EXHIBIT NO. ___(JPH-1T)
DOCKET NO. UG-15____
WITNESS: JAMES P. HOGAN

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

In the Matter of the Petition of **PUGET SOUND ENERGY, INC.** **for (i) Approval of a Special Contract for Liquefied Natural Gas Fuel Service with Totem Ocean Trailer Express, Inc. and (ii) a Declaratory Order Approving the Methodology for Allocating Costs Between Regulated and Non-regulated Liquefied Natural Gas Services**	**DOCKET NO. UG-15____**

PREFILED DIRECT TESTIMONY (NONCONFIDENTIAL) OF JAMES P. HOGAN ON BEHALF OF PUGET SOUND ENERGY, INC.

AUGUST 11, 2015

PUGET SOUND ENERGY, INC.

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PUGET SOUND ENERGY INC.

PREFILED DIRECT TESTIMONY (NONCONFIDENTIAL) OF JAMES P. HOGAN

I. INTRODUCTION

Q. Please state your name, business address, and occupation.

A. My name is James P. Hogan. I am a Consulting Project Manager for Puget Sound Energy, Inc. ("PSE"). My business address is 10885 NE 4th Street, P.O. Box 97034, Bellevue WA 98009-9734.

Q. Have you prepared an exhibit describing your education, relevant employment experience, and other professional qualifications?

A. Yes, I have. It is Exhibit No. ___(JPH-2).

Q. What are some of your duties as Consulting Project Manager?

A. I am responsible for the overall design and construction of PSE's liquefied natural gas ("LNG") facility in Tacoma, Washington ("Tacoma LNG Facility"). In this role, I am responsible for scope, schedule, and budget for the design and construction of all elements of the Tacoma LNG Project. I lead a team of internal and external resources responsible for the preliminary design of Tacoma LNG Facility. Additionally, I support the commercial and permitting elements of the project as a technical resource. I manage contracts for the plant design effort, as well as develop and negotiate contracts for the construction phase of the project. I also serve as the technical "face of the project" for outside stakeholders

including public agencies, community groups, and customers. In this role, I represent PSE in government and community outreach activities through both informal meetings and group presentations. During construction, I am responsible for overseeing contractor performance, construction management, quality assurance, and any scope, schedule, or budget changes to the project.

Q. Please summarize the purpose of your prefiled direct testimony.

A. My testimony will provide an overview of the properties of LNG, the production, storage, and use of LNG, and safety topics associated with the Tacoma LNG Facility. I will additionally address the contracting methods proposed for the construction of the project, the permitting process, and the stakeholder outreach activities that have taken place.

II. DESCRIPTION AND USE OF LNG

Q. What is LNG?

A. LNG is liquefied natural gas. The liquefaction process first requires pre-treatment of the natural gas stream to remove impurities such as water, nitrogen, carbon dioxide, hydrogen sulfide and other sulfur compounds. By removing these impurities, solids cannot be formed as the gas is refrigerated. The pretreated natural gas becomes liquefied at a temperature of approximately –260°F (–160°C) and is then ready for storage and shipping. Because the LNG is an extremely cold liquid formed through refrigeration, it is not stored under pressure. It is sometimes also referred to as liquid methane.

Q. What are the properties of LNG?

A. LNG is colorless, odorless, non-toxic, non-flammable, non-explosive, and non-corrosive. At atmospheric pressure LNG boils and gives off natural gas vapor (methane), which may be flammable at certain concentrations in air. The LNG itself, however, will not ignite or explode. The density of LNG is about 3.9 pounds per gallon, compared to the density of water, which is about 8.3 pounds per gallon. Thus, LNG, if spilled on water, floats on top and vaporizes rapidly because it is lighter than water.

Q. If LNG is non-flammable how is it used for fuel?

A. LNG in its liquid state will not burn. In order to use it as a fuel, it is first warmed and returned to its vapor (gaseous) state just like the natural gas used for furnaces, water heaters, and stoves in homes and businesses. In its gas form it can be mixed with air and ignited in the pistons of an engine, just like diesel or gasoline.

Q. What are the benefits of LNG as compared to natural gas vapor?

A. The chief advantage of LNG is that it allows for the storage and transportation of large volumes of natural gas when a pipeline is not available. LNG takes up only 1/600th of the volume required for a comparable amount of natural gas at room temperature and normal atmospheric pressure. It would not be practical to store natural gas in its vapor form for later use during winter peaks (known as "peak shaving") or as fuel for a ship, locomotive, or other long-duration use such as long-haul trucking. Condensing the natural gas to liquid form allows it to be stored in a much smaller space.

Q. What is the difference between LNG and CNG?

A. As described above, LNG is methane that has been cooled to a liquid state with a corresponding 1/600th reduction in volume. Compressed natural gas ("CNG") is methane that remains in gaseous form but is stored at high pressure resulting in a reduction in volume of approximately 1/100th as compared to non-compressed natural gas. CNG is commonly used by buses, garbage trucks, and small cars and trucks that travel short distances and are considered "return to base" vehicles that are re-filled at the end of each day. In contrast, LNG is better suited for high-horsepower applications such as ships, locomotives, or long-haul trucks that have greater fuel requirements and typically travel much greater distances. The additional size reduction of LNG allows these vehicles to carry natural gas without allocating huge amounts of space for fuel storage.

Q. What experience does PSE have that lends itself to the operation of an LNG facility?

A. PSE has significant experience with natural gas and natural gas storage. PSE has operated an LNG peak shaving facility in Gig Harbor for over 10 years. This plant stores up to 140,000 gallons of LNG, which is purchased from other utilities, vaporizes it back to a gaseous state, and injects it into the local distribution system to augment the pressure on cold days. In recent years the plant has been used over 30 times per winter. PSE owns and operates the Swarr propane-air facility in King County, which has been in operation over four decades. This facility serves the same peak shaving function as the Gig Harbor facility or the proposed Tacoma LNG facility, but it uses a combination of

propane and air, rather than natural gas, to augment the natural gas system. At the correct mixture, propane and air can be interchanged with methane in natural gas appliances. The Swarr facility stores up to 1.5 million gallons of propane, which can be mixed with air and injected into the gas distribution system as needed. PSE also operates and co-owns the Jackson Prairie gas storage facility in Lewis County, which is the largest natural gas storage facility in the Pacific Northwest and provides 25% of the region's peak day gas demand. PSE also operates a fleet of natural gas-fired power plants, which are similar to the LNG plant in terms of requiring operations and maintenance planning, employee training, and safety programs.

III. LNG FACILITIES AND THE TACOMA LNG FACILITY

Q. How common are LNG plants?

A. There are over 100 LNG facilities in the United States. Please see Exhibit No. ___(JPH-3) for maps of LNG plants in the U.S. In addition to PSE's facility in Gig Harbor, there are five nearby facilities in the Pacific Northwest. Williams Pipeline owns a facility in Plymouth, Washington. Fortis owns two facilities in British Columbia—one in Vancouver and one in Prince Rupert. Northwest Natural Gas owns two facilities in Oregon—one in Portland and one in Newport.

Q. How does the Tacoma LNG Facility compare to the LNG export terminals being proposed in Oregon?

A. LNG export facilities, like the proposed Jordan Cove project in Oregon, are much larger than the Tacoma LNG Facility. Terminals like the proposed Jordan Cove

are referred to as "world-scale" plants, whereas the Tacoma LNG Project would be considered a small-scale facility. For example, the proposed Jordan Cove project's liquefaction capacity is 40 times greater than the Tacoma LNG Project and will have nearly 11 times the storage capacity. World-scale plants of the size of the proposed Jordan Cove project sit on much larger footprints. For example, the proposed Jordan Cove project is on 500 acres, as compared to 30 acres for the Tacoma LNG Facility. World-scale plants also generate their own electricity with on-site or nearby power plants solely dedicated to the plant. The Tacoma LNG Facility will take electricity from Tacoma Power (the local utility) via existing transmission lines in the adjacent street.

Q. Describe how LNG will be made at PSE's proposed plant.

A. Natural gas will enter the plant from PSE's distribution system and will be further pressurized and then filtered to remove impurities. Although natural gas is primarily methane, it also may contain a few percent of other chemicals such as carbon dioxide, sulfur compounds, and other components that freeze at a higher temperature than methane. These chemicals are removed before the gas stream is cooled to -260 degrees, or they would freeze and clog the process. Following removal of these components, the natural gas stream is cooled in a refrigeration system until it condenses into a liquid. It is then stored on site in an insulated tank at essentially atmospheric pressure.

Q. What are the main components of the proposed LNG plant?

A. The largest feature of the facility is an eight million gallon, full containment concrete tank. This tank consists of an interior nickel steel tank, surrounded by a concrete outer tank, with insulation between the two vessels. Most of the rest of the facility is called the liquefaction train, which consists of a large refrigeration system and associated piping, fans, and compressors to treat and cool the gas stream. The facility also contains smaller ancillary equipment such as a control building, electrical substation, and equipment to return the LNG to the natural gas distribution system.

Q. How is the LNG returned to the PSE distribution system?

A. LNG is pumped from the storage tank and run through a heat exchanger in a hot water bath. This warms the LNG from -260 degrees to +60 degrees F where it is then odorized and sent back into the PSE distribution system via the same pipe used to provide gas for the liquefaction process. The plant will not make LNG on days that it is returning gas to the PSE distribution system.

IV. SECURITY AND SAFETY

Q. What type of security is planned for the Tacoma LNG facility?

A. Security at an LNG facility is similar that of any other industrial facility. Federal regulations prescribe requirements for access control, physical security (fences, etc.), communication requirements, monitoring, and lighting requirements. The code further states that all security systems have backup power sources in the event of a power outage.

Generally speaking, the Tacoma LNG Facility will have the same access control card reader systems as other PSE facilities, as well as closed circuit television monitoring. The Tacoma LNG Facility may also employ a security service to provide a guard at the main gate to monitor ingress and egress.

Q. Describe the safety properties of LNG and the Tacoma LNG Facility.

A. As previously discussed, LNG itself is not flammable; however, as it boils off at ambient temperatures it releases methane vapor which is flammable when mixed with air at the proper concentration (5 – 15% methane to air). The same safety precautions that surround the use of natural gas in homes and businesses apply to working with LNG. In addition, due to LNG's cold temperature, steps are taken to prevent contact with skin or other materials that can be harmed by extreme low temperatures.

Q. What happens if a pool of LNG catches on fire?

A. Since LNG itself will not burn, only the vapor space immediately above a pool of spilled LNG will burn until there is no more LNG left. A methane flame in the open atmosphere is often referred to as a slow, lazy flame—much like that of a candle. In the event of an LNG pool fire, the flame can be extinguished by a dry chemical fire extinguisher, or in some cases may be left to just burn itself out.

Q. What are the safety regulations that govern design, construction, and operation of an LNG plant?

A. Although there are myriad federal, state, and local codes and standards that cover LNG, the overarching regulation is the U. S. Code of Federal Regulations (CFR)

Title 49, Part 193, *Liquefied Natural Gas Facilities: Federal Safety Standards*. These regulations provide requirements for siting requirements; the design, construction, and operation and maintenance of LNG facilities; personnel qualifications and training; and fire protection and safety, including seismic design, fire protection, spill containment, and emergency procedures.

NFPA 59A "Standard for the Production, Storage, and Handling of Liquefied Natural Gas" is an industry standard issued by the National Fire Protection Association ("NFPA"). NFPA 59A covers general LNG facility considerations, process systems, stationary LNG storage containers, vaporization facilities, piping systems and components, instrumentation and electrical services, transfers of natural gas and refrigerants, fire protection, safety and security. This standard includes requirements for LNG facilities to withstand substantial earthquakes. The NFPA standard for level of design means that the LNG facilities are strongly fortified for other events such as wind, flood, earthquakes and blasts.

Q. What are the physical safety features of the Tacoma LNG Facility?

A. The plant will be designed and built in accordance with regulations that set forth strict design standards and multiple levels of redundancy and hazard detection to prevent accidents or the release of LNG or natural gas vapors. It will be designed to have quick detection of any spill, with rapid automatic shutdown and isolation. Multiple sensors located throughout the plant are designed to rapidly detect a spill. These sensors include methane detectors, smoke detectors, flame sensors, and cryogenic temperature sensors. In addition, the plant has an Emergency Shut Down ("ESD") system that automatically shuts the plant down and places it in a

safe mode (stopping pumps, closing valves, etc.) whenever a non-normal condition is sensed. There are also ESD buttons placed throughout the plant that allow personnel to manually trigger a shutdown in the event of an emergency.

Q. Are earthquakes factored into the design of the proposed facility?

A. Yes. Federal safety standards for LNG facilities are much more stringent than for most other structures, including roads, bridges, and overpasses. The proposed Tacoma LNG Facility has been designed to withstand a seismic event with a mean return interval of 2,450 years (a two percent probability that the event will happen in a 50-year period) with no loss of LNG. To put that in perspective, this event is far greater than the design event for bridges or overpasses required by the American Association of State Highway Safety Officials and the Washington State Department of Transportation – a mean return interval of 1000 years (a five percent probability that the event will happen in a 50-year period). A higher mean return interval correlates to a more powerful seismic event.

V. ENGINEERING AND CONSTRUCTION

Q. What contracting methodology does PSE plan to use for the Tacoma LNG Facility?

A. The bulk of the Tacoma LNG Facility (including pre-treatment, liquefaction, storage tank, truck rack, vaporization system, and balance of plant) will be engineered and constructed pursuant to an engineering, procurement, and construction ("EPC") contract. PSE will self-perform initial site preparation (demolition, soil improvement, and underground utilities) as well as ancillary

systems (marine structures, building improvements, etc.) via traditional design, bid, build contracting methodology.

A. Work to be Performed by an Engineering, Procurement, and Construction Contractor

Q. Please describe PSE's decision to engineer and construct the bulk of the Tacoma LNG Facility pursuant to an EPC contract.

A. PSE originally retained the national engineering firm CH-IV International ("CH-IV") to assist with feasibility studies for the Tacoma LNG Facility. In 2012, based upon input from CH-IV and a study of the marketplace, PSE determined that an EPC contracting methodology would be the preferred method for contracting portion of the Tacoma LNG Facility.

An EPC contract is a firm, fixed price contract with performance guarantees and liquidated damages. In exchange for control of all elements of the project (engineering, procurement, and construction), the EPC contractor retains cost and schedule risks during project delivery.

EPC contracts are particularly suitable for manufacturing or process plants where the owner can set specific performance criteria (in PSE's case, production quantity, storage quantity, and send-out requirements), but is not heavily vested in the methodology of producing the product (i.e., technology neutral and/or the design of the facility is outside the owner's core business or skill set).

The EPC contractor is therefore responsible for process design, including specifying, procuring, installing, and commissioning all elements of the project as

required to meet performance specifications and guarantees stipulated by the owner in the contract. Since the EPC contractor also constructs the project, the owner has a single point of contact throughout the life of the project. Also, because a single entity holds responsibility for both design and construction, a more active consideration of constructability and construction efficiency in the design of the project is more likely than it would be with alternative contracting methodologies such as design-bid-build, or even design-build.

Q. Has PSE used an EPC contractor during the development phase of the Tacoma LNG Facility.

A. Yes. During the initial development phase of the Tacoma LNG Facility, PSE selected a single EPC contractor to perform an initial front end engineering design ("FEED") study to develop the plant to a conceptual level and provide budgetary pricing. In 2013, PSE selected Chicago Bridge & Iron, an international leader in LNG plant and tank engineering and construction, from a field of seven candidate firms or teams to perform the FEED study for the Tacoma LNG Facility.

Q. Has Chicago Bridge & Iron completed the FEED study?

A. Yes. Due to the commercial uncertainty of the Tacoma LNG Facility, Chicago Bridge & Iron completed an initial FEED study, which culminated in an open book price review and firm bid price in fall 2013. Although PSE had no intention of executing on the firm price proposal at that time, PSE has used the work product to support continued commercial and regulatory development.

Q. Is Chicago Bridge & Iron still involved in the development phase of the Tacoma LNG Facility?

A. Yes. PSE has retained Chicago Bridge & Iron has been retained to continue value engineering and other plant design changes, as required, to support ongoing changes to the Tacoma LNG Facility (TOTE direct loading line, permit preparation, developments in regulations, etc.). Chicago Bridge & Iron submitted a revised proposal to PSE in June, 2015 that incorporated these design changes.

Q. Will PSE conduct a competitive bid process for the EPC contract?

A. Yes. After the initial selection of Chicago Bridge & Iron for the FEED study, the target completion date of the project was moved to January 1, 2019, due to the time necessary for TOTE to complete its competitive bidding process for an LNG supplier.

This delay allowed PSE to commission Black & Veatch to perform a parallel FEED effort to develop pricing for a plant based upon the same design criteria as used for the existing Chicago Bridge & Iron FEED study. (Black & Veatch was a top contender for the original FEED contract and has experience designing and building LNG facilities globally.) Given the relatively small cost of a FEED study (approximately 0.5 percent of the plant cost) and the value to PSE of having competitive options for the EPC contract, this process offers value to the Tacoma LNG Facility. Black & Veatch completed their FEED study in May of 2015 and submitted a proposal to PSE.

PSE will select an EPC contractor prior to final approval by the PSE Board of Directors for the construction of the Tacoma LNG Facility.

Q. What will be the scope of work of the EPC contractor during the construction phase of the Tacoma LNG Facility?

A. During the construction phase, the EPC contractor will maintain responsibility for the site and all subcontractors working on the plant scope of work (pre-treatment, liquefaction, storage, send out, and balance of plant).

PSE staff will be co-located onsite and provide overall project management, quality assurance of EPC work product, and project management of ancillary activities occurring in parallel on the Facility site (marine construction, Tacoma Power substation construction, and PSE-provided metering and odorization at the pipeline tie-in point). PSE will also manage and coordinate with TOTE for construction activities taking place at the TOTE terminal (direct LNG line to TOTE and the loading platform on the Blair waterway).

B. Work to be Performed by PSE

Q. What work will PSE perform at the Tacoma LNG Facility?

A. PSE will perform all design and construction work necessary to ready the site for the EPC contractor (demolition, soil improvement, and underground utilities), as well as all marine work (TOTE loading platform). PSE is choosing to perform these project elements because they are outside the value-added capability of an EPC contractor and can be more cost effectively managed by PSE using local resources.

Q. Has PSE assembled a design team for the work to be performed by PSE?

A. Yes. The design team for the work to be performed by PSE includes the following firms:

- **GeoEngineers (Geotechnical Design)**. GeoEngineers is a regional engineering firm that has worked on projects with PSE for over 25 years. GeoEngineers also has extensive experience working in the Port of Tacoma and other port facilities in the Northwest. The GeoEngineers scope of work includes developing ground improvement strategies to meet federal and local seismic design requirements, coordinating structural and foundation requirements with the EPC firm and providing contracting and quality assurance support for the execution of the ground improvement program.

- **Moffatt & Nichol (Marine Design).** Moffatt & Nichol is an international engineering firm specializing in infrastructure projects on coastlines, harbors, and rivers. Moffatt & Nichol has been involved in many of the LNG import/export terminal projects in North America and has ongoing working relationships with the Port of Tacoma, GeoEngineers, and Chicago Bridge & Iron. Moffatt & Nichol also successfully participated in two prior projects for PSE (both the Upper and Lower Baker Dam Floating Surface Collectors). Moffatt & Nichol's scope of work includes development of a demolition plan for the existing timber pier and design of a new concrete pier on the Hylebos Waterway, the design of a new loading platform on the Blair Waterway, and marine construction oversight as necessary.

- **Sanborn Head & Associates (Owner's Engineer).** Sanborn Head is a regional engineering company located in New England with experience consulting on a number of LNG projects on the east coast and has worked on projects with Chicago Bridge & Iron. Sanborn Head has been retained to: review EPC design work product, perform a peer review of GeoEngineers work product, assist with EPC contract preparation, and provide support on permitting and community outreach efforts, as needed.

- **Tacoma Power (Substation Design/Construction).** Tacoma Power will design and construct the utility substation located on the site. It has already completed an initial preliminary power supply study and will be further engaged as the Tacoma LNG Facility moves forward.

- **Sitts & Hill Engineers – Site Civil Design.** Sitts & Hill is a local Tacoma civil engineering firm with experience working in the Port of Tacoma. Their work scope includes creating demolition drawings and specifications, designing storm water management systems, fire water, domestic water, and sanitary sewer systems, overall site grading plans, and permitting assistance.

Q. Has PSE selected firms for the construction work to be performed by PSE?

A. No, not yet. Construction work to be performed by PSE will be contracted to a minimum of three firms. The site soil improvement work can only be performed by a limited number of specialized contractors, some of which use proprietary soil improvement techniques. The design will be "performance-based" in nature, which allows contractors to bid different techniques to meet final design requirements. The Tacoma LNG Facility is large enough to attract contractors from outside the Pacific Northwest, and both GeoEngineers and Sanborn Head will assist PSE in drawing interest from as many contractors as possible in order to ensure a competitive bid environment.

Q. Has PSE selected firms for the site demolition and underground utility work to be performed by PSE?

A. No, not yet. Site demolition and underground utility work can be performed by any number of general contractors in the Seattle-Tacoma area, and PSE expects the bidding environment to be quite competitive. Likewise, although marine

construction is more specialized, there are a number of firms in the Pacific Northwest capable of performing the expected work.

VI. PERMITTING PROCESS

Q. What permits are required for the construction of the project?

A. PSE is working with over a dozen local, state, and federal agencies on the environmental review and permitting of the project. These give the public opportunities for input and allow for stakeholders' needs and preferences to be considered in the design and construction of the project. Please see Exhibit No. ___(JPH-4) for a list of project permits.

Q. What is the status of the project permits?

A. PSE is currently in a State Environmental Policy Act permitting process with the City of Tacoma as the lead agency. The City of Tacoma published a Draft Environmental Impact Statement in early July and the public comment period for the Draft Environmental Impact Statement is set to close August 6, 2015. After closure of the public comment period, the City of Tacoma will issue a Draft Environmental Impact Statement and formally complete the State Environmental Policy Act process. This is expected to take place by mid-September. Until that time, none of the other permits that PSE has applied for may be issued.

Q. What other permits has PSE applied for?

A. PSE has applied for the following permits in parallel to the State Environmental Policy Act process:

- Tacoma Shoreline Substantial Development Permit (includes Critical Areas Review);
- Pierce County Conditional Use Permit;
- NPDES Construction Stormwater General Permit (Washington State Department of Ecology);
- Coastal Zone Consistency Determination (Washington State Department of Ecology);
- 401 Water Quality Certification (Washington State Department of Ecology);
- Hydraulic Project Approval (Washington Department of Fish and Wildlife);
- Section 106 Consultation (Washington Department of Archeology and Historic Preservation and Tribes);
- Nationwide Permit 3 for Stormwater Outfall Repair and Maintenance (U.S. Army Corps of Engineers);
- Individual Section 10 Permit for In-water Construction (U.S. Army Corps of Engineers);
- Waterway Suitability Analysis (U.S. Coast Guard); and
- Section 7 Consultation with National Marine Fisheries Service and US Fish and Wildlife Service under the Endangered Species Act and Magnuson-Stevens Fishery Management and Conservation Act.

Q. What is the status of the remaining permits?

A. The remaining permits are in work (site demolition permit, construction stormwater permit, etc.) or will be applied for when the project design advances further.

VII. COMMUNITY SUPPORT

Q. What outreach has been done for the Tacoma LNG Project?

A. Early in the project, PSE conducted focus groups and telephone polls to gauge the public's understanding of LNG and understand any concerns. Based on this input an outreach strategy was developed to ensure that all stakeholders were informed and given an opportunity for input. This outreach has included briefings with elected officials at the federal, state, county, city, and Port of Tacoma levels. In addition, PSE has met with local community groups, business groups, and Port of Tacoma tenants, and maintains a website and dedicated email for project questions or comments. Pursuant to the City of Tacoma State Environmental Policy Act process, there have been two public open houses, two all-agency open houses (for permitting agencies), and several meetings with the Northeast Tacoma Community Council.

Q. What has been the response from the stakeholder outreach?

A. The project has received unanimous support from elected officials at all levels. Community members and other local stakeholders have been generally supportive or ambivalent about the project. Please see Exhibit No. ___(JPH-5) for examples of support from local stakeholders.

VIII. CONCLUSION

Q. Please summarize your prefiled direct testimony.

A. Liquefied natural gas provides a safe and effective method of storing large volumes of natural gas for utility peak shaving and for transportation fuel. PSE

has established deliberate and prudent methods to design and construct the Tacoma LNG in an effective manner.

Q. Does this conclude your prefiled direct testimony?

A. Yes.