LAKE CHARLES LNG COMPANY
An ENERGY TRANSFER Company

March 22, 2017

Mr. R. M. Seeley
Director, Southwest
Pipeline and Hazardous Material Safety Administration
8701 S. Gessner, Suite 630
Houston, TX 77074

RE: Response to Notice of Probable Violation, Proposed Civil Penalty and Proposed Compliance Order CPF 4-2017-3002

Dear Mr. Seeley,

On behalf of Lake Charles LNG Company, LLC (LCLNG), I would like to request a hearing to review the one item associated with the Proposed Civil Penalty and the three items associated with the Proposed Compliance Order. A statement for each of these items is attached for your consideration. Lake Charles LNG will be represented by counsel at the hearing.

Please do not hesitate to contact Nathan Hlavaty at (713) 989-7225 if you have any questions about LCLNG's response.

Sincerely,

Jeff Brightwell, P.E.
Vice President, LNG Operations

xc: w/attachments
Mr. Alan Mayberry (PHMSA)

xc: w/o attachments
Ryan Coffey
Eric Amundsen
Nathan Hlavaty

PHMSA Finding – Item 1:

1. **§1932629 External corrosion control, buried or submerged components**
   (a) Each buried or submerged component that is subject to external corrosive attack must be protected from external corrosion by:
   (2) The following means:
   (ii) A cathodic protection system designed to protect components in their entirety in accordance with the requirements of §192.463 of this chapter and placed in operation before October 23, 1981,or within 1year after the component is constructed or installed whichever is later.

   §192.463 External corrosion control: Cathodic protection.
   (a) Each cathodic protection system required by this subpart must provide a level of cathodic protection that complies with one or more of the applicable criteria contained in Appendix D of this part. If none of these criteria is applicable, the cathodic protection system must provide a level of cathodic protection at least equal to that provided by compliance with one or more of these criteria.

   Appendix D - Criteria for Cathodic Protection and Determination of Measurements
   I. Criteria for cathodic protection
   (I) A negative {cathodic) voltage of at least 0.85 volt, with reference to a saturated copper-copper sulfate half cell. Determination of this voltage must be made with the protective current applied, and in accordance with sections II and IV of this appendix.
   II. Interpretation of voltage measurement.
   Voltage (IR) drops other than those across the structure electrolyte boundary must be considered for valid interpretation of the voltage measurement in paragraphs A(l) and (2) and paragraph B{l) of section I of the appendix.

Lake Charles LNG failed to consider IR drop when interpreting cathodic protection readings from their annual survey to determine if the cathodic protection was adequate as required by §193.2629 and §192.463, Appendix D. During the inspection, the Operator stated that they were using the - 0.85 volt criterion with current applied. This criterion requires that voltage (IR) drops other than those across the structure to electrolyte boundary be considered for valid interpretation of the voltage measurements. PHMSA requested information on how the Operator had considered IR drops in determining the adequacy of the readings, but the operator was unable to explain or provide additional information in the form of surveys, studies, or measurements to show how this requirement had been satisfied.

The -0.85 volt criterion at a minimum requires this potential at the pipe-to-soil interface. Readings taken on the surface of the ground above the pipe incorporate a voltage drop that if not considered, could result in the required cathodic protection potential at the pipe-to-

soil interface being inadequate. Lake Charles LNG's records show only structure to soil readings with the cathodic protection current applied and the Operator did not account for the voltage (IR) drops in the cathodic protection circuit, particularly IR drop in the soil between the point of measurement on the surface of the ground and the pipe.

LCLNG Response to PHMSA Finding – Item 1:

LCLNG offers the following information to demonstrate compliance with this requirement in advance of the September 2015 inspection:

- In preparation for the PHMSA inspection in September of 2015, LCLNG scheduled CorrPro to be onsite to support any field measurements required by the PHMSA inspector and to simultaneously conduct the 2015 cathodic protection survey.
- As part of preparing for the 2015 cathodic protection survey, the proposal for the survey was finalized with CorrPro on August 20, 2015 and included the consideration for IR drop based on the suggestion of CorrPro. See Attachment A.
- CorrPro mobilized to conduct the 2015 cathodic protection survey on September 14, 2015 and completed the survey on September 16, 2015. The survey for 2015, dated September 28, 2015, is attached as Attachment B for reference. Note that this coincided with the dates of the PHMSA inspection on September 15-16, 2015.
- The LCLNG corrosion procedure TPM 8.8 CP Test Point Survey was updated on 9/24/15 to incorporate consideration for IR drop.
- As a follow up to the 2015 cathodic protection survey results, remedial actions were taken in the form of adjustments to the cathodic protection system. The updated survey dated November 2, 2015, indicating mitigation of the points of concern, is attached as Attachment C for reference.
- The 2016 cathodic protection survey was completed August 22-26, 2016 and included consideration for IR drop. The survey is attached as Attachment D for reference.
- As a follow up to the 2016 cathodic protection survey results, remedial actions were taken in the form of adjustments to the cathodic protection system. The updated survey dated March 18, 2017, indicating mitigation of the points of concern, is attached as Attachment E for reference.

In response to the statement "PHMSA requested information on how the Operator had considered IR drops in determining the adequacy of the readings, but the operator was unable to explain or provide additional information in the form of surveys, studies, or measurements to show how this requirement had been satisfied.", LCLNG suggests that our response was from a historical perspective and that we could not provide this information for surveys completed prior to September 2015. However, the September 2015 survey, which included this consideration, was already in progress at the time of the inspection. The sequence of events detailed above establishes that LCLNG had in fact revised its practice regarding consideration of IR drop prior to the PHMSA inspection in September 2015 and done so of its own accord. Notwithstanding the prior history, LCLNG believes that it acted in good faith to improve its procedures in this area and offers that as mitigating circumstances and respectfully requests PHMSA to rescind the finding or at a minimum reduce the proposed fine in consideration of these actions.

PHMSA Finding – Item 2:

2. §1932635 Monitoring corrosion control

Corrosion protection provided as required by this subpart must be periodically monitored to give early recognition of ineffective corrosion protection including the following, as applicable:

(d) Each component that is protected from atmospheric corrosion must be inspected at intervals not exceeding 3 years.

Lake Charles LNG failed to periodically inspect a portion of their aboveground piping to monitor for ineffective corrosion protection from atmospheric corrosion as required by §193.2635. During the PHMSA inspection, the Operator was asked to provide atmospheric corrosion inspection records for their aboveground piping, specifically the insulated stainless steel piping used to transport chilled or liquefied natural gas within the facility. Lake Charles LNG responded by stating that the stainless steel piping will not corrode and consequently did not require inspection for atmospheric corrosion. This assumption is also documented in the Lake Charles LNG's Technical Procedures Manual, Section 8.1 Component Identification, which shows that the Operator did not require atmospheric corrosion inspections of the stainless steel piping.

The Lake Charles LNG facility has a significant quantity of aboveground insulated stainless steel piping that has not been periodically inspected for atmospheric corrosion. The insulation generally consists of a fibrous material wrapped around the circumference of the pipe covered by aluminum sheathing held onto the piping by metal straps (Exhibit B, Photos 1 – 5). This covering, while necessary to help preserve the temperature of the chilled or liquefied natural gas, makes it difficult to visually inspect the piping for atmospheric corrosion. However, insulated piping is susceptible to a specific type of atmospheric corrosion called *Corrosion Under Insulation (CUI)* and must be periodically inspected for corrosion just as with other aboveground piping. *CUI* is recognized by industry as a serious damage mechanism that results from the presence of moisture trapped under insulation and can adversely affect the integrity of piping by providing an environment conducive to corrosion, particularly environments that contain chlorides or sulfides. The location of the Lake Charles LNG facility is in an environment that includes high humidity (making it likely that condensation will form on the pipe) and potential sources of chlorides (the nearby brackish or salt water in Calcasieu Lake and the Gulf of Mexico).

The justification provided by the Operator for concluding that the stainless steel piping will not corrode was primarily based on the argument that the operating temperature at the Lake Charles LNG facility is not within the range where stainless steel piping is susceptible to corrosion. The source referenced by the Operator for this conclusion was a study by the Norwegian University of Science and Technology titled "Pitting and Crevice Corrosion of Stainless Steel under Offshore Conditions" [1] authored by a graduate student at the Norwegian University of Science and Technology as a Master's thesis (see Exhibit

[1] Wika, Sandra Finsas (2012). *Pitting and Crevice Corrosion of Stainless Steel under Offilwre Conditions* (Master's Thesis) Norwegian University of Science and Technology. Trondheim, 2012.

B, Pitting and Crevice Corrosion of Stainless Steel under Offshore Conditions, Norwegian University of Science and Technology, Trondheim 2012). The Operator refers to Figure 2.5 in the document that shows the Critical Pitting Temperature (CPT) and the Crevice Corrosion Temperature (CCT) for various grades of *zm-welded* stainless steel. Lake Charles argues that their operating temperatures range from -255 degrees F (-159 degrees C) to -50 degrees F (-46 degrees C) but the CPT and CCT for 304 Stainless Steel from Figure 2.5 are 4 degrees C and -16 degrees C, respectively, making their operating temperatures too low for corrosion to occur. When the PHMSA inspection was performed, the Lake Charles LNG facility was not operating and the piping was at atmospheric temperature, showing that the surface temperatures of the piping are not always within the range stated by the operator.

The conclusions of the thesis referenced by the Operator do not support the argument that corrosion of stainless steel can be predicted solely on the basis of operating temperature. In fact, the referenced research was initiated because offshore operators were experiencing corrosion of stainless steel piping under temperatures where existing charts and graphs indicated it wouldn't occur. The author states, "This study has shown that in order to be able to assess the possibility of pitting and crevice corrosion and probability of failure with respect to time due to pitting corrosion and coating degradation it is not enough to only consider temperature. It is shown that other parameters are probably as important as temperature." (Wika 73). The Operator also failed to consider the stated limitations of the study. Specifically, the document states, "Only the bulk of the pipe is considered, so welds, flanges and other places where localized corrosion is likely to occur are out of scope for this study" (Wika 3). It is apparent that the Operator selected excerpts from the referenced thesis to try and support their decision to not inspect the insulated stainless steel piping, but failed to use the findings in a manner consistent with the complete results of the research.

LCLNG Response to PHMSA Finding – Item 2:

As a general note, the reference to fibrous material and Exhibit B, Photos 1-5, are clarified below:

- While many insulation systems do include fibrous materials, the cryogenic piping insulation for the LCLNG terminal utilizes a combination of urethane foam and foam glass insulation.
- The photos referenced in Exhibit B were not included with the letter and LCLNG therefore cannot consider them in our response.

As required in the Proposed Compliance Order, LCLNG will proceed with the development of a procedure to inspect the insulated above ground stainless steel piping for atmospheric corrosion. The inspection intervals will not exceed three years except that due to the inability to inspect this piping when it is at cryogenic temperatures, this procedure will stipulate that the inspections will occur when the piping is at ambient temperatures and as a result the three year interval may not be practicable. As a mitigating measure, inspections will be conducted prior to operation of the piping at cryogenic temperatures and thus intervals may be more frequent than three years dependent on the demand on the terminal operations.

In addition, LCLNG did conduct under insulation inspection of stainless steel piping during 2012. These inspections were conducted due to the first idle operation of the facility since 1989 and therefore the first opportunity to conduct such under insulation inspection. These inspections included 80 points at 4 quadrants of the pipe at each location. The pipe was examined visually and by UT for thickness. There were no indications of visual corrosion and the UT readings indicated no reduction in wall thickness since the original installation of the pipe. Records of these inspections are available for inspection at the LCLNG terminal at the convenience of PHMSA.

PHMSA Finding – Item 3:

3. §193.2707 Operations and maintenance.
   (a) Each operator shall utilize for operation or maintenance of components only those personnel who have demonstrated their capability to perform their assigned functions by
   (1) Successful completion of the training required by §§193.2713 and 193.2717;
   (2) Experience related to the assigned operation or maintenance function; and,
   (3) Acceptable performance on a proficiency test relevant to the assigned function.

   §193.2713 Training, operations and maintenance.
   (a) Each operator shall provide and implement a written plan of initial training to instruct-
   (1) All permanent maintenance, operating, and supervisory personnel-
   (i) About the characteristics and hazards of LNG and other flammable fluids used or handled at the facility, including, with regard to LNG, low temperatures, flammability of mixtures with air, odorless vapor, boiloff characteristics, and reaction to water and water spray;
   (ii) About the potential hazards involved in operating and maintenance activities; and,
   (iii) To carry out aspects of the operating and maintenance procedures under

   §§193.2503 and 193.2605 that relate to their assigned functions; and
   (2) All personnel-
   (i) To carry out the emergency procedures under §193.2509 that relate to their assigned functions; and
   (ii) To give first-aid; and,
   (3) All operating and appropriate supervisory personnel-
   (i) To understand detailed instructions on the facility operations, including controls, functions, and operating procedures; and
   (ii) To understand the LNG transfer procedures provided under §193.2513.
   (b) A written plan of continuing instruction must be conducted at intervals of not more than 2 years to keep all personnel current on the knowledge and skills they gained in the program of initial instruction.

   §193.2717 Training, fire protection.
   (a) All personnel involved in maintenance and operations of an LNG plant, including their immediate supervisors, must be trained according to a written plan of initial instruction, including plant fire drills, to:
   (1) Know the potential causes and areas of fire;
   (2) Know the types, sizes, and predictable consequences of fire; and
   (3) Know and be able to perform their assigned fire control duties according to the procedures established under § 193.2509 and by proper use of equipment provided under § 193.2801.
   (b) A written plan of continuing instruction, including plant fire drills, must be conducted at intervals of not more than 2 years to keep personnel current on

the knowledge and skills they gained in the instruction under paragraph (a) of this section.

(c) Plant fire drills must provide personnel hands-on experience in carrying out their duties under the fire emergency procedures required by § 193.2509.

Lake Charles LNG failed meet the training requirements required by the regulations. Lake Charles LNG failed to provide records demonstrating that they had met all required initial and/or refresher training according to §193.2707 and the Operator's procedures as required by §193.2713 and § 193.2717. In addition, the Operator failed to require refresher training on detailed operations for supervisors and the required training for security personnel was not in accordance with §193.2713.

Training records presented by Lake Charles LNG during the inspection did not show that personnel had completed the required training as required by §193.2707 and defined by the facility's training matrix, Lake Charles LNG Company, Table 1.1, Master Training Matrix, Initial and Refresher Training, Revised 02/01/2010. In addition, the Operator's records did not show that supervisors completed refresher training on detailed operations. Contract security personnel also have assigned duties as part of the facility's emergency response but there were no records showing that security personnel received training on the Operator's emergency procedures.

LCLNG Response to PHMSA Finding – Item 3:

LCLNG has reviewed the training records for all personnel and offers the following updates and clarifications:

- Regarding initial training records for all employees, while some of the LCLNG records have been misplaced over recent years related to the transition of training management programs, about 60% of the initial training courses for all employees were completed within the first year of assignment to the LNG facility and records of this training are available for inspection at the LCLNG terminal at the convenience of PHMSA. As a result, in addition to providing currently available initial training records, we will document the employees whose initial training records cannot be produced for future record inspection clarity.
- Regarding training required by paragraph 2707, LCLNG does not manage this training through our Training Manual as indicated from the excerpt below. The competency of operating and maintenance personnel is developed through our job standard training program which is directly administered by the supervision for the operating and maintenance personnel. In addition, this training is not considered an initial training requirement but is a competency program to verify an individual's ability to independently perform defined operating and maintenance activities as required by paragraph 2707. Attachment F, "Operations Qualification Report - Example" and "Maintenance Qualification Report - Example", represent the format that is utilized to track the qualification of all operating and maintenance personnel. The current reports and job standard training records were available at the time of the September 2015 PHMSA inspection and remain available for inspection at the LCLNG terminal at the convenience of PHMSA.
    - "Individuals who have gained on the job experience at Lake Charles LNG Company will have completed defined job standards to demonstrate proficiency in their duties (job books). Note that employee job standards, skill-set training requirements and procedures are not covered by this training manual, but are administered and managed through the employee's respective department and supervision."
- Regarding refresher training, upon complete review of the training records at the time of the inspection refresher training required by the Attachment G, "Lake Charles LNG Company, Table 1.1, Master Training Matrix, Initial and Refresher Training, Revised 02/01/2010", had been completed within the two years previous to the inspection. The following summary outlines the refresher training status for which the records of completion are available at the LCLNG terminal for inspection at the convenience of PHMSA:
    - PHMSA-1A – Characteristics & Hazards of LNG was completed in July of 2014.
    - PHMSA-1B – Characteristics & Hazards of Ethane and Propane is completed in the same training as PHMSA – 1A and was completed in July of 2014.
    - PHMSA-2A – Potential Hazards – Lock and Tag was completed in August of 2015.
    - PHMSA-2B – Potential Hazards – Torqueing was completed in November of 2014.
    - PHMSA-2C – Potential Hazards – Rigging/Slings/Cranes/Hoists was completed

in January of 2015.

- PHMSA-2D – Potential Hazards – Forklift Operation was completed in May of 2014.
- PHMSA-2E – Potential Hazards – Tubing was completed in June of 2014.
- PHMSA-2F – Potential Hazards – Safety Related Conditions was completed in August of 2015.
- PHMSA-3 – Emergency Procedures was completed in August of 2014 and April of 2015.
- PHMSA-4 – First Aid and CPR was completed in August of 2015.
- PHMSA-5 – Emergency Response/Simulation was completed in October of 2013.
- PHMSA-6 – Fire Prevention and Response was completed in September of 2014.
- PHMSA-7/8 – Security Procedures/Ops Overview was completed in June of 2013.
- PHMSA-12 – Detailed Plant Operations was completed in July of 2014.
- PHMSA-13 – LNG Transfer Procedures is completed in the same training as PHMSA – 12 and was completed in July of 2014.

- Regarding refresher training on Detailed Operations for supervisors, LCLNG does require this training. At the time of the inspection, the PHMSA 13 - Detailed Plant Operations Training had last been completed in July of 2014. The records of this training are available at the LCLNG terminal for inspection at the convenience of PHMSA.
- Regarding training on Operations emergency procedures for Contract security personnel, LCLNG does require this training. At the time of the inspection, the PHMSA 3 - Emergency Procedures Training had last been completed in August of 2014. The records of this training are available at the LCLNG terminal for inspection at the convenience of PHMSA.