



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

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Houston TX 77074

AMENDED NOTICE OF PROBABLE VIOLATION PROPOSED CIVIL PENALTY

VIA ELECTRONIC MAIL TO: Jack.fusco@cheniere.com

September 16, 2021

Jack A. Fusco
President and CEO
Cheniere Energy Inc.
700 Milam Street, Suite 1900
Houston, Texas 77002

CPF 4-2021-002-NOPV

Dear Mr. Fusco:

Beginning January 25, 2018, representatives of the Pipeline and Hazardous Materials Safety Administration (PHMSA), Office of Pipeline Safety (OPS), pursuant to Chapter 601 of 49 United States Code (U.S.C.), initiated its investigation into an incident that occurred within Cheniere Energy, Inc.'s Sabine Pass LNG (SPLNG) facility located in Cameron Parish, Louisiana. On January 22, 2018, at approximately 9:00 p.m. CST, SPLNG discovered liquefied natural gas (LNG) leaking through four cracks in the outer carbon steel tank shell of Tank S-103, which is one of five LNG storage tanks located within the LNG facility (Incident). At 11:40 p.m. CST, SPLNG notified the National Response Center (NRC Report No. 1202595) of the Incident and reported that there were no damages, no off-site impacts to the environment, and the released LNG was contained within the secondary containment. SPLNG also notified the local fire and police departments and the United States Coast Guard. PHMSA personnel responded to the Incident and initiated an investigation. The Federal Energy Regulatory Commission (FERC) also sent a team of investigators.^a

After initiating the investigation, SPLNG informed PHMSA of a history of temperature excursions experienced in Tank S-103 (a significant temperature drop in the annular space between the inner and outer tank walls). SPLNG contracted with Matrix PDM Engineering in March 2017, approximately ten months prior to the Incident, to analyze the cause of these temperature excursions, and Matrix surmised that the temperature excursions were associated with a transient condition that occurred when the flow was rapidly reestablished into the bottom fill line at a high flow rate.

^a During the course of its investigation, PHMSA worked closely with FERC to coordinate information requests and share findings.

On the day of the Incident, SPLNG was returning the LNG storage tanks to normal operations after the area experienced a period of freezing weather beginning on January 16, 2018, which resulted in the loss of the city water supply to portions of SPLNG, including water used for liquefaction. During Tank S-103's return to normal operations, a sudden and large influx of LNG splashed through the gap where the bottom fill piping directly flows into a slightly offset funnel near the top of the bottom fill downcomer and into the space between the inner wall and the suspended deck into the annular space. The LNG contacted the outer carbon steel tank wall and the bottom plate, causing low-temperature thermal embrittlement resulting in four visible cracks in the outer tanks and cracks to the base plate of the external tank. This resulted in the release of LNG through the cracks, which pooled in the secondary containment.

SPLNG personnel responded to a thermal leak detection sensor alarm on Tank S-103 and proceeded to the top of the berm, which surrounds the five LNG tanks. They observed spalling paint and ice at the top of the outer tank, indicating a pathway where LNG had flowed down the tank, and reported their findings to the control room. The control room personnel began implementing steps to isolate the tanks and activate the Emergency Response Plan. Within one hour, SPLNG manually shut off valves, established an exclusion zone around Tank S-103, and initiated the removal of LNG from tank S-103. Technicians disconnected the instrument air supply on the fail-to-close bottom fill valves, directed all liquefaction run down to the top fill lines, and changed the sensor alarm set points from -256 to 10 degrees Fahrenheit. SPLNG also inspected the other four LNG storage tanks at the facility and discovered methane gas vapors were emitting from the interface between the base of the outer tank annular plate and the concrete of Tank S-101. However, SPLNG did not inform PHMSA of the vapor escaping on Tank S-101 until January 30, 2018.

On February 8, 2018, PHMSA issued a Corrective Action Order (CAO), CPF No. 4-2018-3001H, which required SPLNG to take the necessary corrective actions to protect the public, property, and the environment from potential hazards associated with a release of LNG from Tank S-103. On February 16, 2018, SPLNG responded to the CAO by challenging the terms, findings, and determinations of the CAO and also requested a hearing. On March 21, 2018, a hearing was held in Houston, Texas, at PHMSA's Southwest Region Office before a Presiding Official from PHMSA's Office of Chief Counsel. Following the hearing, PHMSA and SPLNG entered into discussions to potentially resolve the CAO. As a result, PHMSA and SPLNG entered into an administrative Consent Agreement and Order to determine the structural integrity of Tank S-101 and S-103 and evaluate the remaining tanks using the findings of a root cause failure analysis. The Consent Agreement and Order remains open as SPLNG continues to work through the corrective measures.

With regards to PHMSA's investigation into the cause of the Incident, PHMSA concluded that the apparent cause of the release of LNG was due to incorrect operations. Based on findings and recommendations from the Matrix report, SPLNG was aware that "initial/inherent tank design" was inadequate under larger liquid flow rates, enough that LNG liquid would likely reach the external wall of the tank. An estimated 245 barrels of LNG escaped through cracks of the outer tank wall, spilled into the secondary containment, vaporized, and released 825 thousand cubic feet of natural gas into the atmosphere. As for the resulting costs of the Incident, SPLNG estimated

\$34 million in damages and repair to SPLNG's property.

As a result of the investigation, PHMSA believes SPLNG has committed probable violations of the Pipeline Safety Regulations, Title 49, Code of Federal Regulations (CFR). The items inspected and the probable violations are:

1. **§ 193.2507 Monitoring operations.**

Each component in operation or building in which a hazard to persons or property could exist must be monitored to detect fire or any malfunction or flammable fluid that could cause a hazardous condition. Monitoring must be accomplished by watching or listening from an attended control center for warning alarms, such as gas, temperature, pressure, vacuum, and flow alarms, or by conducting an inspection or test at intervals specified in the operating procedures.

SPLNG failed to monitor Tank S-103 to detect any malfunction which could cause a hazardous condition. Specifically, the warning alarms in the annular space for Tank S-103 were not set to detect the presence of annular space temperatures below the design temperature of the carbon steel outer tank. This failure to properly set its alarms allowed SPLNG to have a hazardous condition go undetected, which resulted in a malfunction. LNG flowed into the annular space and contacted the carbon steel outer shell, causing the outer shell to crack in four locations, allowing LNG to leak through the cracks into secondary containment.

On January 22, 2018, between 4:36 p.m. and 5:20 p.m. CST, Tank S-103's leak detection sensor data showed a precipitous drop in the annular space temperature approaching that of LNG. SPLNG personnel were dispatched to visually check the position of the bottom fill valve on Tank S-103; however, upon arrival, they observed LNG leaking from cracks in the tank's outer shell.

A study completed by Matrix PDM in March 2017 informed SPLNG of at least 28 prior occurrences where annular space temperatures were below the design temperature of the carbon steel outer shell. The completed study recommended that the leak detection alarms for the annular space be set to warn of a potential temperature excursion in the annular space by setting them to warn of a malfunction appropriately. This assessment advised SPLNG to set the leak detection alarm set points at less than ambient conditions but considerably higher than the temperature of LNG (i.e., -260 degrees Fahrenheit). However, despite having knowledge of this recommendation, SPLNG did not change the settings on the leak detection alarms to warn of the temperature excursion as recommended by the study and left the leak detection alarm at the temperature of LNG.

By failing to change the set points on the annular space leak detection alarms to detect the temperature excursions that led to the malfunction and resulted in failure of Tank S-103, the release of LNG, and the resultant hazardous situation on January 22, 2018, SPLNG failed to comply with the requirements of § 193.2507.

2. § 193.2101 Scope.

(a) Each LNG facility designed after March 31, 2000 must comply with the requirements of this part and of NFPA-59A-2001 (incorporated by reference, see § 193.2013). If there is a conflict between this Part and NFPA-59A-2001, the requirements in this part prevail. NFPA 59A-2001.

NFPA-59A-2001; Chapter 6.3.3.5: Valves and valve controls shall be designed to allow operation under icing conditions if such conditions can exist.

SPLNG failed to design the valve and valve controls to allow operation under icing conditions. The air dryer for the compressed air system used to operate the valves in the plant was undersized in relation to the quantity of air required for reliable operation. This inadequacy allowed the water content of the compressed air to be too high, resulting in valve operator freeze-ups during a low-temperature weather event that occurred immediately prior to the Incident. Specifically, the undersized valve and valve controls became “iced,” and SPLNG could not operate the bottom fill valve properly, causing it to remain open.

During this time, the operator removed a supervisory lock restriction in the software designed to prevent operation of the bottom fill valve and attempted to “stroke” the valve (operate the valve through the full extent of its movement by opening and re-closing the valve). SPLNG previously placed this restriction on the valve as it had determined that the source of the LNG within the annular space during the previous 28 occurrences was caused by a design flaw in the bottom fill line that, when activated, could cause LNG to be “geysered” into the annular space, thus causing a threat to the integrity of the outer tank. To address the issue, SPLNG attempted to limit the use of the bottom fill valve by implementing a restriction in the control system software (DCS). The bottom fill valve was operated by the compressed air system in the plant, which contained an undersized air dryer that failed to allow the valve to operate under icing conditions.

Further compounding the issue, SPLNG’s DCS failed to show the valve position after the attempt to operate it on January 17, 2018. SPLNG re-implemented the supervisory lock, logged out of the DCS, and continued to operate as if the conditions were normal. However, the bottom fill valve remained 100% open for five days leading up to the detection of cryogenic temperatures in the annular space, cracking of the outer shell, and the release of LNG from Tank S-103 on January 22, 2018.

3. § 193.2017 Plans and procedures.

(a) Each operator shall maintain at each LNG plant the plans and procedures required for that plant by this part. The plans and procedures must be available upon request for review and inspection by the Administrator or any State Agency that has submitted a current certification or agreement with respect to the plant under the pipeline safety laws (49 U.S.C. 60101 et seq.). In addition, each change to the plans or procedures must be available at the LNG plant for review and inspection within 20 days after the change is made.

(b)...

(c) Each operator must review and update the plans and procedures required by this part –

(1) When a component is changed significantly or a new component is installed;

SPLNG failed to review and update its procedures when the bottom fill valve was significantly changed to prevent the use of the bottom fill and the overall operation of the LNG storage tank. Specifically, SPLNG failed to update its procedures when it placed the bottom fill line valve for Tank S-103 in a “supervisory lock” or closed position, thus changing the operations of the tank. SPLNG became aware of a design flaw in the LNG storage tank bottom fill piping that had caused “geysering” of LNG into the annular space of the tank resulting in temperature excursions and the presence of LNG in an area not designed for cryogenic temperatures. Additionally, a March 2017 report from Matrix PDM identified 28 instances where temperature excursions occurred. To address the identified design flaw, and prior to the Incident on January 22, 2018, SPLNG created and placed a restriction on using the bottom fill valve in DCS that required additional approval from personnel in authority above the on-duty controller to operate the bottom fill valve as early as 2016.

At the time of the Incident, SPLNG had not updated its plans or procedures to specify the restrictions put in place regarding the use of the bottom fill line. Additionally, SPLNG’s procedures had not been updated to define the persons in authority required to approve the use of the bottom fill line, nor had it designated the positions with authority to remove the supervisory lock that would allow the bottom fill valve to be operated. PHMSA’s investigation of the Incident revealed that plant operators, operations personnel, and operations supervisors were not aware of why the supervisory lock had been put in place or any restrictions placed on the use of the bottom fill line.

Proposed Civil Penalty

Under 49 U.S.C. § 60122 and 49 CFR § 190.223, you are subject to a civil penalty not to exceed \$225,134 per violation per day the violation persists, up to a maximum of \$2,251,334 for a related series of violations. For violation occurring on or after January 11, 2021, and before May 3, 2021, the maximum penalty may not exceed \$222,504 per violation per day the violation persists, up to

a maximum of \$2,225,034 for a related series of violations. For violation occurring on or after July 31, 2019, and before January 11, 2021, the maximum penalty may not exceed \$218,647 per violation per day the violation persists, up to a maximum of \$2,186,465 for a related series of violations. For violation occurring on or after November 27, 2018, and before July 31, 2019, the maximum penalty may not exceed \$213,268 per violation per day, with a maximum penalty not to exceed \$2,132,679. For violation occurring on or after November 2, 2015, and before November 27, 2018, the maximum penalty may not exceed \$209,002 per violation per day, with a maximum penalty not to exceed \$2,090,022. Also, for each violation involving LNG facilities, and additional penalty of not more than \$82,245 occurring on or after May 3, 2021, may be imposed. For each violation involving LNG facilities, an additional penalty of not more than \$81,284 occurring on or after January 11, 2021, and before May 3, 2021, may be imposed. For each violation involving LNG facilities, an additional penalty of not more than \$79,875 occurring on or after July 31, 2019, and before January 11, 2021, may be imposed. For each violation involving LNG facilities, an additional penalty of not more than \$77,910 occurring on or after November 27, 2018, and before July 31, 2019, may be imposed. For each violation involving LNG facilities occurring on or after November 2, 2015, and before November 27, 2018, an additional penalty of not more than \$76,352 may be imposed.

We have reviewed the circumstances and supporting documentation involved for the above probable violations and recommend that you be preliminarily assessed a civil penalty of \$1,458,200 as follows:

<u>Item number</u>	<u>PENALTY</u>
1	\$ 568,700
2	\$ 452,100
3	\$ 437,400

Proposed Compliance Order

With respect to the Items listed above, PHMSA and SPLNG have entered into a Consent Agreement to address the issues identified regarding bottom fill operations, alarm set points, valve controls, and procedures for bottom fill and recognizing and reacting to abnormal operating conditions. Please refer to the Consent Agreement and Order for CPF 4-2018-3001H, which details requirements related to these items.

Response to this Notice

Enclosed as part of this Notice is a document entitled *Response Options for Pipeline Operators in Enforcement Proceedings*. Please refer to this document and note the response options. All material you submit in response to this enforcement action may be made publicly available. If you believe that any portion of your responsive material qualifies for confidential treatment under 5 U.S.C. 552(b), along with the complete original document, you must provide a second copy of the document with the portions you believe qualify for confidential treatment redacted and an explanation of why you believe the redacted information qualifies for confidential treatment under 5 U.S.C. 552(b).

Following the receipt of this Notice, you have 30 days to submit written comments, or request a hearing under 49 CFR § 190.211. If you do not respond within 30 days of receipt of this Notice, this constitutes a waiver of your right to contest the allegations in this Notice and authorizes the Associate Administrator for Pipeline Safety to find facts as alleged in this Notice without further notice to you and to issue a Final Order. If you are responding to this Notice, we propose that you submit your correspondence to my office within 30 days from receipt of this Notice. This period may be extended by written request for good cause.

In your correspondence on this matter, please refer to **CPF 4-2021-002-NOPV** and, for each document you submit, please provide a copy in electronic format whenever possible.

Sincerely,

Mary L. McDaniel, P.E.
Director, Southwest Region
Pipeline and Hazardous Materials Safety Administration

Enclosures: *Response Options for Pipeline Operators in Enforcement Proceedings*

cc: Tom Myers, Vice President, Health, Safety and Environmental, Cheniere Energy,
Thomas.myers@cheniere.com