

Agenda Date: April 28, 2016  
Item Number: A4

**Docket: PG-151949**  
Company: Puget Sound Energy

Staff: Lex Vinsel, Pipeline Safety Engineer

### **Recommendations**

Issue an order granting Puget Sound Energy's (PSE) request for a waiver of Title 49 Code of Federal Regulations (49 CFR) 193.2167 for a buried Liquefied Natural Gas (LNG) transfer pipeline to deliver LNG product from PSE's proposed LNG facility to Totem Ocean Trailer Express (TOTE) shipping for use as a transportation fuel. Title 49 CFR 193.2167 "Covered Systems" states, "*A covered impounding system is prohibited except for concrete wall designed tanks where the concrete wall is an outer wall serving as a dike.*"

This waiver is based on the design characteristics as presented to staff by PSE.

We recommend approval of this waiver subject to the following conditions:

- a) The enclosed drainage channel is made of carbon steel 48 inches in diameter and 1 inch thick and bored at least 11 feet below grade to provide a conservative level of clearance beneath the roadway, rail road tracks, and existing underground utilities.
- b) The LNG transfer system is composed of two vacuum jacketed LNG lines and one vacuum jacketed vapor return line that are installed on a movable pipe rack that will be inserted into the buried enclosed drainage channel.
- c) The moving pipe rack is inserted into the completed enclosed drainage channel and sealed.
- d) During operation and LNG transfer, the vacuum jacketing of the liquid and vent lines are constantly monitored for loss of vacuum.
- e) The enclosed drainage channel is filled with nitrogen gas and constantly purged with a monitor for hydrocarbons at the nitrogen vent.
- f) The bottom of the enclosed drainage channel is instrumented with cryogenic temperature monitors that will detect any liquid release and will also act as a secondary containment vessel.
- g) The entire pipeline is continuously monitored from the Tacoma LNG Facility Control Room which will be staffed twenty four hours a day, year round.
- h) The casing is cathodically protected.
- i) Commission staff will secure an independent geotechnical engineering consultant to assist in ensuring that PSE's design of this pipeline meets federal code requirements as it relates to forces applied by a seismic event. In this regard, PSE will comply with all sections of module 5 of Pipeline and Hazardous Materials Safety Administration (PHMSA), Form 18, Evaluation of LNG Facility Siting, Design, Construction, and Equipment (Rev 03/18/11).

Safety relief valves for the proposed “enclosed drainage channel” will be per NFPA 59A-2006 Section 5.2.2.3, are *sized for the anticipated liquid flow and vapor formation rates*, to prevent pressure build up in the casing that would be detrimental to the integrity of the casing or other equipment in the case of a LNG spill.

This order is for the waiver of 49 CFR 193.2167 only, and does not imply any approval of plans or drawings that must be presented and reviewed, with the guidance of PHMSA Form 18. Further, this project is subject to several other state and local permits and approvals prior to being authorized for construction.

This order does not release PSE from providing to the commission documents, plans, procedures and drawings for review in sufficient detail for the commission to determine compliance with all applicable requirements 49 CFR 193, National Fire Protection Association (NFPA) 59A, and Pipeline and Hazardous Materials Safety Administration (PHMSA) Form 18, Evaluation of LNG Facility Siting, Design, Construction, and Equipment (Rev 03/18/11).

### **Discussion**

Puget Sound Energy (PSE) requests a waiver from the portion of Federal Safety Standards for Liquefied Natural Gas Facilities in 49 CFR 193.2167. PSE intends to construct a LNG facility (facility) in the city of Tacoma, Pierce County, Washington. This facility will be connected to PSE’s intrastate natural gas distribution system. The facility will receive gas from the distribution system, produce LNG, and store it for use during times of peak demand. The facility will also supply LNG as a transportation fuel to TOTE shipping vessels. The TOTE terminal is located immediately across the street from PSE’s planned LNG facility. It is PSE’s intent to deliver LNG product to the TOTE facility on the Blair Waterway using a buried LNG transfer pipeline approximately 800 feet long.

Chapter 81.88 of the Revised Code of Washington requires state pipeline safety rules to meet or exceed federal standards. Under WAC 480-93-999, the commission expressly adopts by reference Parts 191, 192, 193, and 199 of Title 49 of the Code of Federal Regulations (CFR). The standards in 49 CFR 193.2167 are thus commission rules.

Under WAC 480-07-110, the commission may exempt an entity from the application of commission rules where consistent with the public interest, the purposes underlying the regulation, and applicable statutes. For the reasons described in this memo, PSE’s request meets the above standard. Staff recommends the commission grant PSE’s request for an exemption.

### **Alternate plans and delivery systems considered**

PSE considered several options to the proposed pipeline which would not require a waiver of the 49 CFR 193.

1. LNG resupply trucks: LNG trucks could resupply the LNG vessel by having 45 additional loaded LNG trailers on the very active shipping terminal. TOTE did not feel

that the additional trucks could be accommodated with the current shipping schedule per vessel that involves up to 600 trailers and 200 cars each way.

2. Standard pipe rack: A standard pipe rack is inexpensive and would allow visual inspection of all components. However, there is considerable risk from vehicular damage in the terminal area. In order to work properly, the pipe racks would need to be very tall to clear trucks transitioning underneath and would cause additional stresses for any seismic design considerations.
3. Preformed concrete trench: This would be relatively inexpensive and allow inspection of the pipeline by using a crane to remove concrete cover sections. However, this option is not gas tight and there is no way to purge the trench area to maintain oxygen-free environment. This type of environment could result in a potential explosive atmosphere with a pipe leak.
4. Preformed concrete trench with grate covering: This option is relatively inexpensive and allows the pipeline to be visually inspected by removing the grate. The area over the trench, however, becomes an NEC Class 1 Division 1 area, which precludes safe operation of vehicles over the trench. This option is not feasible for a shipping terminal.
5. Direct bury of the lines: This option is inexpensive. There are risks of third party damage with traditional gas line depth. However, there is no way to visually inspect the line and there is risk of gas migration in the event of a leak. Also, behavior during a seismic event and vapor dispersion criteria is unknown.
6. Pipe rack in casing: This is the proposed and the highest cost option. The transfer piping in a 48 inch casing, 1-inch thick at a depth of 11 feet removes any conceivable third party damage risk. The vacuum jacketed piping is in a dry, inert environment. Nitrogen purge and vent prevent the possibility of an explosive environment in the event of a pipeline leak. Dual leak detection (temperature sensor and hydrocarbon monitoring) in the event of a spill. Any inspection or maintenance requires the pipe rack assembly to be disconnected at the terminal side and rolled back out on rails at the facility site.

## Scope

The 49 CFR 193.2167 restrictions on covered impounding systems are stated in 49 CFR 193 amendment #17. The intent of 49 CFR 193.2167 is to ensure that a covered impound system does not produce an explosive area by confining air and CH<sub>4</sub> vapor in a flammable/explosive mixture in a closed container or a container that is not properly vented to prevent overpressure of the container.

PSE intends to construct a buried LNG transfer pipeline from PSE's LNG facility to the TOTE terminal. This buried pipeline could be considered a "covered impounding system" that is not allowed by 49 CFR 193.2167 and that is why PSE is requesting a waiver from the CFR. PSE intends to build an enclosed drainage channel which is allowed by newer versions of NFPA 59A 2013 Section 5.3.2.3 with certain restrictions. Restrictions are that they, "*conduct spilled LNG*

*away from critical areas and they are sized for the anticipated liquid flow and vapor formation rates.*” The enclosed drainage channel will be a 48 inch diameter carbon steel casing with a wall thickness of 1 inch. The enclosed drainage channel will be located at least 11 feet below grade to provide adequate protection for the LNG transfer pipeline. NFPA 59A – 2013, Section 5.3.2.3. *”Enclosed drainage channels for LNG shall be prohibited except where they are used to rapidly conduct spilled LNG away from critical areas and they are sized for the anticipated liquid flow and vapor formation rates.”* PSE will construct this LNG transfer pipeline with several safety systems that will provide a higher level of safety than other alternatives. This buried LNG transfer system will be installed beneath Port of Tacoma properties that are leased by TOTE and PSE, in addition to a public right-of-way and railroad tracks owned by the City of Tacoma. The area is located in an industrial sea port which contains no residences or parks.

PSE’s design removes the threat of flammable/explosive mixture by replacing the oxygen in the air with nitrogen gas and constantly purging with nitrogen so no flammable/explosive mixture can occur in the drainage channel. To prevent vapor pressure from damaging the casing in the event of a liquid release, the casing is protected with a pressure relief valve. The pressure relief valve must be sized to prevent overpressure of the casing.

The system will be monitored 24 hours per day, seven days per week. LNG is transported in a vacuum jacketed pipe where the vacuum will be monitored at all times and would sense a breach of any of the three vacuum lines. The bottom of the casing will have temperature sensors to detect the presence of LNG. The nitrogen purge will be monitored for the presence of organics (CH<sub>4</sub>-methane) and the casing will have a relief system to prevent any overpressure from the buildup of methane vapor. Any of the above conditions will prompt manual shutdown of the LNG transfer system to minimize the amount of LNG spilled.

Because the transfer lines will be considered a dock line, the Coast Guard will have operational safety jurisdiction for the line. The commission will review the design using PHMSA Form 18. commission will inspect construction and testing of the facility.

When considering 49 CFR 193 and Form 18, both documents are heavily dependent on NFPA 59A. Many of the citations and sections in the document cross reference to NFPA 59A. The current version of 49 CFR 193.2167 does not allow enclosed impoundments, but newer versions of NFPA 59A – 2013 allow the use of an “enclosed drainage channel” *where they are used to rapidly conduct spilled LNG away from critical areas and they are sized for the anticipated liquid flow and vapor formation rates.* The enclosed drainage channel will protect the LNG transfer lines from possible damage that would be expected of LNG lines positioned on a traditional pipe rack. The enclosed drainage channel and enclosed LNG transfer lines create a safer system than would be expected of an aboveground pipe rack exposed to the considerable truck traffic associated with the TOTE terminal. PHMSA statistics (2013-2015) show that 3.6 percent of all incidents are from vehicle damage not engaged with excavation, nearly half of the total for all Outside Force Damage (7.9 percent). With the traditional aboveground pipe rack, there would be added danger of vehicular and heavy equipment damage. Also, risk could be increased due to lack of automated leak detection.

The enclosed drainage channel will be installed 11-feet below grade and then the LNG transfer pipeline will be inserted in the enclosed drainage channel by means of a trolley system. The LNG transfer pipeline consists of one 10-inch diameter LNG vacuum-jacketed send-out pipeline with a 2-inch LNG vacuum-jacketed return line and a 3-inch vacuum-jacketed vapor return line. After all the transfer pipe has been connected on both sides of the channel then the enclosed drainage channel will be filled with nitrogen and continuously purged. The enclosed drainage channel will have temperature sensors located at the 6-o'clock position to detect the temperature drop from any LNG spill. The purge gas will be monitored for hydrocarbons and air at the purge vent. The containment and purge with inert gas appears safer than an aboveground pipe rack exposed to TOTE terminal traffic.

### **Other Regulatory Reviews**

Pipeline and Hazardous Materials Safety Administration (PHMSA) gave verbal approval of the waiver to the Washington Utilities and Transportation Commission (commission) on February 22, 2016, accepting the concept of the enclosed transfer line and drainage channel to the TOTE terminal.

The Coast Guard provided written approval on February 5, 2016, for the use of an “enclosed drainage channel” per Section 5.3.2.3 of NFPA 59A-2013 to protect the LNG transfer pipeline from vehicle traffic in and around TOTE terminal.

Staff have been in discussions with the City of Tacoma (Tacoma Fire Department) and they are aware of PSE’s plan to build an enclosed drainage channel and they have no objections to the waiver request.

Staff have reviewed the available options and agree with PSE that the proposed enclosed drainage channel will provide a higher level of safety than any of the alternatives.

### **Next Steps**

Upon submission of plans and supporting documents by PSE, staff will begin review and complete modules for the PHMSA Form 18, Evaluation of LNG Facility Siting, Design, Construction and Equipment (Rev 03/18/11) for the inspection of an LNG plant during construction. PSE will also be seeking other permits and approvals from local and state agencies.

Staff intends to brief the commission after completion of each of the PHMSA Form 18 modules and any other critical points in the project.