



Freeport LNG Incident Review

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U.S. Department of Transportation
Pipeline and Hazardous Materials
Safety Administration

PHMSA: Your Safety is Our Mission



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- Due to PHMSA's ongoing investigation, the information in this presentation is all publicly available and my comments will be limited to publicly available information. I cannot comment on the ongoing investigation.



Incident

- On June 8, 2022, the Freeport LNG experienced a Loss of Primary Containment (LOPC) and Boiling Liquid Expanding Vapor Explosion (BLEVE) that resulted in a catastrophic failure of piping
- Immediately following the BLEVE a vapor cloud explosion (VCE) occurred fueled by vaporized LNG escaping from the rupture
- Pool fire in LNG impoundment
- Secondary LOPC events



NOPSO

- On June 30, 2022, PHMSA issued a Notice of Proposed Safety Order (NOPSO) proposing that Freeport LNG take certain measures to ensure that the public, property, and the environment are protected from the integrity risk of the facility



Consent Order and Consent Agreement

- On August 3, 2022, PHMSA issued a Consent Order and Consent Agreement to resolve the alleged integrity risks raised in the NOPSO
 - Root Cause Failure Analysis (RCFA)
 - Assessment and Inspection of Damage
 - Operating Procedures Evaluation
 - Control System Procedures Evaluation
 - Assessment of Personnel Qualifications and Training
 - Remedial Work Plans



RCFA Report

- On October 30, 2022, IFO Group issued the final Root Cause Failure Analysis (RCFA) Report
- On November 15, 2022, PHMSA posted the redacted RCFA report to the PHMSA FOIA Library Electronic Reading Room



Direct Cause

- The Direct Cause of the incident identified as the overpressure of an LNG line with no protection from overpressure resulting in a BLEVE and LOPC
- The flammable vapor (methane) then met an ignition source resulting in a vapor cloud explosion, a small secondary pool fire, and a short-term release of vaporizing LNG from damaged 3-inch piping



Root Causes

- Lack of PSV (pressure safety valve) Testing Procedure and lack of Car Seal Program
- IFO Group recommended that Freeport
 - Develop a PSV Testing Procedure
 - Consider providing formal classroom and field training
 - Consider developing a Car Seal program



Root Causes

- Lack of Safeguards to Warn Operators of Increasing VIP (vacuum insulated piping) Temperature
- IFO Group recommended that Freeport
 - Consider performing an alarm rationalization
 - Analyze temperature data and perform repairs and regular PM on temperature indicators
 - Consider revising the operating philosophy to minimize warming of VIP lines due to loss of flow



Root Causes

- Lack of Operational Integrity of certain Operating Procedures
- IFO Group recommended that Freeport
 - Perform a complete review of the operating procedures for the tank farm area



Contributing Causes

- HAZOP (hazard and operability analysis) Did Not Evaluate all Operating Modes
- IFO Group recommended that Freeport
 - Consider performing a revalidation Process Hazard Analysis (PHA) for all VIP systems to ensure the necessary safeguards are provided in the design based upon the severity of consequence



Contributing Causes

- The Facility did not follow the FLNG MOC process for modifications to Procedure-Unit 18 Tank Management
- IFO Group recommended that Freeport
 - Consider using FLNG's existing MOC process and procedure for all changes to the unit as defined in the procedure.



Contributing Causes

- Facility Personnel Failed to Recognize an Abnormal Operating Condition and Related Hazard
- IFO Group recommended that Freeport
 - Train engineering, operations and maintenance personnel to recognize Abnormal Operating Conditions (AOCs), including those related to pipe movement and the recognition of pipe movements/stresses.



Contributing Causes

- Operator Fatigue
- IFO Group recommended that Freeport
 - Consider a review of operator staffing and hours worked

