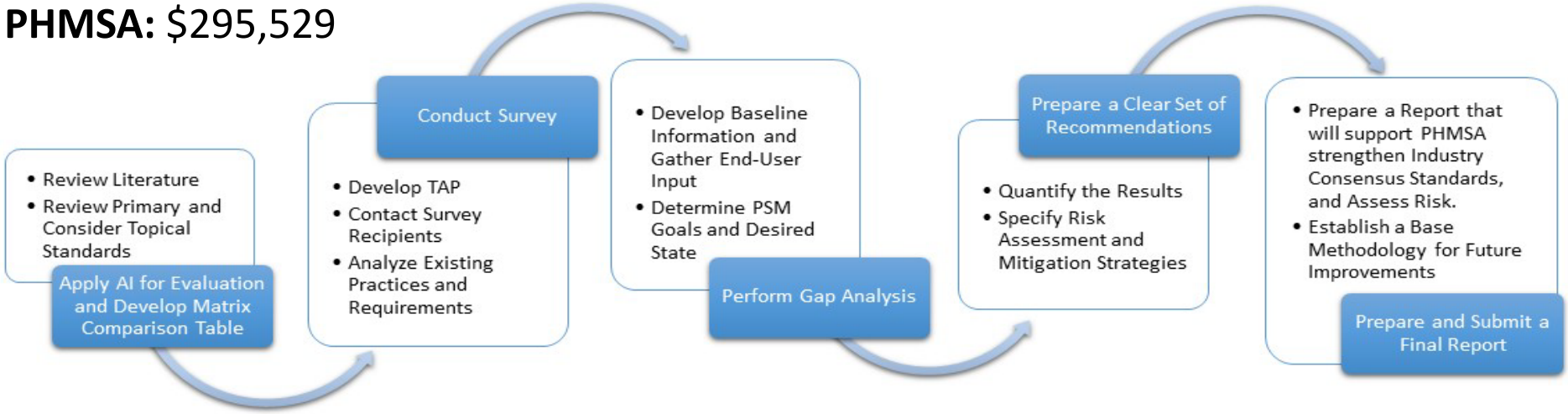

# New/Ongoing Research

**Performance Gap Comparison of Process Safety Management Consensus Standards and Regulatory Requirements for LNG Facilities**

**Main Objective:** This project will evaluate consensus standards, best practices, and regulatory requirements for process safety management to support PHMSA's strategy to update regulatory requirements for safety management systems of LNG facilities.

**Results:** Jan 31, 2020

**PHMSA:** $295,529





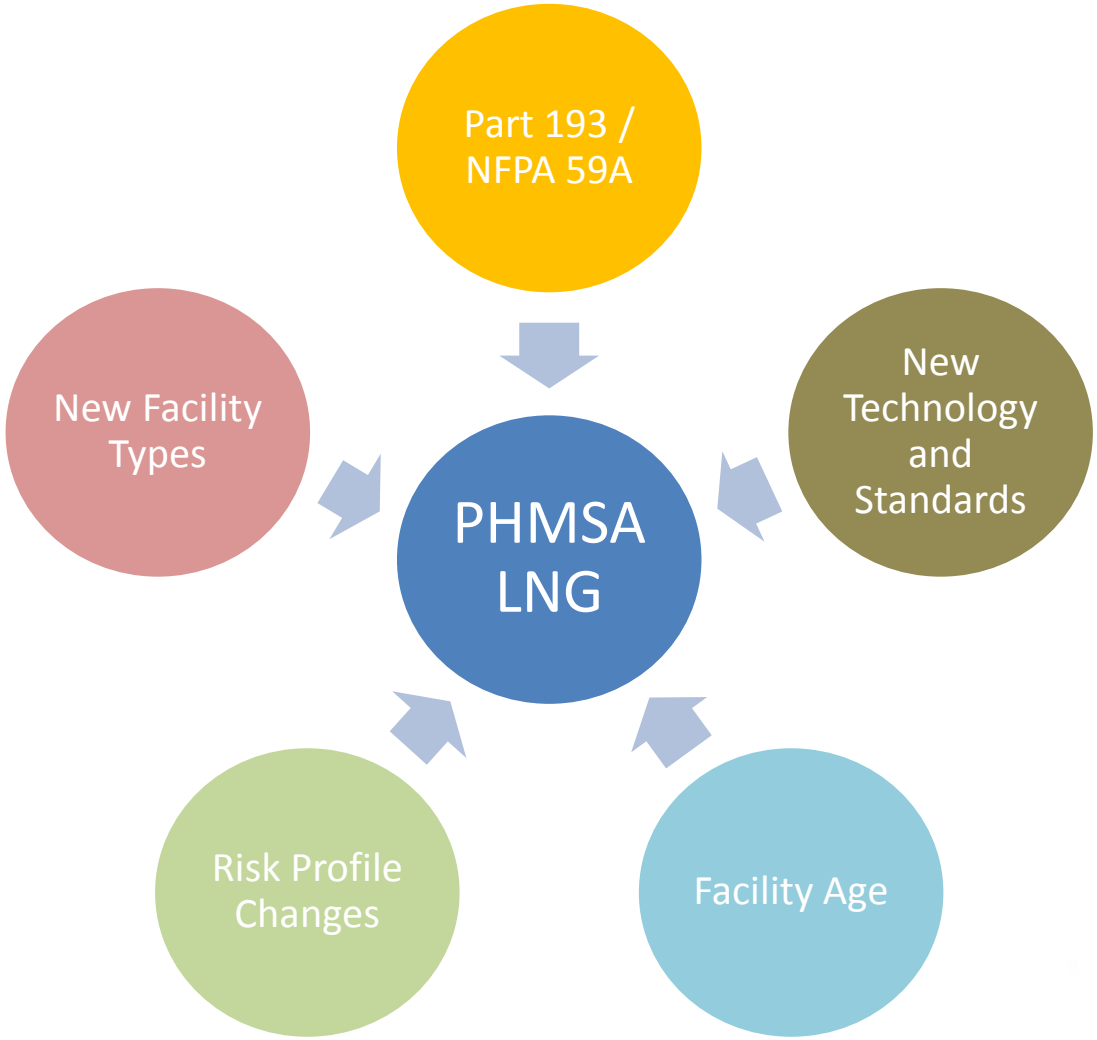

# PHMSA LNG Program
# Current Initiatives and Projects

- Federal Coordination on FERC-Jurisdictional LNG Projects
- Special Permit Reviews for LNG Facilities (49 CFR §190.341)
- Petitions for Part 193 Finding or Approval by the Administrator (49 CFR §190.9)
- PIPES Act 2016 Mandates
- NFPA 59A (2019) Standard Public Comments and Revisions
- PHMSA LNG Facility Construction Inspection Software Development
- Evaluation of FDS for LNG Flammable Vapor Dispersion and Thermal Radiation Protection Exclusion Zone Calculations
- PHMSA LNG Inspector Training Course Updates
- LNG R&D Projects

PHMSA



# PHMSA LNG Research Drivers






# Regulatory Effectiveness




- **1972:** 1st Federal LNG Safety Regulations (Part 192)
- **1980:** Safety Standards Established for LNG Facilities (Part 193)
- **2000:** Title 49 CFR Part 193 Incorporated by Reference Parts of NFPA 59A (1996)
- **2004:** Title 49 CFR Part 193 IBRs NFPA 59A (2001)

# New LNG Facility Types

## Marine Export of LNG

# New LNG Facility Types

## Small-Scale LNG Facilities


LNG Bunkering


LNG By Rail


LNG Vehicular Fuel



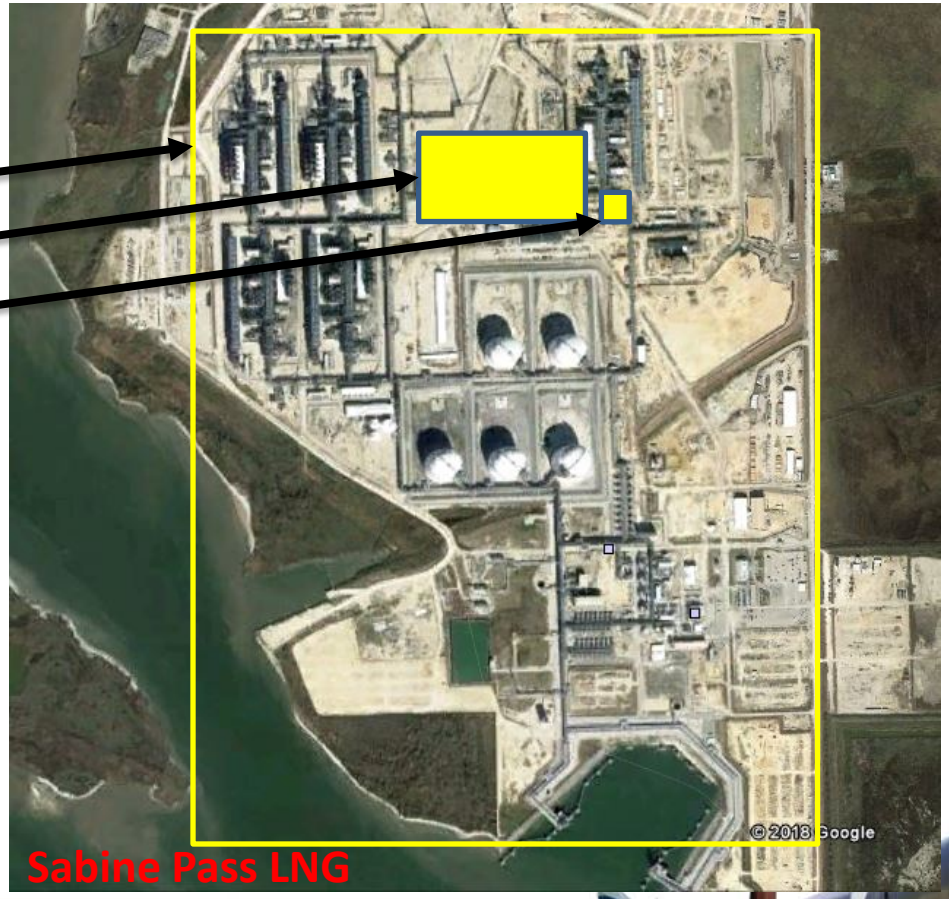
# Changing Risk Profile of New Facilities

## 1. Shrinking Lot Size

- 1000 acres: Marine Export
- 100 acres: Peak Shaving
- 15 acres: Small-Scale

## 2. Near High Population

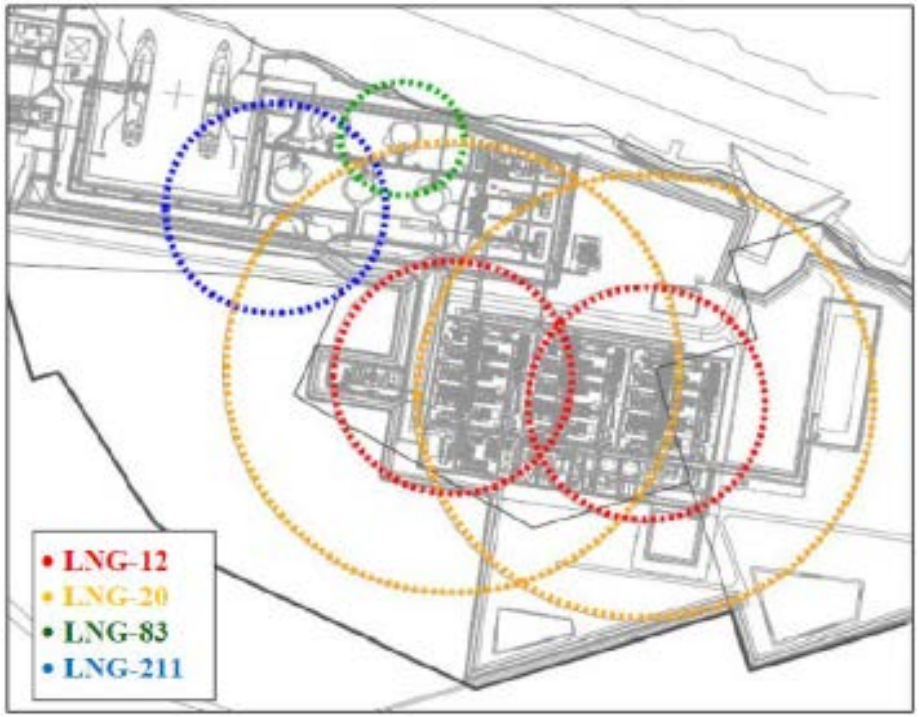
## 3. Vehicle Fuel Transfer



# Part 193 Requirements

## LNG Facility Siting

- LNG Hazards stay within the property controlled by the LNG Operator
- Exclusion Zones
- Requires large property, which does not work for many small-scale LNG proposals in busy city ports
- Use of LNG models approved by PHMSA

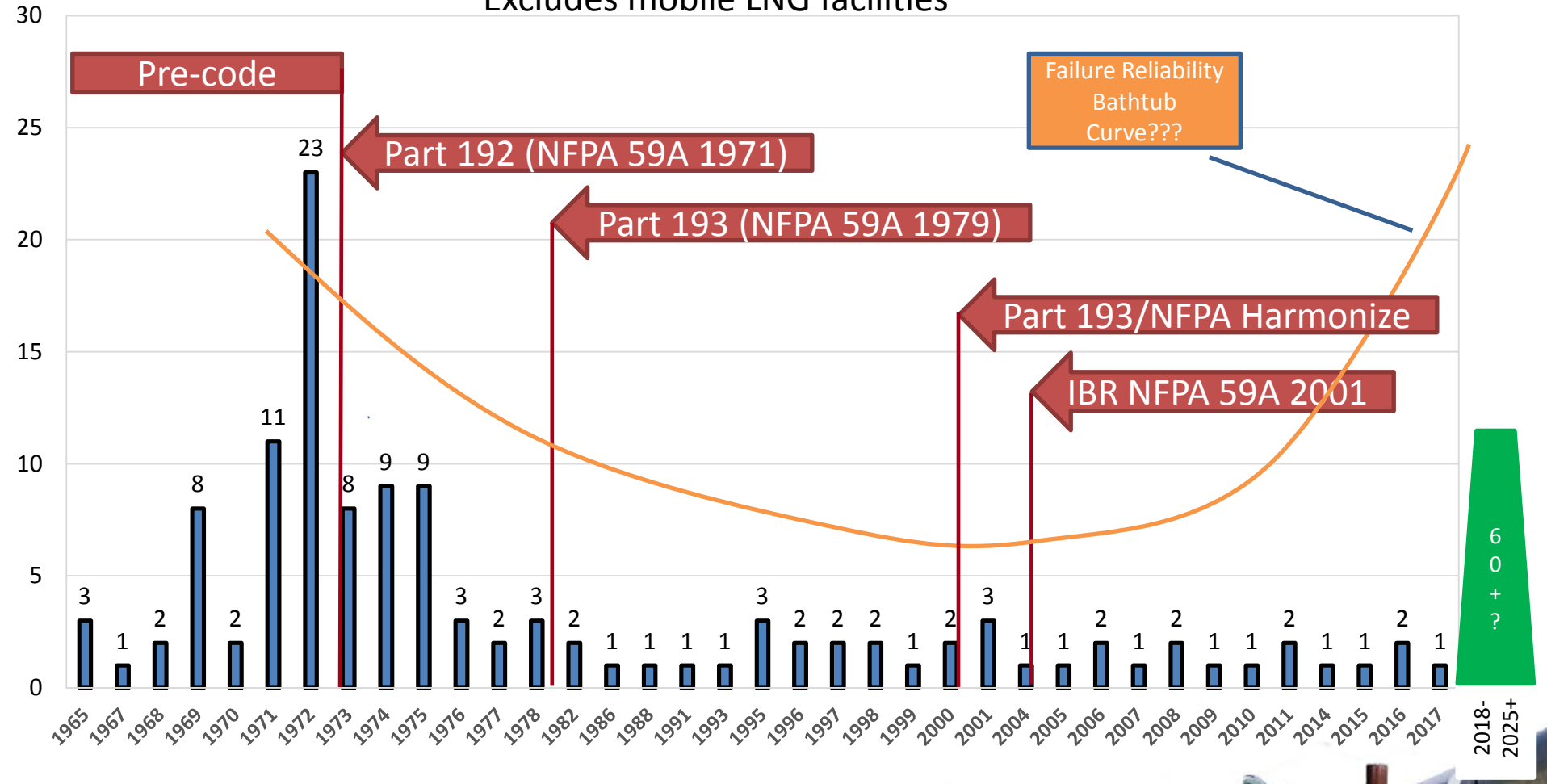



**Golden Pass LNG Liquefaction Export Project – LNG Flammable Vapor Dispersion Exclusion Zones**

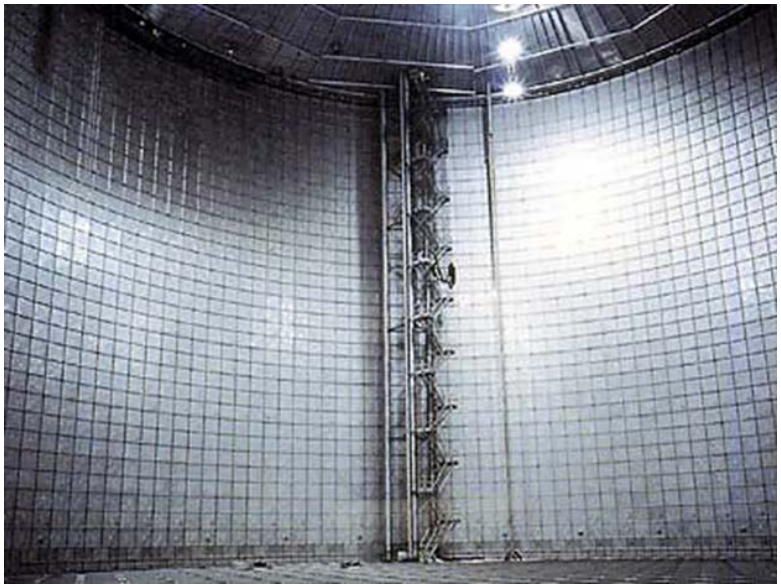
# Aging and New LNG Facilities

## Number of LNG Facilities Entering Service by Year

Excludes mobile LNG facilities



# New Technologies & Standards



**Membrane Tank** - A tank that uses a thin metallic liner as the inner tank. Unlike a conventional metal tank (which is self-supporting), a membrane cannot support its own weight and must be supported by other means.

**New Technologies**

- Vacuum jacketed pipe
- Membrane tanks
- Concrete tanks
- Single wall refrigerated pressure vessels
- Modular plants
- Truck and rail loading

**New Standards IBR in NFPA 59A Recent Editions**

- Over 60 Standards IBR in NFPA 59A



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## PHMSA RD&T Providing/Supporting: