



# **US DOT PHMSA Research Project #732: Performance Gap Comparison of Process Safety Management Consensus Standards and Regulatory Requirements for LNG Facilities**

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Final Virtually Held Information Dissemination Meeting

June 30, 2020

DOT PHMSA Contract #693JK31810007

# Discussion Topics

- Project Sponsor, Technical Advisory Panel, and Research Team
- Project Challenge and Main Objective
- Background Information
- Overview of Project Tasks, followed by activities in or across Tasks:
  - Literature Review, Gap Analysis Matrix Table Development, Survey Development
  - High-Level Summary of Potential Gaps
  - Survey Responses from LNG Operators
- Results
- Recommendations
- Knowledge Transfer / Potential Next Steps



# Project Sponsor: US DOT PHMSA



- PHMSA's Project Team:
  - Technical: Matt Valerio
  - Contractual: Ben Patterson, with Bob Smith
  - Supported by others in the PHMSA LNG Team
- **Public Final Report issued June 8, 2020**
- **Project public webpage:** <https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=732>
- Project need/concept developed at PHMSA's Pipeline Safety R&D Forum, Cleveland, OH, Nov. 16-17, 2016
- Provided timely input to support PHMSA's response to the Executive Order issued on April 10, 2019 to the Secretary of Transportation, which included to initiate a rulemaking to update 49 CFR 193



# Project Technical Advisory Panel (TAP)

*A Hearty Thank You* to the TAP from the Project Research Team!

- **PHMSA: Matt Valerio**, Agreement Officer Representative
- **BGE: Kevin Ritz**, Senior Gas Engineering Technical Specialist
- **Cameron LNG: Scott Mills**, Process Engineering Manager
- **Cheniere: David Anderson**, when Corporate Manager, Asset Integrity Management & Reliability and then **Paul Nielson**, Manager, Regulatory Compliance
- **Everett LNG Facility/Distrigas of MA: Tony Scaraggi**, when VP and Plant Manager, and then **Susan Stritter**, Principal Compliance Specialist
- **FERC: John Bugno II, P.E.**, Chemical Engineer, LNG Branch 2
- **National Grid: Chris Conlon**, Process Safety Director
- **OSHA: Liliana Silvera**, Process Safety Engineer
- **Shell International E&P: Shawn Murphy**, Team Lead, LNG Market Access



# Project Research Team



## Prime Contractor: **Gas Technology Institute (GTI)**

- Rich Kooy, P.E., Senior Institute Engineer
- Rupesh Muthyala, Senior Risk Engineer
- Ernest Lever, R&D Director, Energy Delivery



## Subcontractor: **BLUE Engineering and Consulting Company**

- Filippo Gavelli, Ph.D., P.E., Consultant
- Kirby Ducayet, Consultant
- Phil Suter, Consultant

# Project Challenge and Main Objective

Specified by PHMSA's July 2017 Research Solicitation

**Project Challenge:**  
Propose a path forward to incorporate critical safety management system advances since 1980 in 49 CFR Part 193 >

**Main Objective:**  
Support PHMSA's strategy to update regulatory requirements for safety management systems in 49 CFR Part 193 >

## *General Knowledge/Standards* – Performance Gap Comparison of Process Safety Management Consensus Standards and Regulatory Requirements

PHMSA promulgated regulations setting federal safety standards for LNG facilities in 1980 at 49 C.F.R. Part 193 (PHMSA LNG regulations). Since that time, safety management systems have greatly advanced. This project should review the current requirements and practices to propose a path forward to incorporate critical safety advances. The scope of the research should include:

- Review voluntary standards such as:
  - API RP 1173; and,
  - Occupational Safety and Health Administration 29 CFR Part 1910.119;
- Survey industry safety management systems to gain an understanding of existing practices;
- Determine the goals;
- Perform gap analysis between desired state and CFR Part 193, NFPA Standard 59A (2001), “Standard for the Production, Storage, and Handling of Liquefied Natural Gas” (NFPA 59A) and other codes; and
- Identify and prioritize gaps to be mitigated and decide how they should be addressed.

The results are anticipated to support the strategy to update regulatory requirements for safety management systems, which have greatly advanced since PHMSA LNG regulations were first promulgated in 1980. The timeline for such a solution should be 1-2 years.



December 9, 1998

Mr. Richard Runyon  
Senior Executive Consultant  
SCIENTECH, Inc.  
1303 South Central Ave., Suite 202  
Kent, Washington 98032

# Background: LNG Facilities Specifically Exempted from 29 CFR 1910.119 (OSHA PSM)

Dear Mr. Runyon:

This is response to your letter of March 31, 1998 requesting interpretation of OSHA's standard 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals; Explosives and Blasting Agents (PSM). Specifically, your inquiry was related to PSM coverage of liquefied natural gas (LNG) facilities. Your inquiry follows:

**Question:** Is OSHA precluded from enforcing the PSM standard at LNG facilities used in the transportation of LNG by pipeline which are subject to pipeline safety laws (49 U.S.C. 60101 et seq.) and Parts 192 and 193 of 49 CFR Chapter I and enforced by the Department of Transportation (DOT), Office of Pipeline Safety (OPS)?

**Response:** As you noted, OSHA previously issued a letter of interpretation related to natural gas distribution and transmission facilities (enclosed) on October 30, 1992 from Dorothy L. Strunk, Acting Assistant Secretary to Michael Baly, III. This interpretation stated, "**OSHA has concluded that current OPS regulations address the hazards of fire and explosion in the gas distribution and transmission process. Accordingly, OSHA has determined that the agency is precluded from enforcing the PSM rule over the working conditions associated with those hazards.**"

Additionally, DOT standards at 49 CFR Part 193, which cover LNG facilities used in the transportation of gas, define LNG to include natural gas which has been liquefied. 49 CFR Part 192 also covers pipeline facilities and the transportation of gas and defines gas to include natural gas. Consequently, OSHA's previous interpretation on natural gas distribution and transmission facilities would include LNG distribution and transmission facilities which are under the jurisdiction of the OPS. As with the natural gas distribution and transmission processes, OSHA has determined that current OPS regulations address the hazards of fire and explosion in the LNG distribution and transmission processes. Therefore, OSHA is precluded from enforcing the PSM standard over working conditions associated with those hazards.

As with the previous interpretation on natural gas, this interpretation on LNG only addresses the applicability of the PSM standard to the LNG transmission and distribution processes; it does not address the applicability of OSHA standards other than PSM, or the applicability of OSHA requirements to operations other than those described above. In other words, natural gas and LNG processing facilities are subject to OSHA coverage, notwithstanding this interpretation. Additionally, employers not subject to particular OPS requirements remain fully subject to OSHA requirements including the PSM standard.

If you have any questions please contact Mike Marshall of my staff at 202-219-8118 ext. 12.

Sincerely,

Richard Fairfax, Director



# Background: Safety Record of 49 CFR 193 with NFPA 59A (2001 and prior editions) with PHMSA Enforcement

As part of its introductory “Project Context”, the Public Final Report notes:

- that the U.S. Department of Energy, University of Texas, and Congressional Research Service have commented about the overall “excellent”, “excellent”, and “relative safety” record of LNG Facilities, in cited references (respectively).
- that 49 CFR 193 (with NFPA 59A incorporated by reference) contains numerous detailed requirements for LNG facilities that do not appear for other (non-LNG) facilities in 29 CFR 1910.119 related for example to:
  - primary and secondary containment requirements
  - equipment separation distances
  - safeguard systems and other process safety aspects
    - Example: This project analyzed 38 categories related to Mechanical Integrity in the Gap Analysis Matrix Table, and survey question #80 asked about 25 specific frequencies to inspect or test specific equipment or classes of specific equipment.

# Background: RAGAGEP – Recognized and Generally Accepted Good Engineering Practices in OSHA PSM

## 29 CFR 1910.119 (j) *Mechanical integrity* - (4) *Inspection and testing.*

(i) Inspections and tests shall be performed on process equipment.

(ii) Inspection and testing procedures shall follow **recognized and generally accepted good engineering practices.**

(iii) The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and good engineering practices, and more frequently if determined to be necessary by prior operating experience.

(iv) The employer shall document each inspection and test that has been performed...

May 11, 2016

**MEMORANDUM FOR:**  
REGIONAL ADMINISTRATORS

**THROUGH:**  
DOROTHY DOUGHERTY  
Deputy Assistant Secretary

**FROM:**  
THOMAS M. GALASSI, Director  
Directorate of Enforcement Programs

**SUBJECT:**  
RAGAGEP in Process Safety Management Enforcement

This enforcement policy addresses the Process Safety Management (PSM) Standard's recognized and generally accepted good engineering practices (RAGAGEP) requirements. Enforcement activity, including the *Petroleum Refinery Process Safety Management National Emphasis Program* (Refinery NEP), and requests for assistance from the field, revealed the need for this guidance. This memorandum rescinds and replaces the memorandum of the same title dated June 5, 2015. It is intended to be a clarification of the policy described in the earlier memorandum and does not reflect any substantive change in OSHA enforcement policy.

**Background on Recognized and Generally Accepted Good Engineering Practices**

<https://www.osha.gov/laws-regs/standardinterpretations/2016-05-11-0>



# Background: RAGAGEP (cont.)

## Should 49 CFR Part 193 Allow More RAGAGEP for Mechanical Integrity?

- Relevant to a May 10, 2018 petition by AGA and INGAA to propose changes to 49 CFR Part 193.2619
- 49 CFR 193.2605(a) is also relevant
- But some LNG facility operators may not want RAGAGEP on a widely used basis, unless an option to prescriptive bases

BEFORE THE  
UNITED STATES DEPARTMENT OF TRANSPORTATION  
PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION  
WASHINGTON, D.C.

PETITION FOR RULEMAKING: 49 CFR Part 193.2619

FILED BY  
THE AMERICAN GAS ASSOCIATION  
THE INTERSTATE NATURAL GAS ASSOCIATION OF AMERICA

May 10, 2018

The American Gas Association (AGA) and the Interstate Natural Gas Association of America (INGAA) respectfully submit this petition for rulemaking to the Pipeline and Hazardous Materials Safety Administration (PHMSA) pursuant to the petition process as set forth in 49 CFR Part 190, Subpart "C" Procedures for Adoption of Rules, Chapter 190.331 Petitions for Rulemaking.

### Petitioners Interest (190.331 (b)(3))

The Associations' interest in pursuing this petition is driven by the intent to minimize unnecessary risk associated with the preparation for and removal, inspection, testing and reinstallation of pressure relief valves on an annual basis required under the current regulation (49 CFR Part 193.2619). If the petition is acceptable to PHMSA and the proposed edits to Part 193.2619 are implemented, the risk to operator personnel associated with annual testing of PRDs will be reduced by a factor of 4 across the entire industry LNG fleet (125 +/- facilities in the U.S. based on PHMSA LNG Annual Reporting Data).



# Overview of Project Tasks

- **Task 1:** Review Literature, Standards and Regulatory Requirements
- **Task 2:** Survey Industry Safety Management Systems
- **Task 3:** Determine PSM Goals and Desired State
- **Task 4:** Perform Gap Analysis in Combination with Matrix Comparison
- **Task 5:** Risk Assessment and Mitigation Strategies
- **Task 6:** Summary, Recommendations and Final Report
- **Task 7:** Project Management

- Total Project Funding (for all tasks) = \$295,529
- 100% funded by US DOT PHMSA



# Task 1: Review Literature, Standards, and Regulatory Requirements

Two Primary Comparisons to Identify Potential Gaps (specified by PHMSA)

#1

## 29 CFR 1910.119 (OSHA PSM Standard)

- Voluntary Practice – 1992 law
- OSHA's 14 PSM categories and text formed a primary basis of identifying potential gaps

#2

## API Recommended Practice 1173 Pipeline Safety Management Systems

- Voluntary Practice – 2015 First Edition
- Many of its principles are non-equipment specific
- AGA's Board of Directors May 21, 2019 resolution recommended all AGA members implement PSMS or API RP 1173

### Basis of Comparison:

- ✓ The project team proposed and included a comparison to the **2019** edition as well as the **2001** edition of NFPA 59A



# Task 1: Review Literature, Standards, and Regulatory Requirements (cont.)

## Additional Comparisons / Considerations

- EPA Risk Management Plan (40 CFR 68)
- FERC Requirements and Orders (18 CFR 153, 157, 380 etc.)
- AIChE CCPS - *Guidelines for Risk Based Process Safety*, 2007
- AIChE CCPS - *Guidelines for Implementing Process Safety Management, 2nd Ed.*, 2016
- CAN/CSA - Z767-17, *Process Safety Management*, 2017
- CSChE - *Process Safety Management Standard, 1<sup>st</sup> Edition*, 2012
- CSChE - *Process Safety Management Guide, 4<sup>th</sup> Edition*, 2012
- CSChE - *Guidelines for Site Risk Communication, 3<sup>rd</sup> Edition*, 2012
- CSChE - *Managing the Health and Safety Impacts of Organizational Change*, 2004
- CSChE - *Risk Assessment - Recommended Practices for Municipalities and Industry*, 2004



# Task 1: Review Literature, Standards, and Regulatory Requirements (cont.)

## Additional Comparisons / Considerations

- IOGP 415 - *Asset Integrity – the key to managing major incident risks*, 2018
- IOGP 456 - *Process Safety – Recommended Practice on Key Performance Indicators*, 2018
- IOGP 460 - *Cognitive Issues associated with Process Safety and Environmental Incidents*, 2012
- IOGP 544 - *Standardization of Barrier Definitions*, 2016
- UK HSE HSG65 - *Managing for Health and Safety*, 2013
- UK HSE HSG254 - *Developing Process Safety Indicators*, 2006
- API RP 754 - *Process Safety Indicators for the Refining and Petrochemical Industries*, 2017

- 150 of 156 topics arose in comparison to 29 CFR 1910.119 and API RP 1173
- Only 6 of 156 topics arose solely from secondary/additional sources
- Comment: Significant 2004 - 2018 advancements in PSM-related body of knowledge



# Tasks 1,3,4: Development of Potential Gaps

## Identifying and Refining Potential Gaps (/Differences)

- Developed a Gap Analysis Matrix Table format to directly compare specific content; follows the order of content and topics in 29 CFR 1910.119
- Refined during several rounds of reviews with PHMSA and TAP members
- Final public version available in Appendix B of Public Final Report
- Provides clear line-of-sight and transparency if a potential gap arose from comparison of 49 CFR 193 with NFPA 59A (either 2001 or 2019) to:

API RP 1173    *or*    29 CFR 1910.119    *or*    Other specific source

<b>156</b>	Topics Reviewed
<b>85</b>	Potential Gaps Considered
<b>39</b>	Survey Questions* with identical quantitative answer; plus option to comment
<b>1</b>	Survey Question (25-component multiple choice re: RAGAGEP)

\*40 actual, but two questions related to same potential gaps; excludes 6 misc. other questions.



# Tasks 1,3,4: Development of Potential Gaps: Matrix Table Format

	Requirements of 29 CFR 1910.119 OSHA	Requirements of 49 CFR 193	Requirements of NFPA 59A 2001	Requirements of NFPA 59A 2019	Requirements of API RP 1173 (2015)	Potential Gap in Current 49 CFR 193 (referencing 2001 and 2006 editions of NFPA 59A)	Potential Gap in a Future Revision to 49 CFR 193 if it IBRs the 2019 edition of NFPA 59A
<b>Process Hazard Analysis (including Risk Management)</b>							
Is an Initial Process Hazard Analysis Required?	Yes.	No, not specifically.	No not specifically. There is a recommended (not required) risk analysis for Safe Shutdown Earthquake seismic loading condition in Appendix §B.3.3.	Yes.	Yes, although identified as Risk Assessment and not Process Hazard Analysis.	Could consider requiring that a formal Process Hazard Analysis/Risk Assessment be completed.	No apparent gap.
Minimum Frequency in Years to Update Process Hazard Analysis	5	No specific requirement.	No specific requirement.	For PHA: No specific requirement.  For QRA: 5, or as required by AHJ.	1	Could consider specifying requirement to periodically update a Process Hazard Analysis or Quantitative Risk Assessment.	Could consider specifying requirement to periodically update a Process Hazard Analysis.
<b>Contractors</b>							
Operator Responsibilities - Track Injury and Illness of Designer, Fabricator or Constructor	1910.119(h)(2)(vi) The operator shall maintain a injury and illness log for contractors' employees related to the contractor's work in process areas.	No specific requirement.	No specific requirement.	No specific requirement.	No specific requirement.	Could require that the operator maintain or receive a injury and illness log related to the Designer's, Fabricator's or Constructor's work in process area.	Could require that the operator maintain or receive a injury and illness log related to the Designer's, Fabricator's or Constructor's work in process area.



# Tasks 1,3,4: Development of Potential Gaps (cont.)

## Organizing – Nomenclature used acronym plus number

### Nomenclature used the categories in OSHA PSM (plus clarification)

EP	Employee Participation (and Stakeholder Engagement)
PSI	Process Safety Information
PHA	Process Hazard Analysis (incl. Risk Management)
OP	Operating Procedures (and Documentation)
TR	Training (and Competence)
CON	Contractors
PSSR	Pre-Startup Safety Review
MI	Mechanical Integrity
HWP	Hot Work Permit
MOC	Management of Change
II	Incident Investigation (incl. Learning)
EPR	Emergency Planning and Response (incl. Fire Protection and Security)
CA	Compliance Audits (incl. Metrics, Review and Improvement)
TS	Trade Secrets



# Tasks 2,3,5: Survey LNG Industry Operators Regarding Industry Safety Management Systems (SMS) Developed an On-Line Survey

- Developed over several rounds of reviews and suggestions from TAP and PHMSA
- Survey questions clearly identified the source(s) of potential gap
- Content directly excerpted from Gap Analysis Matrix Table
- Some questions grouped multiple potential gaps - - to simplify survey
  - Care was taken to avoid (as feasible) grouping survey questions about potential gaps that arose separately from 29 CFR 1910.119 vs. API RP 1173
- Questions were not posed if a potential gap would be eliminated if PHMSA IBRs the 2019 edition of NFPA 59A
- Two sets of questions were asked about two topics in two different ways

Project Matrix Table Reference Nos: EPR-26

**Page description:**

PSM Category: Emergency Planning and Response (incl. Fire Protection and Security)  
PSM Subcategory Topic: Minimum Frequency in Years to Exercise Emergency Response Notification Mechanism

Potential Gap in 49CFR193: There is no apparent requirement in §193.2509(3) "Emergency procedures" that: An operator must conduct an exercise of the LNG facility's emergency response notification mechanisms at least one each calendar year, and maintain a written record of each notification exercise conducted over the last five years. The notification exercises may be as part of the tabletop and field exercises that involve simulated accidental releases.

Arising from a comparison of 49CFR193 to:

- EPA 40CFR68.96

421

62. Should this potential gap be addressed? \*



# Tasks 2,3,5: Survey LNG Industry Operators (cont.)

Multiple Choice Answers: Yes or No if a Potential Gap Should be Addressed, and Respondents could Prioritize Potential Revisions in 49 CFR 193

## Survey Answer Option to most questions: **Should this potential gap be addressed?**

- Yes, address via a potential revision to NFPA 59A (e.g. 2022 edition), on the assumed basis that 49 CFR 193 will be revised to incorporate by reference this future edition of NFPA 59A.
- Yes, address via a potential revision to 49 CFR 193 (on the assumed basis that 49 CFR 193 has been revised to incorporate by reference the 2019 edition of NFPA 59A), and at this level of importance/priority vs. other topics in this survey:
  - 3 High Priority
  - 2 Medium Priority
  - 1 Low Priority
- Yes, address via a voluntary practice by operator
- No:
  - No need to address gap, because gap is incorrectly stated; in reality, there is no gap
  - No need to address gap, because gap is of negligible importance
  - No single answer or approach applies to all situations, or another reason



# Tasks 2,3,5: Survey LNG Industry Operators (cont.)

## Roll-Out

- Only 9 LNG facility operators surveyed - - due to 5 CFR 1320.3(c)
  - the project team originally envisioned a much larger survey pool
  - sought balanced input, as feasible: (5) Small Scale Operators + (4) Terminal Operators
- Survey recipients received:
  - the survey in pdf form, to help them prepare responses in advance
  - the detailed Gap Analysis Matrix Table, to provide the underlying analysis
  - a presentation that provided more background information
  - link to PHMSA's public information webpage for this research project
- Survey conducted Dec. 2019 – March 2020
  - individual survey responses kept confidential
  - survey responses consolidated as either small scale or terminal facility operators
- Survey and detailed responses provided in Public Final Report



# Tasks 2,3,5: Survey LNG Industry Operators (cont.)

## Responses

- All 9 surveys that were offered were completed - - 100% response rate

<u>Facility Type</u>	<u>Company</u>	<u>Respondent's Title</u>
Small Scale Peak Shaving	National Grid	Lead Engineer
Small Scale Peak Shaving	NiSource	Manager, Operations Compliance
Small Scale Peak Shaving	Piedmont Natural Gas	Director of Supplemental Gas
Small Scale Peak Shaving	Southern Company Gas	Director
Small Scale Merchant	Stabilis Energy	Senior Vice President, Operations
Terminal	Cameron LNG	Manager, Regulatory and Compliance
Terminal	Everett LNG Terminal	Regulatory Compliance Specialist
Terminal	Freeport LNG	Director LNG Technology, Operations and Projects
Terminal	Shell International E&P	Senior LNG Process Engineer, LNG Design



# Tasks 3,4,5,6: Results - Summary of Potential Gaps

## High-Level Summary – See Public Final Report for Detailed Summary

- **Mechanical Integrity**

- Potential increased allowance for RAGAGEP - - of high interest to industry representatives would be specific relief valve testing (potential gaps MI-10, MI-11, MI-12). \*
- “Component” does not appear to be as well-defined in 49 CFR 193 as “process equipment” is in 29 CFR 1910.119(j)(i). \*
- 6 potential gaps would apparently be addressed if 49 CFR 193 IBRs the 2019 edition of 59A. These pertain primarily to inspection and test frequencies for various components; some are differences that would align 49 CFR 193 with 2019 edition.

\* Arising from a comparison primarily to 29 CFR 1910.119



# Tasks 3,4,5,6: Results - Summary of Potential Gaps (cont.)

## High-Level Summary – See Public Final Report for Detailed Summary

- **Process Hazard Analysis (incl. Risk Management)**
  - e.g. methodology to perform and content in a PHA; composition and expertise of team that performs PHA; requirements to implement PHA findings; minimum frequency to update and revalidate PHA; minimum period to retain PHA records. \*
  - e.g. process to identify HCAs; identify and mitigate threats; define risk criteria. \*\*
  - Potential gap to have PHA would be addressed if 49 CFR 193 IBRs 59A 2019 edition. \*
  - In comparison, applications to FERC for authorization to construct, operate or modify a FERC-regulated LNG facility under 18 CFR 153.8 and 18 CFR 380.12(o) include the requirement to submit Resource Report 13, which requires that a PHA be performed.
  - The Final Report notes that there are important confidentiality and security considerations relevant to PHAs created for LNG facilities since they are critical energy infrastructure.

\* Arising from a comparison primarily to 29 CFR 1910.119

\*\* Arising from a comparison primarily to API RP 1173 or other voluntary industry recommended practice



# Tasks 3,4,5,6: Results - Summary of Potential Gaps (cont.)

High-Level Summary – See Public Final Report for Detailed Summary

- **Process Safety Information**

- Not a defined term in 49 CFR 193, while it is in 29 CFR 1910.119. \*
- No specific requirement for P&IDs, PFD, HMBs in 49 CFR 193 or NFPA 59A 2001, although the project team has observed that these are commonly present in LNG facility “plans and procedures”.
- Appendix A.3.3.9 “Engineering Design” of the 2019 edition of NFPA 59A recommends documentation (including P&IDs, PFD, HMBs, etc.), but as Appendix content is not enforceable.
- In comparison, applications to FERC for authorization to construct, operate or modify a FERC-regulated LNG facility under 18 CFR 153.8 and 18 CFR 380.12(o) include the requirement to submit Resource Report 13, with process safety information.

\* Arising from a comparison primarily to 29 CFR 1910.119



# Tasks 3,4,5,6: Results - Summary of Potential Gaps (cont.)

High-Level Summary – See Final Public Report for Detailed Summary

- **Management of Change**

- MOC is one of OSHA’s 14 PSM Elements. MOC is also Sec 8.3 of API RP 1173, and is also one of the 20 elements in American Institute of Chemical Engineers (AIChE) Center for Chemical Process Safety (CCPS) Risk Based Process Safety.
- No MOC provisions by that name in 49 CFR 193 or NFPA 59A 2001 or 2019, although other current requirements in 49 CFR 193 or NFPA 59A 2001 are certainly relevant. \*
- Section 4.6 of the 2019 edition of NFPA 59A is “Engineering Review of Changes”, but opinions differed if this content meets full intent of MOC as defined elsewhere.
- In comparison, FERC-regulated LNG facilities for which an application for authorization to construct, operate or modify is submitted (e.g., proposed new construction or substantial modification) are required by 18 CFR 153.8 and 18 CFR 380.12 to submit an environmental report, which must include submission of a MOC procedure. In addition, MOC procedures and sample forms for changes after the operation of the project has commenced must be provided.

\* Arising from a comparison in part to 29 CFR 1910.119



# Tasks 3,4,5,6: Results - Summary of Potential Gaps (cont.)

## High-Level Summary – See Final Public Report for Detailed Summary

- **Pre-Start Safety Review**

- PSSR is one of OSHA’s 14 PSM Elements.
- No PSSR provisions by that name in 49 CFR 193 or NFPA 59A 2001 or 2019, although other current requirements in 49 CFR 193 or NFPA 59A 2001 are certainly relevant. \*
- Section 18.7 the 2019 edition of NFPA 59A is “Commissioning”, and opinions differed if clarifications to that content may be desirable.

\* Arising from a comparison primarily to 29 CFR 1910.119



# Tasks 3,4,5,6: Results - Summary of Potential Gaps (cont.)

## High-Level Summary – See Final Public Report for Detailed Summary

- **Incident Investigation (and Learning)**

- e.g. threshold of incident to be investigated; qualifications of incident investigation team; incident report documentation and retention; follow-up action system and documentation; and personnel involvement. \*
- e.g. having a process to review and reassess any reportable incidents after five years to identify any subsequent lessons learned; what changes have been made from those past incident investigations; and other impacts. A related process may identify and internally review lessons learned from incidents external to the operator. \*\*
- The Final Report notes the Dec. 19, 2019 outcome of EPA’s RMP Reconsideration Final Ruling, which rescinded its 2017 requirement to consider “near miss” events in Program 2 and 3 incident investigations.

\* Arising from a comparison in part to 29 CFR 1910.119

\*\* Arising from a comparison primarily to API RP 1173 or other voluntary industry recommended practice



# Tasks 3,4,5,6: Results - Summary of Potential Gaps (cont.)

## High-Level Summary – See Final Public Report for Detailed Summary

- **Emergency Planning and Response (incl. Fire Protection and Security)**
  - e.g. exercise emergency notification mechanism once each calendar year; conduct tabletop exercises; conduct field exercises; and prepare evaluation reports. \*
  - e.g. consider pandemic outbreaks in emergency planning processes; account for all employees after evacuation; and extend an invitation to an external agency or organization to participate in training or drills at least every 2 years. \*\*
  - 5 potential gaps would apparently be addressed if 49 CFR 193 IBRs the 2019 edition of 59A. These pertain primarily to cybersecurity assessment, fire protection system modification timeliness, and procedure review frequency; some are differences that would align Part 193 with current 2019 edition of 59A.

\* Arising from a comparison primarily to 40 CFR 68

\*\* Arising from a comparison primarily to API RP 1173 or other voluntary industry recommended practice



# Tasks 3,4,5,6: Results - Summary of Potential Gaps (cont.)

## High-Level Summary – See Final Public Report for Detailed Summary

- **Contractors**

- e.g. periodically evaluate the safety and performance of contractors, and receive and maintain injury and illness log related to work done while at operator's facility. \*
- e.g. having a process to receive "lessons learned" suggestions and recommendations that pertain to potential process safety improvements at operator's facility and that are voluntarily provided from designers, fabricators, inspectors, constructors or those performing testing. \*\*

\* Arising from a comparison primarily to 29 CFR 1910.119

\*\* Arising from a comparison primarily to API RP 1173 or other voluntary industry recommended practice



# Tasks 3,4,5,6: Results - Summary of Potential Gaps (cont.)

High-Level Summary – See Final Public Report for Detailed Summary

- **Operating Procedures, Employee Participation (and Stakeholder Engagement), and Compliance Audits (incl. Metrics, Review and Improvement)**
  - e.g. if operator should have a procedure to manage its process safety, to include employee participation, periodic self-audits, appropriate responses, etc. \*
  - e.g. if self-audits should include specific topics such as: evaluation of safety culture; collection of useful and representative data; using effective leading and lagging Key Performance Indicators (KPIs); evaluating program maturity; and other factors. \*\*
  - e.g. if operator's procedures should include: minimum requirements for content, control, retention of PSM documents; increased consideration of human factors; etc. \*\*
- **Employee Participation (and Stakeholder Engagement), as expressed through Operator's Management Leadership Commitment, and Engagement with External Stakeholders. \*\***

\* Arising from a comparison at least in part to 29 CFR 1910.119

\*\* Arising from a comparison primarily to API RP 1173 or other voluntary industry recommended practice



# Tasks 3,4,5,6: Results - Summary of Potential Gaps (cont.)

High-Level Summary – See Final Public Report for Detailed Summary

- **Hot Work Permit**

- One of OSHA's 14 PSM elements.
- Not called out by that name in 2001 edition of 59A or in 49 CFR 193, but operating procedures must ensure safety to persons and property while repairs carried out. \*
- Potential gap apparently addressed if 49 CFR 193 IBRs the 2019 edition of 59A since §4.11.2 and §8.4.8.2.6 of the 2019 edition of 59A specifically refers to NFPA 51B.

- **Training (and Competence)**

- No potential gaps were identified.

- **Trade Secrets**

- No significant potential gaps were identified.

\* Arising from a comparison primarily to 29 CFR 1910.119



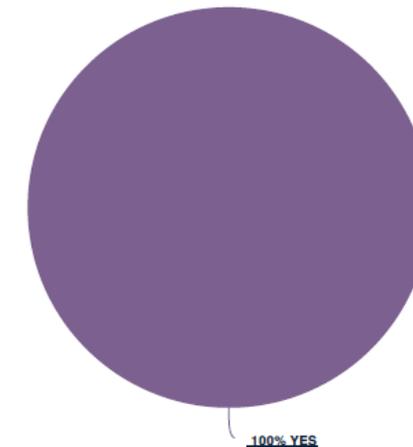
# Tasks 2,3,5: Survey Responses of LNG Operators

## Survey Response re: Should 49 CFR 193 (with NFPA 59A) allow more RAGAGEP basis to ensure Mechanical Integrity?

- **Yes** - - unanimous or very strong support
  - 100% in favor in response to overarching survey question no. 2
  - Very strong support when question posed for 25 individual components in survey question no. 80
- **But** - - **33% of survey recipients do not want to completely replace prescriptive requirements with RAGAGEP-based language**
  - 2 of 5 Responses from Small Scale Operators
  - 1 of 4 Responses from Terminal Operators

2. Should this potential gap be addressed?

■ All



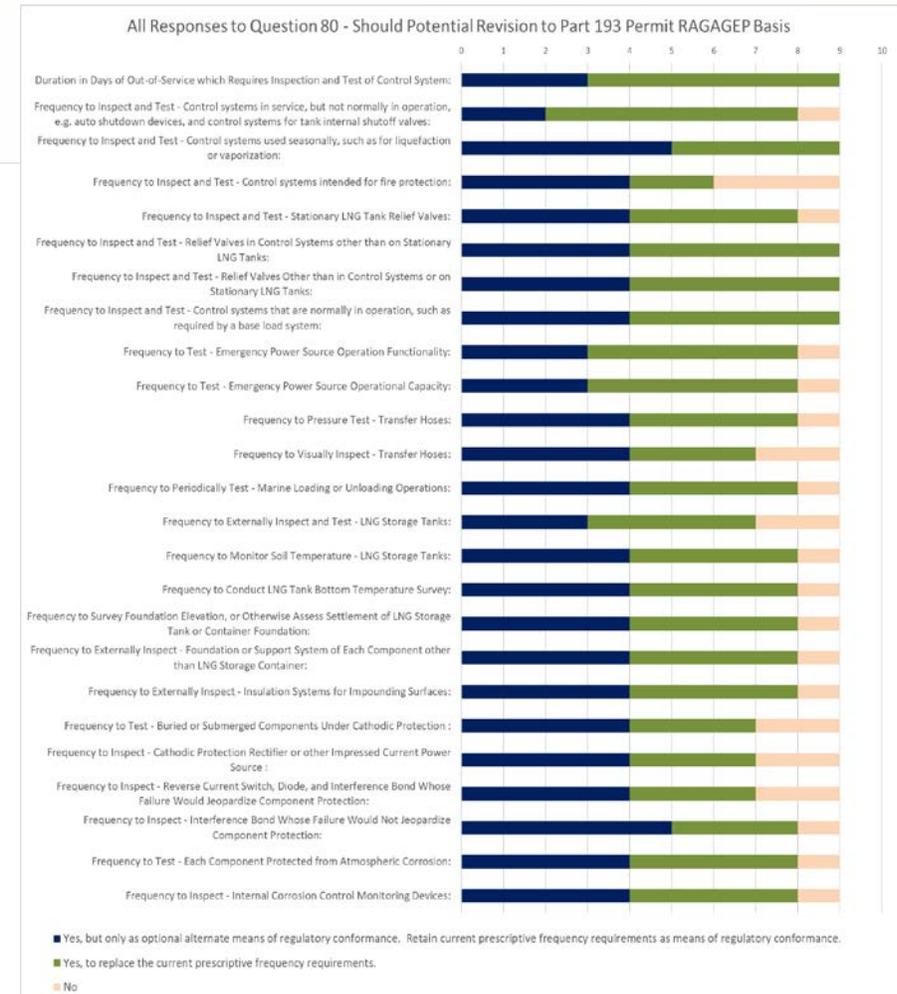
Response	Total Responses	Percent
YES — In general replace prescriptive based requirements with RAGAGEP based regulatory language. — 2 Medium Priority	3	33.3%
YES — In general replace prescriptive based requirements with RAGAGEP based regulatory language. — 3 High Priority	3	33.3%
YES — But only if the current primarily prescriptive based requirements remain and additional RAGAGEP based regulatory language provides an optional alternate means of conformance — 2 Medium Priority	2	22.2%
YES — But only if the current primarily prescriptive based requirements remain and additional RAGAGEP based regulatory language provides an optional alternate means of conformance — 3 High Priority	1	11.1%



# Tasks 2,3,5: Survey Responses of LNG Operators (cont.)

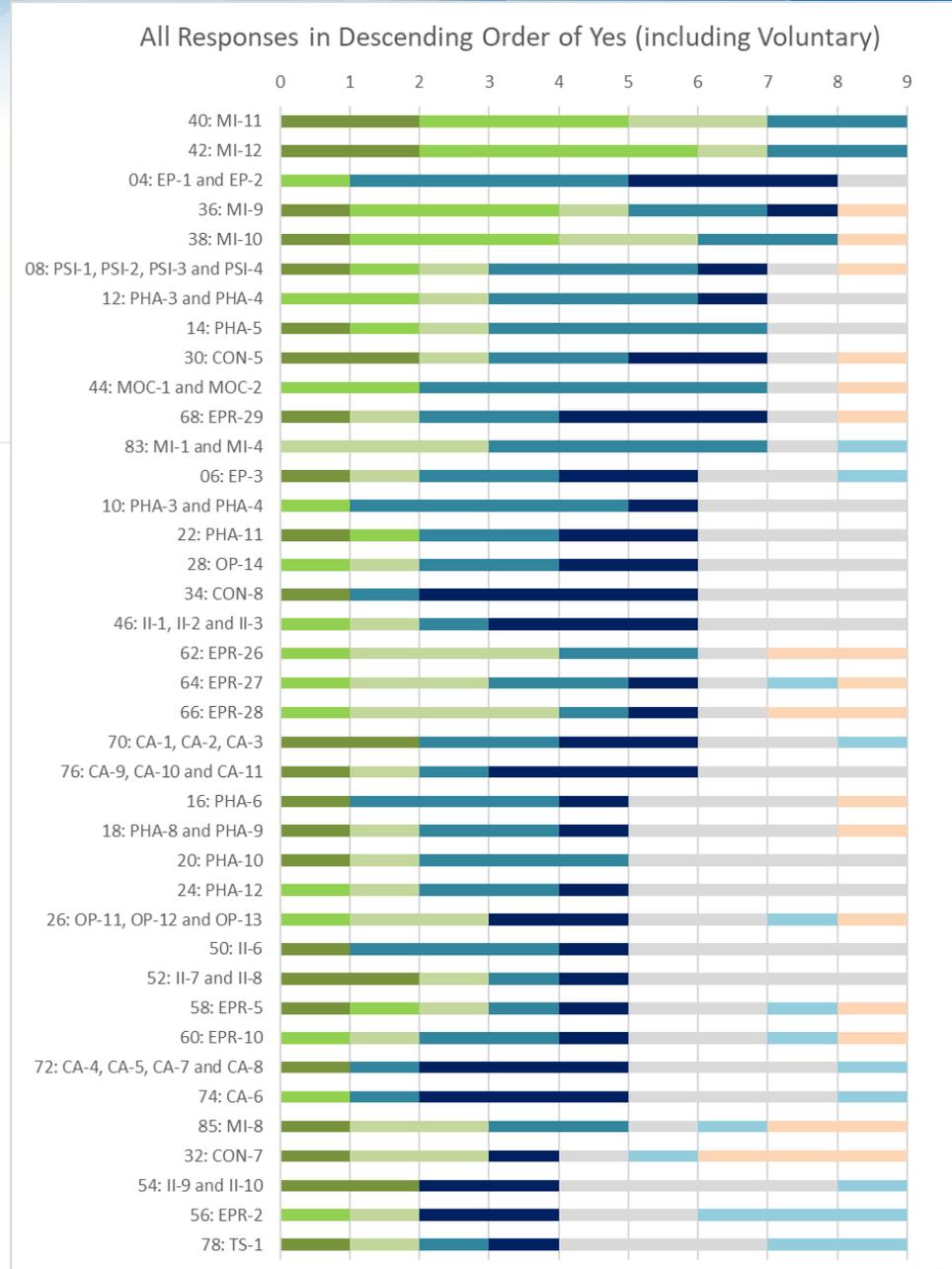
## Survey Response re: Should 49 CFR 193 (with NFPA 59A) allow more RAGAGEP basis to ensure Mechanical Integrity? (cont.)

- When operators were asked about individual components:
  - ~**33-44%** want the **option** to use RAGAGEP-based language/approach
  - ~**44-66%** want to **replace** the current prescriptive requirements with RAGAGEP-based language/approach
- Responses by specific components or activity did not vary significantly, except for the frequency to inspect and test control systems in service but not normally in operation



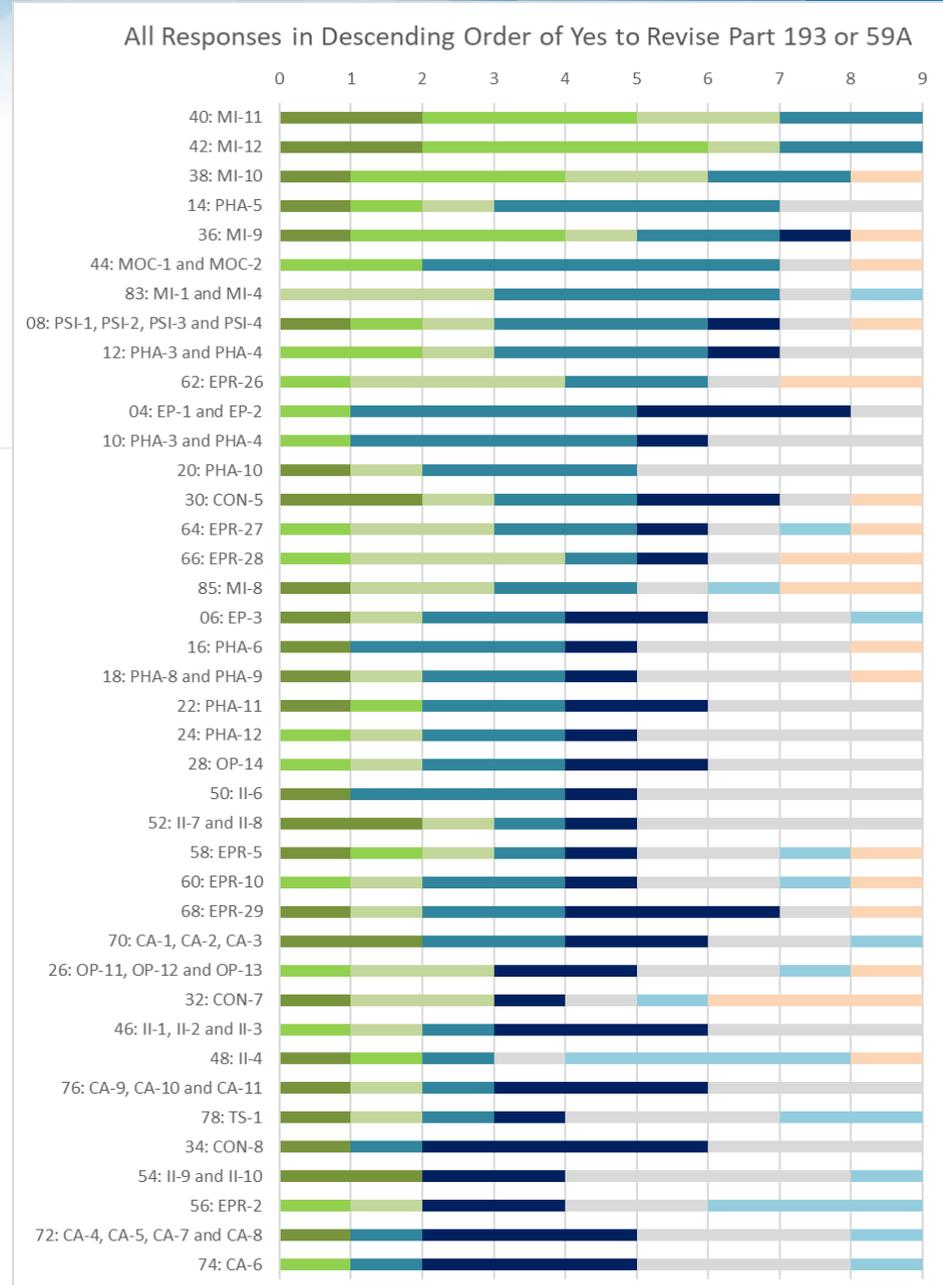
# Tasks 2,3,5: Survey Responses of LNG Operators (cont.)

- Majority of operators thought that **35** of the 39 potential gaps should be addressed by:
  - revision to NFPA 59A, or
  - revision to 49 CFR 193, or
  - voluntary action
- Significant variations in preferred method



# Tasks 2,3,5: Survey Responses of LNG Operators (cont.)

- Majority of operators thought that **16** of the 39 potential gaps should be addressed by:
  - revision to NFPA 59A, or
  - revision to 49 CFR 193
- Significant variations in preferred method



# Tasks 2,3,5: Survey Responses of LNG Operators (cont.)

## 16 Top Potential Gaps/Topics –

### Majority Responded to Revise 49 CFR 193 or NFPA 59A

	No.	Topic
<b>Mechanical Integrity</b>	MI-10	Frequency in Months to Inspect and Test - Stationary LNG Tank Relief Valves
	MI-11	Frequency in Months to Inspect and Test - Relief Valves in Control Systems other than on Stationary LNG Tanks
	MI-12	Frequency in Months to Inspect and Test - Relief Valves other than in Control Systems or on Stationary LNG Tanks
	MI-9	Frequency in Months to Inspect and Test - Control systems intended for fire protection
	MI-8	Frequency in Months to Inspect and Test - Control systems used seasonally, such as for liquefaction or vaporization
	MI-1 and MI-4	Definition of Process Equipment to Have Required Mechanical Integrity, and Method to Inspect and Test - Process Equipment
	<b>Process Hazard Analysis</b>	PHA-3 and PHA-4
PHA-5		Qualifications of Team that Conducts PHA
PHA-10		Minimum Frequency in Years to Update Process Hazard Analysis



# Tasks 2,3,5: Survey Responses of LNG Operators (cont.)

## 16 Top Potential Gaps/Topics – Majority Responded to Revise 49 CFR 193 or NFPA 59A

	No.	Topic
<b>Process Safety Information</b>	PSI-1, PSI-2, PSI-3, and PSI-4	Required Process Safety Information Content for Operator to Maintain
	MOC-1 and MOC-2	Is a Management of Change Procedure Required?, and Considerations and Content in MOC Procedures
<b>Management of Change</b>	EPR-26	Minimum Frequency in Years to Exercise Emergency Response Notification Mechanism
	EPR-27	Minimum Frequency in Years to Conduct Field Exercise Involving Simulated Accidental Release of a Regulated Substance
	EPR-28	Minimum Frequency in Years to Conduct Tabletop Exercises Involving Simulated Accidental Release of a Regulated Substance
<b>Emergency Planning and Response</b>	CON-5	Operator Responsibilities - Evaluate Performance of Designer, Fabricator and Constructor with respect to PSM Requirements
	EP-1 and EP-2	Must Operator have a Written Plan of Action to Implement Employee Participation in Process Safety Management Requirements? And Operator's Engagement with Employees and Other Internal Stakeholders
<b>Contractors</b>		
<b>Employee Participation</b>		



# Tasks 3,5,6: Summation and Categorization of Potential Gaps in Public Final Report

- 1) “Higher Priority Potential Gaps and Mitigation Strategies” for further consideration were those that:
  - the potential gap arose in comparison to another PSM-related federal regulation (i.e., OSHA 29 CFR 1910.119 or EPA 40 CFR 68)
  - industry participants on the project TAP identified as a high priority for PHMSA’s consideration - - specifically, potential increased use of RAGAGEP
  - AGA and INGAA have previously formally petitioned regarding those topics (gap nos. MI-10, MI-11, and MI-12).
- 2) “Lower Priority Potential Gaps” for further consideration were those that:
  - the potential gap arose in comparison to another PSM-related federal regulation, but not considered higher priority (6 in total)



# Tasks 3,5,6: Summation and Categorization of Potential Gaps in Public Final Report (cont.)

- 3) “Potential Gaps Substantially Addressed in 2019 Edition of NFPA 59A”
  - 12 potential gaps, when compared to 29 CFR 1910.119 or 2019 59A
    - Some are differences that would align 49 CFR 193 with current 2019 59A edition
  - No prioritization designated
  - But an overall recommendation is for PHMSA to adopt 2019 addition of 59A
- 4) “Potential Gaps if Compared to a Voluntary Industry Recommended Practice”
  - Differences or potential “gaps” that arose when comparing 49 CFR 193 and NFPA 59A to API RP 1173 (or another voluntary industry recommended practice) were broken out separately
  - No prioritization designated



# Task 6: Recommendations

## Potential Revisions Specific to 49 CFR 193

- Consider incorporating the 2019 edition of NFPA 59A by reference in 49 CFR 193, to address some/all of 12 potential gaps identified in this analysis
- Consider incorporating in 49 CFR 193 an increased allowance for operators to use a RAGAGEP basis for equipment inspection, testing and maintenance related to ensuring mechanical integrity, **while retaining** the current prescriptive requirements as alternative means of compliance.
  - Where allowed, include well-defined bases for acceptance of various components.
  - If a broader incorporation of a RAGAGEP basis to perform mechanical integrity is not to be considered, then recommend considering the optional allowance of a RAGAGEP basis for specific components e.g.:
    - Stationary LNG Tank Relief Valves (MI-10)
    - Relief Valves in Control Systems other than on Stationary LNG Tanks (MI-11)
    - Relief Valves other than in Control Systems or on Stationary LNG Tanks (MI-12)



# Task 6: Recommendations

## Potential Revisions to NFPA 59A or 49 CFR 193

- Potential gaps for consideration were derived from a comparison of requirements to other relevant federal law, e.g.:
  - Process Hazard Analyses - 29 CFR 1910.119(e)(1)-(7)
  - Process Safety Information - 29 CFR 1910.119(d)
  - Incident Investigation - 29 CFR 1910.119(m)(1) and (3)-(7)
  - Management of Change - 29 CFR 1910.119(l)
  - Emergency Planning and Response - 40 CFR 68(a)-(b)
  - Pre-Startup Safety Review - 29 CFR 1910.119(i)
- OSHA's 1998 exclusion of applicability of 29 CFR 1910.119 on LNG facilities, and differing regulatory approaches between OSHA 29 CFR 1910.119 and 49 CFR 193, were noted in Public Final Report.



# Project Knowledge Transfer / Potential Next Steps

Supporting Consensus-Building Paths Forward to Integrate Safety Advances since 1980

- Presented project results to AGA's Virtual Operations Conference on June 10, 2020
- This public presentation
- The Final Report and other project results are a resource to PHMSA as it considers revisions to 49 CFR Part 193
- The Public Final Report is a resource for NFPA 59A Technical Committee and others to help inform potential consensus revisions to NFPA 59A future editions
  - For example multiple TAP members, project members and organizations were involved in this project and serve on the NFPA 59A Technical Committee
- The Public Final Report is a resource that provides LNG-focused information to support an LNG operator's voluntary implementation of API RP 1173 or other PSM/PSMS programs
  - For example see section "Some Notable Areas Where Other Voluntary Practices Can Further Support PSM for LNG Facilities", or text with double asterisk \*\* on slides 23-30



# Thank You / Closing Discussions



**Project public webpage:** <https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=732>

- **Public Final Report**
- **This Presentation**

