Statement of Basis for the Air Operating Permit—Final

Puget Sound Energy
Encogen Generating Station

Bellingham, Washington

February 5, 2014

northwest Clean Air agency

Serving Island, Skagit & Whatcom Counties

PERMIT INFORMATION

Puget Sound Energy - Encogen Generating Station
915 Cornwall Avenue, Bellingham, WA 98225

SIC: 4911
NAICS: 221 **NWCAA ID: 1638-V-W**
EPA AFS: 53-073-00032

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Air Operating Permit Number:	**Issuance Date:**
004R2M2	August 4, 2011
Permit Modifications:	**Modification Date:**
Modification 2	February 5, 2014
Supersedes Permit Number:	**Expiration Date:**
004R2M1	August 4, 2016
Application Received Date:	**Renewal Application Due:**
May 29, 2008	August 4, 2015

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1 INTRODUCTION

The Puget Sound Energy - Encogen Generating Station (PSE Encogen), located in Bellingham, Washington, is required to obtain an air operating permit because it has the potential to emit 100 tons or more of each of the following "criteria"[1] pollutants: oxides of nitrogen (NO_X), sulfur dioxide (SO_2), and carbon monoxide (CO). These criteria pollutants are emitted during the burning of liquid and gaseous fossil fuels in three combustion turbines that produce electric power for the Puget Sound Energy (PSE) grid. The primary sources of emissions are the three GE Frame 6 combustion turbines and the transfer and storage of fuel oil[2]. Furthermore, PSE Encogen is subject to the acid rain program (Title IV of the Clean Air Act), which also triggers the requirement to obtain an air operating permit.

The purpose of this Statement of Basis is to set forth the legal and factual basis for the conditions of the PSE Encogen Air Operating Permit (AOP) No. 004R2 in accordance with WAC 173-401-700(8). This document also provides background information to facilitate review of the permit by interested parties. The Statement of Basis is not a legally enforceable document.

1.1 Permit Changes in the Second Renewal

The Northwest Clean Air Agency (NWCAA) received an application for the second renewal of the PSE Encogen AOP on May 29, 2008.

For this second AOP renewal, formatting throughout the AOP was updated to current NWCAA standards. Changes specific to each permit section are listed below. Changes made during an earlier AOP renewal and modification are listed in Appendix A.

1.1.1 General Information and Attest

- The Responsible Official and Corporate Inspection Contact information was updated. Dates were incremented generally by five years, except that the renewal application is now due one year, rather than six months, before permit expiration.
- NWCAA signatories were updated.

1.1.2 Section 1 Emission Unit Identification

The previous version of the AOP listed only aboveground distillate fuel oil storage Tanks B and C. Table 1 was updated to include Tank A, which is a potential emission unit but is out of service as of the date of permit issuance.

1.1.3 Section 2 Standard Terms and Conditions

Section 2 of the AOP was updated with the current NWCAA standard version, which includes new and modified applicable regulations and updated reference dates.

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[1] The Environmental Protection Agency (EPA) calls these pollutants "criteria" air pollutants because it regulates them by developing human health-based and/or environmentally-based criteria (science-based guidelines) for setting permissible levels in the ambient air. For more information, please visit the EPA's website www.epa.gov/air/urbanair.

[2] The terms "fuel oil", "No. 2 distillate", "diesel fuel", "diesel oil", "No. 2 diesel", and "oil" all are synonymous with the term "on-road spec oil" within the context of the PSE Encogen Air Operating Permit and Statement of Basis. "On-road spec oil" means "on-road specification No. 2 diesel fuel" containing no more than 0.05 percent sulfur by weight, as specified in 40 CFR 80.29, as amended through January 18, 2001.

1.1.4 Section 3 Standard Terms and Conditions for NSPS

Section 3 of the AOP was updated with the current NWCAA standard version consistent with the NSPS regulations that apply to PSE Encogen. New and modified applicable regulations and updated reference dates are included.

1.1.5 Sections 4 and 5 Generally and Specifically Applicable Requirements

Changes made to the Generally and Specifically Applicable Requirements sections in the current AOP are summarized in the following bulleted list:

- The monitoring, recordkeeping, and reporting (MR&R) requirement for opacity compliance determination was clarified in Section 4. The Section 5 opacity term references the opacity MR&R in Section 4.
- General odor, nuisance, and fugitive emission terms now reference one set of updated MR&R requirements. These updates result in more stringent requirements for fugitive emissions and a consistent approach for addressing complaints.
- Compliance with the SO_2 emission limits is now demonstrated by requiring that fuel receipts be kept to show that only natural gas or low-sulfur diesel fuel is burned rather than periodic testing with stain tubes per ASTM methods.
- Table 5 has been split into two tables of specifically applicable requirements: requirements for the three combustion turbines are listed in Table 5-1, and requirements for the three fuel storage tanks are listed in Table 5-2. What used to be term 5.11 for the combustion turbines, for example, is now term 5.1.11.
- Updates to the combustion turbine Order of Approval to Construct (OAC) 400 were incorporated into the AOP. OAC 400e is the current revision at the time of AOP issuance; more detail on OAC 400 revisions is provided in Section 2.4.
- Consistent with Prevention of Significant Deterioration (PSD) permit 91-02 Amendment 2 conditions 2 and 10, the following statement is included in the AOP terms that limit NO_X emissions from the turbine stacks: "During startup or shutdown conditions, NO_X emissions in excess of the above limits shall be considered unavoidable provided the source reports the exceedance according to Permit Term 5.1.4".
- SO_2 emissions are limited to 9.0 ppmdv (corrected to 15% O_2 and ISO conditions) daily average and 1,584 lb/day when fired on fuel oil, and 100 lb/day when fired on natural gas (no SO_2 concentration limit is set for natural gas firing). In addition, fuel-bound sulfur is limited to 0.8% by weight, and stack emissions cannot exceed 150 ppmdv corrected to 15% O_2. These AOP terms have a common MR&R requirement, which has been significantly upgraded from the previous permit. The original MR&R required that the facility burn only natural gas unless that fuel is curtailed, then burn oil that contains no more than 0.05% sulfur by weight. Consistent with the cited New Source Performance Standard regulations, the MR&R term now requires testing of fuels unless the permittee has a valid purchase contract, tariff sheet, or transportation contract showing that the natural gas contains 20.0 grains or less of total sulfur per 100 standard cubic feet, and oil contains no more than 0.05% by weight sulfur. Additionally, natural gas curtailment is defined.
- Consistent with PSD permit 91-02 Amendment 2 conditions 4 and 10, the following statement is included in the AOP term that limits CO emissions from the turbine stacks: "During startup or shutdown conditions, CO emissions in excess of

the above limits shall be considered unavoidable provided the source reports the exceedance according to Permit Term 5.1.4". Periodic source testing for CO is now required by OAC 400e and is listed in the AOP as well.

- NWCAA determined that CO is an appropriate surrogate for incomplete combustion and volatile organic compound (VOC) emissions from the combustion turbine stacks at the PSE Encogen facility. Limits for unburned hydrocarbons were dropped from OAC 400e, and periodic CO source testing is now required. The Specifically Applicable VOC term in the previous AOP that cited the unburned hydrocarbon limit of OAC 400 was dropped from the current AOP.
- OAC 951 was modified in June 2008 to eliminate the need for source testing while the unit is physically removed from service; the associated AOP terms were updated to reflect this testing requirement change. OAC 951a is the current revision at the time of AOP issuance.
- OAC 428 lists conditions for three tanks: A, B, and C. Tank A is out of service. The previous version of the AOP listed only Tanks B and C. All three tanks are now listed Table 5-3.

1.1.6 Section 6 Acid Rain Permit for Combustions Turbines 1, 2, and 3

The permittee is required to resubmit the Acid Rain Permit Application and Certificate of Representation every five years. The new documents were scanned and included in the AOP.

1.1.7 Section 7 Inapplicable Requirements

References to 40 CFR 60 Subpart GG were removed since the applicability of specific terms in the standard is addressed in the rule, and the rule itself applies to the PSE Encogen facility. The permit shield has been extended to cover the inapplicable requirements per WAC 173-401-640.

1.2 Changes made during Modification 1 (Administrative Amendment)

The responsible official was changed from Wayne Gould to Ed Odom. Permit information on page 2 of the AOP and SOB were changed to reflect issuance of this modification.

These changes were performed in accordance with WAC 173-401-720.

1.3 Changes made during Modification 2

This modification is an administrative permit amendment pursuant to WAC 173-401-720(3).

PSE Encogen has dismantled and sold the auxiliary boiler on April 1, 2013. As a result, Table 5-2 of AOP 004R2M1, which contains conditions from OAC 951a pertaining to the auxiliary boiler, has been removed from the permit. Table 1-1 of the AOP, containing the emission units at the facility, has been edited accordingly. Table 7-1 in Section 7 of the AOP (Inapplicable Requirements) also was edited to remove references to the auxiliary boiler.

2 FACILITY DESCRIPTION

2.1 General Facility Description

The PSE Encogen facility is located on approximately 5 acres in the 900 block of Cornwall Avenue in Bellingham, Washington. The plant is approximately 1,000 feet east of Bellingham Bay. The surrounding area is predominantly industrial or commercial; however, there is a residential area on the hillside east of the plant. Puget Sound Energy assumed complete ownership of the facility in November 1999. The plant was originally constructed and operated by the Enserch Development Corporation.

The PSE Encogen facility consists of three combustion gas turbine generator systems and associated heat recovery steam generators (HRSGs) and exhaust gas treatment, a steam turbine-generator system, fuel oil storage, an electrical switchyard, and equipment for feed water treatment. A facility plot plan is shown in Figure 2-1.

PSE Encogen is a combined cycle facility that produces electric power, steam, and hot water from the combustion of fossil fuels. The electric power generated by the combustion and steam turbines is transferred to the distribution system operated by Puget Sound Energy. Prior to December 2007, PSE Encogen was considered a combined cycle cogeneration facility since steam and hot water were transferred to the adjacent Georgia-Pacific (GP) tissue plant for use in their manufacturing process. However, with the shutdown of the GP plant in December 2007, PSE Encogen is no longer a cogeneration facility and is now classified simply as a combined cycle facility. A process flow diagram is shown in Figure 2-2.

In early 2006, a 93 MMBtu/hr (million British thermal units per hour) natural gas-fired Nebraska auxiliary boiler was added to the facility to provide steam to the GP plant during times when the turbines were not in operation. On December 21, 2007 and concurrent with the shut-down of the GP plant, the auxiliary boiler was disconnected from service and designated as inactive. On April 1, 2013, the boiler was sold and removed from site.

The combined cycle turbines use natural gas as the primary fuel source, but distillate fuel oil is available as a backup fuel to facilitate continued generation of power in the event of a natural gas curtailment[3]. A small amount of fuel oil is used for periodic readiness testing of the turbines. This testing typically consumes less than 100,000 gallons of distillate fuel per year. The backup fuel is maintained in two 470,000-gallon tanks. A third 470,000-gallon tank exists on-site, but it is not used nor is it connected to the fuel delivery system. Fuel oil is delivered to the PSE Encogen site by tanker truck from various suppliers.

Natural gas is provided to the facility via pipeline from Canada and is consumed at a maximum nominal rate of 1,320 MMBtu/hr. Electrical output to PSE at full nominal rating is 172 megawatts (MWe). This is an increase from 160 MWe full nominal rating for the PSE Encogen plant due to the closure of the GP plant; steam that used to go to GP, about 140,000 pounds per hour, is now routed through the steam turbine, which generates more power. Therefore, the increased power output does not result in increased emissions.

[3] *Period of natural gas curtailment or supply interruption* means a period of time during which the supply of natural gas to an affected facility is halted for reasons beyond the control of the facility. An increase in the cost or unit price of natural gas does not constitute a period of natural gas curtailment or supply interruption. (Reference: 40 CFR 63.7575).

Prior to the shutdown of the GP plant, PSE Encogen supplied steam and hot water to GP for use in their process, and GP received and treated wastewater from PSE Encogen. Since the shutdown of GP, process water and wastewater exchange no longer occurs. Excess heat from PSE Encogen's electrical generation operations is dissipated through the cooling towers, and process wastewater is now treated onsite to adjust pH and discharged to the City of Bellingham sewer system.

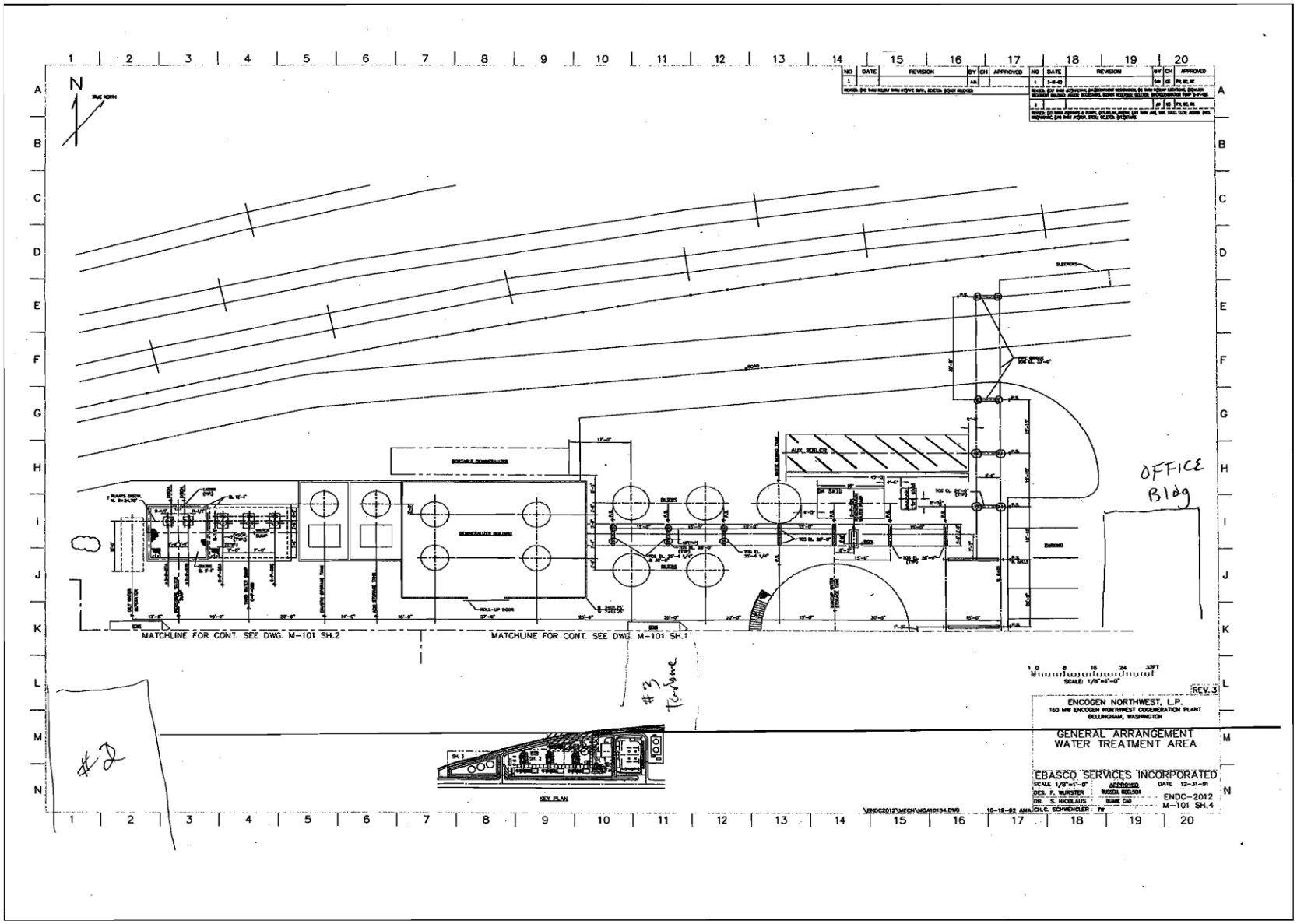

Figure 2-1 PSE Encogen Plot Plan

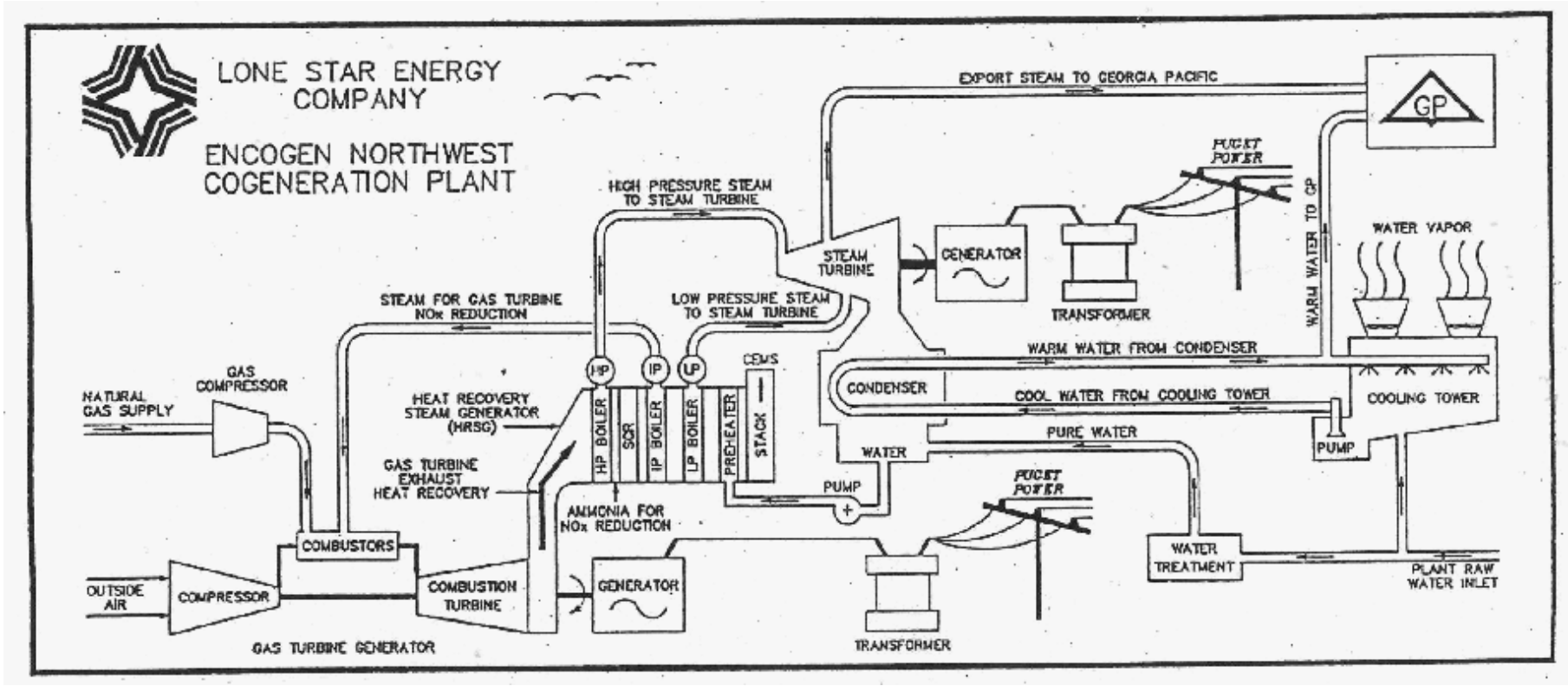

Figure 2-2 PSE Encogen Process Flow Diagram

2.2 Emission Unit Description

2.2.1 Turbine Units

The combustion turbines are GE Frame 6, Model MS6001B combined cycle combustion gas turbine generator systems with associated heat recovery steam generators (HRSG). These turbines are designated as Turbine Units 1, 2, and 3, and each has a separate exhaust stack. Each turbine is rated at 440 MMBtu/hr heat input and 41.5 MWe electrical output when burning natural gas. When burning No. 2 distillate fuel during natural gas curtailment events, each turbine is rated at 470 MMBtu/hr heat input and 39.9 MWe electrical output. PSE Encogen employs various techniques to control pollutants generated in the turbines during the combustion process.

Nitrogen oxides (NO_X) are controlled by injection of steam into the turbine combustors and the use of a selective catalytic reduction (SCR) system. Steam injection limits combustion temperatures thereby limiting formation of thermally generated NO_X. The SCR system controls NO_X through injection of ammonia ahead of a catalyst grid in the HRSG section. Most of the NO_X reacts to form elemental nitrogen and water in the presence of ammonia and catalyst. Ammonia (NH_3) emissions are controlled by carefully regulating the rate of ammonia injection into the SCR system.

Sulfur dioxide emissions are controlled by use of natural gas and "on-road spec" diesel fuels, both of which are considered to be low-sulfur fuels.

Emissions of particulate matter, nearly all of which is composed of particles with a mean aerodynamic diameter smaller than 10 microns (PM_{10}), as well as carbon monoxide (CO) and volatile organic compounds (VOCs), are minimized by the use of "good combustion practices." Turbines generate the least amount of combustion byproducts such as PM_{10}, CO, and VOC when they are operating most efficiently.

Continuous emission monitoring systems (CEMS) continuously measure emissions of NO_X and O_2 from the turbine exhaust stacks.

2.2.2 Distillate Oil Storage Tanks

The facility has three distillate oil storage tanks; each tank has a capacity of 470,000 gallons. On March 20, 2004, one of the storage tanks (Tank 'A') was decommissioned due to a reduced requirement for on-site storage of backup fuel. "Good engineering practices" are used to minimize evaporative emissions of VOCs from the oil storage tanks. Good engineering practices consist of painting the tanks a light color, using the tanks only for storage of low vapor pressure diesel fuel, and taking precautions to minimize spillage during fuel transfer activities.

2.2.3 Ammonia Storage

Originally, an anhydrous ammonia storage and delivery system was used in conjunction with the combustion turbine SCR system to reduce emissions of NO_X. In November 2006, the system was converted to an aqueous ammonia storage and delivery system. Aqueous ammonia has fewer risks associated with its storage and handling than does anhydrous ammonia; thus the risks to plant personnel and the public in the surrounding area are reduced by the switch to an aqueous ammonia system.

2.3 Emissions Inventory

The facility qualifies as a major source subject to the requirements of the Clean Air Act (CAA) Title V program because it has the potential to emit more than 100 tons per year of NO_X, SO_2, and CO. The primary sources of emissions are the three combustion turbines.

Table 2-1 and Table 2-2 below show the recent emissions history of the facility as identified in

the annual emissions inventory submitted to NWCAA for the seven year period from 2004 through 2010. Table 2-1 lists the criteria pollutant emissions in tons per year, and Table 2-2 lists the toxic pollutant emissions in pounds per year.

Table 2-1 Criteria Pollutant Emissions Inventory, tons per year

Pollutant ton/year	2004	2005	2006	2007	2008	2009	2010
PM_{10}	6	6	3	3	1	1	0
$PM_{2.5}$	6	6	3	3	1	1	0
NH_3	13	10	8	7	3	10	7
SO_2	4	5	3	3	2	6	3
CO	13	14	7	5	3	10	5
NO_X	51	51	30	21	12	40	21
VOC	1	0	0	1	0	0	0
CO_2					47,075	177,097	94,537
CH_4 (CO_2e[4] = tons CH_4*21)					3 (63)	15 (315)	7 (147)
N_2O (CO_2e = tons N_2O*310)					0	6 (1,860)	3 (930)
Total CO_2 equivalents					47,138	179,272	95,614

Table 2-2 Toxic Pollutant Emissions Inventory, pounds per year

Pollutant lb/year	2004	2005	2006	2007	2008	2009	2010
1,3 Butadiene	2	2	0	0	0	NR*	0
Acetaldehyde	174	136	93	63	35	128	69
Acrolein	28	26	15	11	6	21	12
Benzene	52	51	28	20	11	41	21
Ethylbenzene	139	133	74	51	29	102	55
Formaldehyde	915	1,041	554	372	212	776	417
Naphthalene	6	5	3	3	0	3	3
PAH, Total	9	9	6	3	3	6	3
Propylene Oxide	126	120	68	46	26	93	50
Sulfuric Acid	NR	NR	NR	NR	NR	NR	0
Toluene	566	541	302	208	113	418	225
Xylenes (Mixed Isomers)	278	265	148	102	55	206	111

*NR – Not Reported

2.4 Permitting History

This section provides a brief chronological history of the PSE Encogen facility owners and operators and associated permit activity.

[4] Carbon dioxide equivalents (CO_2e) are equal to the tons of greenhouse gas times the Global Warming Potential as listed in Table A-1 of WAC 173-441-040(2).

On September 26, 1990, an agreement was signed for "Firm Power Purchase" between Puget Sound Power & Light Company ("Puget") and Encogen Northwest, LP, ("ENW"), a Delaware limited partnership. The agreement stated that ENW should sell and deliver to Puget the entire electrical output of the plant. The agreement stated that the ENW facility was a "qualifying co-generation facility" pursuant to the provisions of Section 210 of the Public Utility Regulatory Policies Act of 1978 (PURPA).

After a twenty-five month construction effort by Enserch Development Corporation, the plant was made available for commercial service on July 1, 1993. Lone Star Energy operated the cogeneration facility, which was owned by ENW.

PSD 91-02 and OAC 310 issued September 1991: The facility was permitted to burn only natural gas and was issued both a PSD Permit (No. 91-02) from the Washington Department of Ecology (Ecology) and OAC 310 from the Northwest Air Pollution Authority (now the Northwest Clean Air Agency, or "NWCAA"). The PSD and OAC permits included specific conditions for construction and operation of the facility.

PSD 91-02 Amendment 1 and OAC 400 issued December 1993: OAC 310 was superseded by OAC 400 in December 1993, which permitted the use of #2 low-sulfur diesel oil as a backup fuel. PSD No. 91-02 was also modified at this time to allow use of diesel as a backup fuel.

OAC 400R1 issued May 1995 and OAC 400R2 issued August 1995: Minor revisions were incorporated into OAC 400 to provide clarity and consistency.

In 1997, Puget Sound Power & Light Company merged with Washington Natural Gas to form PSE.

PSD 91-20 Amendment 2 issued July 23, 1998 and OAC 400R3 issued May 29, 1998: ENW submitted an application to revise PSD permit No. 91-02 Amendment 1 to allow higher daily NO_X emission levels, which were granted in PSD No. 91-02 Amendment 2. OAC 400R2 was similarly revised to allow higher daily NO_X mass emissions.

Air Operating Permit 004: On January 1, 1999, ENW received a Title V Air Operating Permit (AOP) from NWCAA for the Encogen Northwest Cogeneration Plant.

On November 1, 1999, PSE became the majority shareholder of ENW. At this time, the facility became subject to the Acid Rain Regulation, 40 CFR 75; see Section 3.3 for more details.

On May 1, 2005, ENW, a subsidiary of PSE, dissolved and the cogeneration facility became wholly owned by PSE. The facility was renamed Puget Sound Energy, Encogen Generating Station (now "PSE Encogen"). About May 22, 2005, facility operation was taken over by PSE, and the contract with PTE North America/PTS Exodus Energy Operations Company LLC as facility operator (an operator subsequent to Lone Star Energy) was terminated.

OAC 951 issued January 2006: OAC 951 was issued to allow construction of an auxiliary boiler at the facility for the purpose of providing steam to the adjacent GP plant during periods when the combustion turbines were not operating.

OAC 951a issued June 13, 2008: OAC 951 was revised to allow performance testing on an elapsed operating hours basis instead of an annual basis. This eliminated the need to bring the boiler out of inactive status for the sole purpose of source testing. Source testing for NO_X, CO, and NH_3 is required within 30 days of the first reintroduction of fuel into the boiler for any reason and every 4,000 operating hours or every twenty-four months thereafter, whichever occurs sooner.

This OAC does not apply since the auxiliary boiler has been sold and removed from the facility site.

OAC 400d issued March 6, 2009: OAC 400R3 was revised to update permit formatting, NWCAA regulatory references, and the monthly emissions report due date.

OAC 400e issued January 13, 2011: OAC 400d was revised to include periodic source testing requirements for ammonia and carbon monoxide. The ammonia stack test method was updated to the Bay Area Air Quality Management District (BAAQMD) Method ST-1B. Unburned hydrocarbon emission limits were removed, as were initial testing requirements.

The earliest versions of OAC 400 required the use of "pipeline grade" natural gas; this requirement was written prior to the formal and more stringent Code of Federal Regulations (CFR) definition of "pipeline grade natural gas". The intention of the original OAC 400 requirement is more consistent with the federal CFR definition of "natural gas". Therefore, the reference to "pipeline grade" natural gas was removed, and a regulatory citation (40 CFR 60.331[u] [7/8/04]) for the definition of "natural gas" was added. In addition, a clear definition taken from 40 CFR 63.7575 for "natural gas curtailment" was added.

Particulate matter (PM) mass emission limits and SO_2 mass and concentration emission limits were dropped from OAC 400e since PM and SO_2 are regulated through the PSD permit; the limits dropped from the OAC were simply duplicates of the limits established by the PSD. Furthermore, reporting requirements already established in the PSD permit were removed from the OAC. The nuisance odor condition was also dropped from the OAC since that requirement is covered by NWCAA regulations. Finally, a requirement to maintain a current and readily available continuous emission monitor (CEM) quality assurance manual was added.

2.5 Compliance History

The PSE Encogen facility has been either a registered air pollution source or a Title V Air Operating Permit source since its startup in 1993.

2.5.1 Notice of Violation

Table 2-3 presents a listing of Notices of Violation (NOV) issued to PSE Encogen by the NWCAA since January 1997. Violations are resolved through a combination of penalty assessments and corrective action taken by the source. In most cases a summary of corrective action taken by the source was submitted to the NWCAA as a written response to the violation. Additional information about each violation can be obtained upon request to the NWCAA.

Table 2-3 PSE Encogen Notices of Violation

NOV	Date Issued	Description
2703 (Warning)	1/9/1997	Exceeded daily mass limit of 893 lb/day for nitrogen oxides on 11/18/96 (894 lb).
2702	1/9/1997	NH_3 emission limit (10 ppm) exceeded during a RATA of #2 turbine on 9/16/96. Average emission rate during 9 tests was 17.06 ppm. Relative accuracy of NH3 CEM was 18.5 ppm (above RATA tolerance limit). Corroded sample line leaked resulting in erroneous readings.
2788	1/23/1998	The 24-hour average nitrogen oxide emissions for 12/2/97 were measured to be 902 lb based on continuous emission monitors. This value is in excess of both PSD permit no. 91-02 condition no. 2 and NWAPA OAC 400 condition no. 4A which limits the total plant emissions to 893 lb/day of NO_X.
3172	5/30/2001	Failure to submit annual AOP certification report in a timely manner. The report was due January 30, 2001 and received by the NWAPA May 29, 2001. Failure to certify the report by signature of the responsible official.

Table 2-3 PSE Encogen Notices of Violation

NOV	Date Issued	Description
3506	9/20/2005	AOP Term 3.1 requires that monthly emission reports be submitted within 30 days following the end of the reported month (monthly reports are required by AOP Terms 4.2 and 4.8). The May 2005 monthly report was due on June 30, 2005, however, it was received by the NWCAA on August 11, 2005.
3486a	9/20/2005	40 CFR 72.30 (a) & (b) Facility failed to submit an Acid Rain permit application in accordance with the deadline of March 1, 2000. Puget Sound Energy, Inc. (PSE) became the majority shareholder of Encogen Northwest, L.P. on November 1, 1999. This purchase ended the facility's designation as a qualifying facility. The acid rain permit application was received with a certified signature date of May, 11, 2005. Therefore, the facility was out of compliance with this provision from March 1, 2000 through May 11, 2005 (5 years & 71 days). 40 CFR 72.9 (a)(2) Encogen failed to acquire an Acid Rain Permit and operate in compliance with the permit. 40 CFR 72.9(b)(1). The facility has failed to comply with monitoring requirements in Subpart A Part 75. 40 CFR 72.9(f): PSE-Encogen Northwest did not keep appropriate records or submit notifications, testing results, monitoring plans, or quarterly Acid Rain emission reports during the period that they were out of compliance with the Acid Rain Program.
3649	10/17/2007	Failure to comply with OAC 951, conditions 5 and 6: Ammonia emissions standard. PSE Encogen performed a source test on April 12, 2007 on the facility's auxiliary boiler and failed to demonstrate compliance with the applicable standard for ammonia emissions. A retest was performed on April 18, 2007. The retest was done with an averaging time of 30 minutes as opposed to the required 60 minutes. A third test was carried out on June 8, 2007, which showed compliance with the standard.
3829	3/10/2010	The turbine NO_X continuous emissions monitoring systems (CEMS) did not include the International Standards Organization (ISO) correction between replacement in October 2008 and September 8, 2009. When the ISO correction was included in the data analysis for that period, 33 exceedances of the NO_X daily average were identified across the three turbines and the months of July, August, and September 2009 for an estimated total of 173.7 pounds excess NO_X emissions.
3879	12/1/2010	Unit 3 combustion turbine failed the annual ammonia stack test on 9/16/10 with an average ammonia concentration of 23.2 ppmdv @ 15% O2, ISO standard conditions during the first test and 14.2 ppmdv ammonia @ 15% O2, ISO during the second test. The violated requirements are also included in AOP 004R1 terms 2.5.8.3 and 5.16. The limit is 10.0 ppmdv ammonia @ 15% O2, ISO.
4008	1/25/2013	Unit 3 combustion turbine failed the annual ammonia stack test on 9/20/12 with an average ammonia concentration of 14.4 ppmdv @ 15% O2, ISO standard conditions [AOP 004R2 (8/4/11) term 5.1.15].

2.5.2 Compliance Reports

The PSE Encogen AOP requires monthly, quarterly, semiannual, and annual reports to be submitted to the NWCAA as part of the facility's ongoing compliance demonstration. The facility submits a monthly summary report of emissions and process information. The monthly report

also must identify any excess emissions and provide a discussion as to the cause and what was done to correct the problem. PSE Encogen submits information about quality assurance/quality control (QA/QC) actions taken on continuous emission monitoring systems (such as Cylinder Gas Audits or Relative Accuracy Test Audits) in quarterly reports submitted as part of the monthly report for the month in which the QA/QC actions occur. Semiannual reports provide for the certification by the responsible corporate official of the truth, accuracy, and completeness of reports submitted during the previous six-month period. Annually, the responsible corporate official also certifies compliance with all applicable requirements in the AOP term by term and whether the facility was fully or intermittently in compliance with each term.

3 BASIS OF REGULATION APPLICABILITY

3.1 New Source Performance Standards (NSPS)

40 CFR 60 Subpart A – General Provisions: The NSPS General Provisions apply to the owner or operator of a stationary source that contains an affected facility. Since the combustion turbines at PSE Encogen are subject to 40 CFR 60 Subpart GG - NSPS for Stationary Gas Turbines, they are "affected facilities". Therefore, the General Provisions of 40 CFR 60 Subpart A apply to those units. NSPS Subpart A requirements are listed in Section 3 of the AOP as generally applicable to affected facilities.

40 CFR 60 Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units: The heat recovery steam generators (HRSGs) are not subject to NSPS Subparts D, Da, Db or Dc (NSPS for steam generating units) because they are not directly fired with duct burners.

40 CFR 60 Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels for which Construction, Reconstruction, or Modification Commenced after July 23, 1984: This regulation does not apply to the fuel storage tanks at PSE Encogen because, although the tanks were constructed after July 23, 1984 and have a capacity greater than 151 m^3 (the tanks have an approximate capacity of 1780 m^3), the maximum true vapor pressure of the diesel fuel stored in the tanks is below the 3.5 kPa (0.5 psia) applicability threshold.

40 CFR 60 Subpart GG – Standards of Performance for Stationary Gas Turbines: The provisions of NSPS Subpart GG apply to stationary gas turbines with a heat input at peak load equal to or greater than 10.7 gigajoules (10 million Btu) per hour, based on the lower heating value of the fuel fired, for which construction, modification, or reconstruction is commenced after October 3, 1977. The three stationary gas turbines were installed at PSE Encogen after the adoption of NSPS Subpart GG; therefore, NSPS Subpart GG applies to the combustion turbines.

PSE Encogen was released by EPA Region 10 from the daily monitoring of fuel sulfur and nitrogen content as required in Subpart GG in a letter dated March 10, 1993. This determination was based on the condition that PSE Encogen monitor the sulfur content of fuels and operate and maintain continuous emission monitors for nitrogen oxides.

PSE Encogen was also granted relief from the semi-annual excess emission reporting requirements under Subpart GG by the NWCAA in a letter dated January 31, 1995. PSE Encogen monitors NO_X continuously and reports these data on a monthly basis as required by their permit. Furthermore, water and steam rates do not need to be monitored due to post-combustion NO_X control and continuous emissions monitoring employed by PSE Encogen.

40 CFR 60 Subpart JJJJ – Standards of Performance for Stationary Spark Ignition Internal Combustion Engines: At the time of this second Title V permit renewal, PSE Encogen had onsite a 1000 W gasoline-powered portable generator. Subpart JJJJ was reviewed for applicability since these regulations apply if the engine is classified as a stationary source (see 40 CFR 60.4248, definition of *stationary internal combustion engine*). The generator, however, was determined to be a nonroad engine (see 40 CFR 1068.30, definition of *nonroad engine*), since it transportable, equipped with a carrying handle, and is not intended to remain at any single site at the PSE Encogen facility for more than 12 consecutive months. Since the generator is considered a nonroad engine, Subpart JJJJ does not apply, and the generator is not listed in the AOP.

3.2 National Emission Standards for Hazardous Air Pollutants (NESHAP)

PSE Encogen is an area source of HAPs due primarily to the small amounts of formaldehyde and

other HAPs generated during the combustion of natural gas. Potentially applicable NESHAP regulations are addressed below.

40 CFR 63 Subpart Q – National Emission Standards for Hazardous Air Pollutants for Industrial Process Cooling Towers: This standard would apply if PSE Encogen emitted more than 10 tons per year of a single hazardous air pollutant (HAP) or if the total HAPs emitted from the plant exceeded 25 tons per year. Based on 1993 source test data taken at PSE Encogen and annual emissions inventory reports from the facility, formaldehyde emissions are estimated to be 0.075 lb/hr per stack or about 1.0 ton per year for the entire plant. Because formaldehyde is the overwhelming driver for NESHAP applicability and because the facility's potential to emit (PTE) formaldehyde is less than 10 tons per year, the standard does not apply to PSE Encogen. Furthermore, chromium has never been used as a biocide in the cooling towers at PSE Encogen.

40 CFR 63 Subpart YYYY – National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines: On January 14, 2003, the proposed combustion turbine NESHAP (CAA Section 112(b)) was published as 40 CFR 63 Subpart YYYY. Since PSE Encogen emits less than 10 tons per year of any single HAP and less than 25 tons per year total HAPs, this standard does not apply.

40 CFR 63 Subpart ZZZZ – National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines (RICE): At the time of this second Title V permit renewal, PSE Encogen had onsite a 1000 W gasoline-powered portable generator. Subpart ZZZZ was reviewed for applicability since there is no de minimis engine size below which this regulation does not apply; however, the applicability of this regulation to the engine depends on whether the engine is classified as a stationary source or a nonroad engine. If the engine meets the definition of a stationary source, this part applies. However, the generator was determined to be a nonroad engine (see 40 CFR 1068.30, definition of *nonroad engine*), since it transportable, equipped with a carrying handle, and is not intended to remain at any single site at the PSE Encogen facility for more than 12 consecutive months. Therefore, Subpart ZZZZ does not apply, and the generator is not listed in the AOP.

3.3 Acid Rain Program

40 CFR Parts 72, 73, 74, 75, 77, and 78 – The Acid Rain Program: Permits, Allowance System, Sulfur Dioxide Opt-Ins, Continuous Emission Monitoring, Excess Emissions, and Appeal Procedures: Title IV of the Clean Air Act authorizes the EPA to establish the Acid Rain Program. The purpose of the Acid Rain Program is to significantly reduce emissions of sulfur dioxide and nitrogen oxides from utility electric generating plants in order to reduce the adverse health and ecological impacts of acidic deposition (or acid rain) resulting from such emissions. The EPA promulgated these rules on January 11 and March 23, 1993. Initially, PSE Encogen was exempt from the acid rain regulations per 40 CFR 72.6 (b)(5) since the facility was:

- classified as a qualifying cogeneration facility pursuant to the provisions of Section 210 of the Public Utility Regulatory Policies Act of 1978 (PURPA),
- had as of November 15, 1990 a qualifying power purchase commitment to sell the entire electrical output of the plant to Puget Sound Power & Light Company, and
- did not exceed 130% of total planned net output capacity.

This exemption was lost when PSE purchased the facility in November 1999 since PSE is a public electric generating utility and, therefore, subject to the acid rain regulations. PSE Encogen did not come into compliance with the rule until 2005 when their Acid Rain Permit application was submitted and approved.

PSE Encogen converted its CEM systems on the turbines from performance and quality assurance/quality control requirements under 40 CFR 60 to those under 40 CFR 75. NWCAA

Regulation Appendix A and 40 CFR 75 require specific quality assurance methods including daily calibration checks, quarterly linearity checks, and annual Relative Accuracy Test Audits (RATAs) that assure precise and accurate CEM information is collected. Cylinder gas audits (CGAs) are required by 40 CFR 60 Appendix F, which is required by NWCAA Regulation Appendix A (III)(A)(2), but the acid rain regulations (40 CFR 75) require more stringent quarterly linearity checks that meet the requirements of NWCAA Regulation Appendix A (III)(A)(1)[5].

3.4 Compliance Assurance Monitoring (CAM)

40 CFR 64 – Compliance Assurance Monitoring: PSE Encogen is not subject to the CAM rule. The CAM rule under 40 CFR 64 requires owners or operators of subject sources to conduct monitoring that satisfies specific criteria established in the rule to provide a reasonable assurance of compliance with applicable requirements. Monitoring focuses on emissions units that rely on pollution control equipment to achieve compliance. The CAM rule coordinates existing monitoring requirements with additional monitoring if current requirements fail to specify adequate detail. CAM applies to units that (1) are subject to an emission limit, (2) use an add-on control device to meet the emission limit, and (3) have potential pre-control device emissions that would classify the unit as a major source (referred to as an "uncontrolled major source").

The three combustion turbines at PSE Encogen are subject to NO_X emission limits, and all units employ selective catalytic reduction control devices to achieve compliance. The combustion turbines also employ steam injection to control NO_X emissions. The turbines' pre-control NO_X emissions exceed major source status (greater than 100 tons NO_X per year). These criteria would generally cause the combustion turbines to be subject to the CAM rule. However, the AOP requires PSE Encogen to operate a NO_X continuous emission monitor, which is accepted as a continuous compliance determination method, on each combustion turbine, 40 CFR 64.2(b)(1)(vi) exempts units from the rule if the AOP specifies a continuous compliance determination method. Therefore, the combustion turbines are also not subject to CAM.

3.5 Risk Management Plan (RMP)

40 CFR 68 – Chemical Accident Prevention Provisions: PSE Encogen is not subject to the provisions of this program at the time of permit renewal. The goal of 40 CFR 68 and the Risk Management Program (RMP) it requires is to prevent accidental release of substances that can cause serious harm to the public and the environment and to mitigate the severity of releases if they do occur. If a tank, drum, container, pipe, or other process at a facility contains any of the regulated toxic and flammable substances listed in 40 CFR 68.130 in an amount above the "threshold quantity" specified for that substance, the facility operator is required to develop and implement a risk management program.

PSE Encogen uses ammonia in selective catalytic reduction (SCR) systems for NO_X control at the combustion turbines. Anhydrous ammonia in quantities greater than 10,000 pounds and aqueous ammonia (concentration of 20% or greater) in quantities greater than 20,000 pounds are regulated substances under 40 CFR 68 – Chemical Accident Prevention Provisions. In 2006, PSE Encogen converted the anhydrous ammonia injection system on the turbine SCR systems to

[5] NWCAA Regulation Appendix A (III)(A)(2) requires that all CEMs be operated in accordance with the appropriate Section of 40 CFR 60 Appendix F, and 40 CFR 60 Appendix F requires Cylinder Gas Audits (CGAs). However, NWCAA Regulation Appendix A (III)(A)(1) states that CEMs subject to acid rain regulations shall be capable of meeting the specifications outlined in the appropriate section of 40 CFR 75. NWCAA Appendix A (III)(A)(2), which requires all CEMs to be operated in accordance with the appropriate section of 40 CFR 60 Appendix F is interpreted to apply to all CEMs not otherwise covered by 40 CFR 75, and the PSE Encogen CEMs, which are subject to the 40 CFR 75 acid rain regulations, shall be capable of meeting the specifications outlined in the appropriate section of 40 CFR 75 per NWCAA Appendix A (III)(A)(1).

an aqueous ammonia injection system. The aqueous ammonia used in the new system contains 17-19.5% ammonium hydroxide; therefore, the requirements of 40 CFR 68 are not triggered by this material. As long as the amount of anhydrous ammonia onsite remains below 10,000 lb and the concentration of the aqueous ammonia used at the facility remains below 20% ammonia, PSE Encogen is not subject to the provisions of this program.

3.6 New Source Review (NSR)

3.6.1 Basic Information

New Source Review (NSR) requires stationary sources of air pollution to acquire permits before they begin construction. NSR is also referred to as construction permitting or preconstruction permitting.

There are three types of NSR permits. A source may have to acquire one or more of these permits:

- Prevention of Significant Deterioration (PSD) permits, which are required for new major sources or a major source making a major modification in an attainment[6] area;
- Nonattainment NSR permits, which are required for new major sources or major sources making a major modification in a nonattainment area; and
- Minor source permits, which are required for sources that emit pollutants below the major source threshold but above the minor source threshold. It is generally the case that a major new or modified source will also require minor NSR permitting that covers a different subset of pollutants.

3.6.2 What are Permits?

Permits are legal documents that the source must follow. Permits specify what emission limits must not be exceeded and how the source is to demonstrate compliance with the set limits. Permits may contain conditions to ensure that the source is built according to the permit application upon which the permitting agency relies for air impact analysis. For example, the permit may specify a stack height that was used by the permitting agency to determine compliance with air pollutant limits. Some limits in the permit may be specified at the request of the source to keep them from being subject to other requirements. For example, the source may take limits in a minor NSR permit to keep the source out of PSD. To assure that sources follow permit requirements, permits also contain monitoring, recordkeeping, and reporting (MR&R) requirements.

3.6.3 Who Issues the Permits?

In Washington State most NSR permits are issued by the Washington State Department of Ecology ("Ecology") or local air pollution control agencies. The EPA issues the permit in some cases. Ecology and local air pollution control agencies have their own permit programs that are approved by EPA in the State Implementation Plan (SIP). In general, in the NWCAA jurisdiction, which encompasses Island, Skagit, and Whatcom Counties, Ecology issues major NSR permits (PSD permits) and NWCAA issues minor NSR permits (Orders of Approval to Construct, or OACs).

3.6.4 Prevention of Significant Deterioration (PSD)

The PSE Encogen facility qualifies as a major source and is, therefore, an applicable source under the PSD program (40 CFR 52.21) since the facility is located in an attainment area. Emissions of NO_X, CO, SO_2, PM, and PM_{10} were subject to PSD review. The PSD-91-02 permit

[6] An attainment area means a geographic area designated by EPA at 40 CFR 81 as having attained the National Ambient Air Quality Standard for a given criteria pollutant (Reference: WAC 173-400-030 (9)).

was issued in September 1991 by Ecology prior to commencement of construction of the facility. Details on revisions to this PSD permit are given in Section 2.4.

Before a major source can be constructed or modified in an area that meets all the health-based ambient air requirements (i.e. in an attainment area), the owner or operator must demonstrate that the project will not cause or contribute to violations of any ambient air quality standard or air quality increment. Also, the owner or operator must demonstrate that the project will not cause significant deterioration in nearby Class I Areas (parks and wilderness areas).

3.6.5 Minor NSR

New or modified sources of air pollution are required to obtain a permit from the NWCAA before beginning construction. Permits are referred to as Orders of Approval to Construct (OACs) and contain a wide range of local, state, and federal requirements to minimize air pollution impacts on the environment. The type of activity, the size of the operation, and the kinds of pollutants emitted determine permit conditions. PSE Encogen was subject to minor NSR for ammonia and VOC (which was originally listed in the permit as unburned hydrocarbons). Ammonia is used in the selective catalytic reduction (SCR) system as part of the NO_X emission control; however, some ammonia "slips" through the catalyst. Ammonia emissions are subject to minor NSR since, although ammonia is neither a criteria pollutant nor on EPA's list of Hazardous Air Pollutants (HAPs), ammonia is a state-listed Toxic Air Pollutant (TAP; see WAC 173-460-150). Section 2.4 details the minor NSR permits that cover the PSE Encogen facility.

3.7 Greenhouse Gas (GHG) Regulation

Greenhouse gases are chemicals that contribute to climate change by trapping heat in the atmosphere. The greenhouse gases recognized by EPA and Ecology are: carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF_6). "Hydrofluorocarbons" or "HFCs" means a class of greenhouse gases primarily used as refrigerants, consisting of hydrogen, fluorine, and carbon.

PSE Encogen is required to meet the following federal and state greenhouse gas emission requirements.

3.7.1 40 CFR 98, Federal Mandatory Greenhouse Gas Emission Inventory Regulation

This regulation applies to PSE Encogen due to its GHG emission levels and facility type. The rule requires annual GHG inventories and reporting starting in calendar year 2010, with reports due to EPA by no later than March 31 of the following year.[7] This regulation is implemented in its entirety by the EPA. This regulation is excluded from appearing in a Title V air operating permit because it does not contain applicable requirements under the Title V program (WAC 173-401-200(4)).

3.7.2 WAC Chapter 173-407, Carbon Dioxide Mitigation Program, Greenhouse Gases Emissions Performance Standard and Sequestration Plans and Programs for Thermal Electric Generating Facilities, Part I WAC 173-407-010 through -070, and Part II, WAC 173-407-100 through -320.

At the time of AOP renewal, PSE Encogen is not subject to the provisions of this regulation. Chapter 173-407 WAC, "Carbon Dioxide Mitigation Program, Greenhouse Gases Emissions Performance Standard And Sequestration Plans And Programs For Thermal Electric Generating Facilities" ", consists of two parts: Part I, WAC 173-407-010 through -080, and Part II, WAC 173-407-100 through -320. According to WAC 173-407-005, Part II, "Greenhouse Gases Emissions Performance Standard and Sequestration Plans and Programs for Baseload Electric

[7] The deadline for reporting for emission year 2010 has been postponed to September 30, 2011.

Generation Facilities Implementing Chapter 80.80 RCW" is the emissions performance standard that must be met first. Then the requirements of Part I, "Carbon Dioxide Mitigation for Fossil-Fueled Thermal Electric Generating Facilities, Implementing Chapter 80.70 RCW", are applied.

The Part II greenhouse gases emissions performance standard is applicable to all existing baseload electric generation facilities and units when a new baseload electric generating facility or unit at the existing facility is issued construction approval or site certification agreement (WAC 173-407-120 (3)(a)), the existing facility or a unit is upgraded (WAC 173-407-120 (3)(b)), or the existing facility or unit is subject to a new long-term financial commitment (WAC 173-407-120 (3)(c)). A "baseload electric generation facility" means a power plant that provides "baseload electric generation", which is defined as electric generation from a power plant that is *designed and intended* to provide electricity at an annualized plant capacity factor of at least sixty percent. For purposes of the rule, designed "means originally specified by the design engineers for the power plant or generating units (such as simple cycle combustion turbines) installed at a power plant; and intended means allowed for by the current permits for the power plant, recognizing the capability of the installed equipment or intent of the owner or operator of the power plant." At this time, Part II performance standards do not apply to the PSE Encogen facility since it is an existing facility and no triggering events have occurred since June 30, 2008 (the date specified in the rule to delineate existing facilities).

3.7.3 WAC Chapter 173-441, Reporting of Emissions of Greenhouse Gases

Chapter 173-441 WAC, "Reporting of Emissions of Greenhouse Gases", is a mandatory greenhouse gas (GHG) reporting rule for:

- Suppliers that supply applicable fuels sold in Washington State of which the complete combustion or oxidation would result in at least 10,000 metric tons of carbon dioxide annually; or
- Any listed facility that emits at least 10,000 metric tons of CO_2-equivalents (CO_2e) of greenhouse gases annually in the state.

WAC 173-441 was adopted by Ecology on December 1, 2010 and became effective on January 1, 2011. This regulation applies to PSE Encogen because the facility emits at least 10,000 metric tons of CO_2e of greenhouse gases per year; in the 2009 annual emission inventory, PSE Encogen reported that 179,272 tons of CO_2 equivalents were emitted from the facility. Similar to the federal reporting rule under 40 CFR 98, WAC 173-441 requires annual GHG inventories with reports due no later than March 31 of the following year for facilities that are also subject to 40 CFR 98. Under WAC 173-441, annual emissions shall be reported to Ecology beginning in calendar year 2012. This regulation is implemented in its entirety by Ecology and is considered an applicable requirement under the Title V program; as such, it is included in Section 2 of the Title V AOP.

4 GENERAL PERMIT ASSUMPTIONS

4.1 Permit Content

The permit contains (1) standard terms; (2) generally applicable conditions for the type of facility permitted; and (3) specifically applicable conditions originating from PSD permits, approvals to construct, and federal New Source Performance Standards. Applicable requirements that were satisfied by a single past action on the part of the source are not included in the AOP. An example of this would be performance testing to demonstrate compliance with applicable emission limitations as a requirement of initial startup. Also, regulations that require action by a regulatory agency but not of the regulated source are not included as applicable permit conditions.

4.2 Excluded Requirements

Early facility history and activities related to one-time permitting requirements are listed below.

- PSE Encogen submitted a PSD Application in February 1991 and a supplemental NOC Application in April 1991.
- PSE Encogen submitted an NOC Application in April 1991.
- PSE Encogen demonstrated that emissions of criteria and hazardous air pollutants would not exceed ambient limits or ASILs as applicable by satisfying WAC 173-400-110, WAC 173-460-070 and NWCAA 300 ambient impact modeling requirements prior to commencement of construction.
- PSE Encogen submitted notification of commencement of construction to Ecology and NWCAA in December 1991.
- PSE Encogen submitted applications in August 1992 to amend the OAC and PSD permits to allow use of oil in the turbines.
- PSE Encogen submitted a complete quality assurance manual for all CEMs in October 1992.
- An operation and maintenance manual was submitted in February 1993.
- PSE Encogen submitted a quality assurance plan for pre-construction ambient PM_{10} monitoring in February 1993, and revisions to that plan in May 1993.
- PSE Encogen submitted notification of start-up to Ecology in March 1993. Actual start-up was reported as July 1993.
- PSE Encogen submitted a source test plan for turbine units to Ecology in May 1993.
- Source tests and CEM certifications for turbine units were conducted in May 1993. Results were submitted to NWCAA in July 1993.
- In March of 2006 the facility was required to conduct performance testing on a newly constructed steam boiler. Testing was completed and the report issued as required.
- In early 2006 PSE Encogen was required to certify the NO_X CEMs at the combustion turbines in accordance with 40 CFR 75 of the Acid Rain Rule. Performance Specification Tests (PSTs) were performed on each of the combustion turbines in April 2006.

PSD 91-02 Amendment 2 conditions 6, 13, and 15 were excluded from the AOP for the following reasons:

- Condition 6: Initial performance tests for NO_X, SO_2, CO, and PM_{10} were conducted in May 1993.

- Condition 13: This condition requires construction of the project to begin within 18 months of PSD approval and to continue without an interruption greater than 18 months in duration. The terms of this condition were met by the construction activities in 1991 through 1993 as noted above.
- Condition 15: This condition requires notification of initial start-up of the plant. The plant began operation in July 1993, and proper notification was submitted.

4.3 Federal Enforceability

Federally enforceable requirements are terms and conditions required under the Federal Clean Air Act or under any of its applicable requirements such as NSPS or NESHAP. Local and state regulations may become federally enforceable by formal approval and incorporation into the State Implementation Plan (SIP) or through other delegation mechanisms. Federally enforceable requirements are enforceable by the EPA and citizens of the United States. All applicable requirements in the permit including Standard Terms and Conditions, Generally Applicable Requirements, and Specifically Applicable Requirements are federally enforceable unless identified in the permit as enforceable only by the state (i.e., labeled as "state only").

Chapter 173-401 WAC is not federally enforceable although the requirements of this regulation are based on federal requirements for the air operating permit program. Upon issuance of the permit, the terms based on Chapter 173-401 WAC will become federally enforceable for the source.

Most rules and requirements are followed by a date in parentheses. Two different versions (identified by the date) of the same regulatory citation may apply to the source if federal approval/delegation lags behind changes made to the Washington Administrative Code (WAC) or the NWCAA Regulation. The date associated with a WAC regulation denotes the "State Effective Date" of the regulation. For SIP-approved WAC regulations (identified by the absence of the "state only" designation), the date represents the "State Effective Date" of the regulation version that was SIP-approved. For NWCAA regulations, the date represents the most recent Board of Directors adoption date, which is identified as the "Passed" or "Amended" date in the NWCAA Regulation. For SIP-approved NWCAA regulations (also identified by the absence of the "state only" designation), the parenthetical date represents the "Passed" or "Amended" date of the regulation version that was SIP-approved. The date associated with an OAC or PSD permit represents the latest revision date of that order. For a federal rule, the date is the rule's most recent promulgation date.

4.4 Gap-Filling

Certain air pollution regulations and permit conditions do not specifically call out sufficient MR&R methods to adequately demonstrate compliance with the applicable requirement. In these cases, the permitting agency is obligated to develop site-specific MR&R requirements that the source must follow pursuant to WAC 173-401-615(1)(b) & (c) (10/17/02). The inclusion of the customized MR&R requirements is called "gap-filling". For instance, nuisance rules and opacity requirements have site-specific gap-filled obligations for the source. If gap-filling has been incorporated for a requirement of the AOP, the MR&R for that term will state "directly enforceable" above the gap-filled text.

On August 19, 2008, the U.S. Court of Appeals vacated EPA's 2006 interpretive rule that prohibited states from enhancing monitoring in Title V permits. As a result, permitting authorities again must ensure that monitoring in each permit is sufficient to assure compliance with the terms and conditions of the permit.

4.5 Future Requirements

Applicable requirements promulgated with future effective compliance dates may be included as applicable requirements in the permit. Some requirements that are not applicable until triggered by an action, such as the requirement to file an application prior to constructing a new source, are addressed within the standard terms and conditions section of the permit.

There are presently no pending applications to construct or modify PSE Encogen in such a way as to trigger New Source Review. PSE Encogen has certified in the permit renewal application that the facility will meet any future applicable requirements on a timely basis.

4.6 Compliance Options

PSE Encogen did not request emissions trading provisions or specify more than one operating scenario in the air operating permit application; therefore, the permit does not address these options as allowed under WAC 173-401-650. This permit does not condense overlapping applicable requirements (streamlining) nor does it provide any alternative emission limitations.

5 PERMIT ELEMENTS AND BASIS FOR TERMS AND CONDITIONS

5.1 Permit Organization

The PSE Encogen Air Operating Permit (AOP) is divided into the following sections:

Permit Information

Attest

Table of Contents

Section 1 Emission Unit Identification

Section 2 Standard Terms and Conditions

Section 3 Standard Terms and Conditions for New Source Performance Standards

Section 4 Generally Applicable Requirements

Section 5 Specifically Applicable Requirements

Section 6 Acid Rain Permit for Combustions Turbines 1, 2, and 3

Section 7 Inapplicable Requirements

5.2 Permit Information and Attest

5.2.1 Permit Information

The Permit Information page identifies the source and provides general information relevant to the permit such as the facility address, the responsible corporate official, the permit issuance date and the permit expiration date, and the agency personnel responsible for permit preparation, review, and issuance.

5.2.2 Attest

The Attest page provides authorization for the source to operate under the terms and conditions contained in the permit.

5.3 Section 1 Emission Unit Identification

The Emission Unit Identification section lists emission units, rated capacities, and air pollution control methods at PSE Encogen.

5.4 Section 2 Standard Terms and Conditions

The Standard Terms and Conditions section contains administrative requirements and prohibitions that do not have ongoing compliance monitoring requirements. Regulations that give legal authority to the standard terms and conditions are cited for each topic. At times, requirements are paraphrased; the language of the cited regulation takes precedence over the paraphrased summary. For understanding and readability, the terms and conditions have been grouped by function. Similar requirements from the State and the NWCAA are grouped together where possible. Requirements that are not applicable until triggered are also included. An example of these would be the requirement to file a "Notice of Construction" and "Application for Approval."

5.5 Section 3 Standard Terms and Conditions for New Source Performance Standards

Section 3 Standard Terms and Conditions for NSPS contains applicable requirements from 40 CFR 60 Subpart A – General Provisions. PSE Encogen is subject to the NSPS General Provisions because the facility is subject to 40 CFR 60 Subpart GG – Standards of Performance for Stationary Gas Turbines.

5.6 Introduction to Sections 4 and 5: Generally and Specifically Applicable Requirements

Requirements that limit emissions and broadly apply to all sources within the jurisdiction of the NWCAA are identified in Section 4 - Generally Applicable Requirements. Requirements that limit emissions and apply specifically to emission units at PSE Encogen are identified in Section 5 - Specifically Applicable Requirements. The tables in these sections are organized by pollutant type. The first column contains the term number followed by the pollutant type. The second column identifies the regulatory citation. The third column provides a brief description of the applicable requirements for informational purposes and is not itself enforceable. The fourth column identifies monitoring, recordkeeping and reporting requirements in accordance with WAC 173-401-605(1), -615(1) & (2). Test methods associated with an applicable requirement or in accordance with WAC 173-401-615(1)(a) are included in this column.

Many generally applicable requirements do not specify test and/or monitoring methods within the text of the regulation or statute. Since WAC 173-401-615 requires that the permit require monitoring and recordkeeping adequate to demonstrate compliance with requirements, legally enforceable site-specific monitoring methods were established ("gap-filled") based on the characteristics of the facility, the nature of the underlying requirement, the requirements of WAC 173-401-615, and EPA guidance on monitoring.

Requirements pertaining to operation and maintenance, nuisance, fugitive emissions and odor may be met through adherence to the PSE Encogen operation and maintenance (O&M) manual and timely complaint response and follow-up corrective action. Note, however, that the PSE Encogen O&M manual is not included as part of the AOP.

The following discussion of permit terms provides some information on how the facility demonstrates compliance with these terms.

5.7 Section 4 Generally Applicable Requirements

5.7.1 Fugitive Emission Standards (Permit Terms 4.7 through 4.11)

PSE Encogen does not conduct activities that typically generate fugitive emissions such as storage or transport of solid materials. Permit conditions require the facility to respond to and correct nuisance emissions as soon as possible. If emissions cannot be corrected within four hours, PSE Encogen must notify the NWCAA within twelve hours with a description of the complaint and action being taken to resolve the problem. PSE Encogen will provide assurance of compliance with these requirements in the annual compliance certification and by maintaining a log of nuisance complaints and associated repairs and mitigation actions.

5.7.2 Opacity Standard (Permit Term 4.12)

The generally applicable opacity requirement limits any source at the facility to 20% opacity according to Ecology Method 9A. Because the combustion turbines have more stringent opacity requirements at 5% opacity by EPA Method 9 and Ecology Method 9A, respectively, and because visible emissions (VE) are not known to occur in general at PSE Encogen, the MR&R for the opacity standard is written such that any visible emissions require immediate action with increasing stages of monitoring, depending on the situation. Any observed VE require that one

of three step be taken within 24 hours: correct the problem, a certified reader shall determine the opacity by EPA Method 9, or shut the unit down. If an EPA Method 9 test shows emissions in excess of any standard, an Ecology Method 9A reading must be taken. If a certified VE reader is unavailable to read the emissions, NWCAA will assume that all opacity standards have been exceeded. Observations and actions taken must be recorded and made available at the facility for inspection.

Demonstration of compliance with permitted visible emission limits must be qualitatively determined based on visual opacity observations by PSE staff on a monthly basis when the turbines operate. Any observed visible emissions require immediate corrective action, followed by consecutive daily opacity measurements according to EPA Method 9 if visible emissions are below all applicable standards, or by Ecology Method 9A if any applicable standard is exceeded until an opacity level less than the applicable limit is achieved. When this level is reached, the facility may revert to monthly opacity observations.

If opacity is greater than an applicable emission standard, immediate corrective action is required and an upset condition must be reported to NWCAA. All Method 9 or 9A opacity readings must be taken by an individual holding a valid Certification of Completion for Plume Evaluation Training from Ecology or other authorized training facility.

This MR&R is meant to capture all possible exceedances of any applicable opacity standard while at the same time providing a consistent set of steps to be taken when any opacity is observed at the facility. The gas turbine exhaust stacks are potential sources of visible emissions at the PSE Encogen facility. Modern gas turbines, when fueled by natural gas or low-sulfur oil, are unlikely to exceed visible emission standards if the units are properly maintained.

5.7.3 Particulate Matter Standards (Permit Terms 4.13, 4.14, and 4.15)

The gas turbine exhaust stacks are sources of particulate matter emissions at the PSE Encogen facility. Modern gas turbines, when fueled by natural gas or low-sulfur oil, are unlikely to exceed particulate matter emission standards if the units are properly operated and maintained.

Performance tests conducted during May and June 1993 using EPA Reference Method 5 demonstrated compliance with particulate matter emission standards for the gas turbines. Tests were conducted on units operating at 100 percent of full load during both natural gas and oil firing.

Permit conditions require that PSE Encogen visually monitor emissions from these stacks as a surrogate to stack testing. In addition, PSE Encogen provides assurance of compliance with these requirements in an annual compliance certification, which is signed by a Responsible Official who is held accountable for the truth and accuracy of the statements he or she certifies.

5.7.4 Sulfur Dioxide Standards, Stack Emissions (Permit Terms 4.16 through 4.19)

The gas turbines are sources of sulfur dioxide emissions. The gas turbines are limited by the conditions specified in the AOP to burning either natural gas or fuel oil containing no more than 0.05% by weight sulfur.

"Natural gas" is defined in NSPS 40 CFR 60.331(u) Subpart GG as follows:

> Natural gas means a naturally occurring fluid mixture of hydrocarbons (e.g., methane, ethane, or propane) produced in geological formations beneath the Earth's surface that maintains a gaseous state at standard atmospheric temperature and pressure under ordinary conditions. Natural gas contains 20.0 grains or less of total sulfur per 100 standard cubic feet. Equivalents of this in other units are as follows: 0.068 weight percent total sulfur, 680 parts per million by weight (ppmw) total sulfur, and 338 parts per million by volume (ppmv) at 20 degrees Celsius total sulfur. Additionally, natural gas must either be composed of at least 70 percent methane by volume or have a gross calorific value between 950 and 1100 British thermal units (Btu) per standard cubic foot. Natural gas does not include the following gaseous fuels: landfill gas, digester gas, refinery gas, sour gas, blast furnace gas, coal-derived gas, producer gas, coke oven gas, or any gaseous fuel produced in a process which might result in highly variable sulfur content or heating value.

PSE Encogen receives natural gas from Cascade Natural Gas. This same natural gas is used by all of the other natural gas consumers, private and industrial, in the Northwest. Natural gas contains approximately 1 to 2 grains of sulfur per 100 standard cubic feet on average and up to 6 grains of sulfur per 100 standard cubic feet, which includes 0.26 grains of sulfur per 100 standard cubic feet contributed by the methyl mercaptan added to this otherwise odorless gas for the purposes of leak detection.

NWCAA Regulation Section 460 requires a sulfur dioxide ambient monitoring plan for sources with a heat input greater than 500 MMBtu/hour. NWCAA has determined that the requirement to burn only natural gas or "on-road spec" oil satisfies this requirement.

5.7.4.1 Sulfur Dioxide Standard, Stack Emissions (Permit Term 4.16)

This condition limits SO_2 emissions to 1.5 lb SO_2/MMBtu of energy consumed.

When natural gas is burned, the gas turbines will emit about 0.0163 lb SO_2 per MMBtu as shown in the following calculation:

$$\frac{6\ gr\ S}{100\ scf\ natural\ gas} \times \frac{1\ lb\ S}{7000\ gr\ S} \times \frac{1{,}000\ scf\ natural\ gas}{1.05\ MMBtu} \times \frac{2\ lb\ SO_2}{1\ lb\ S} = \frac{0.0163\ lb\ SO_2}{MMBtu}$$

Note: A "lb-mole" of a pure gas weighs the molecular weight of that gas in pounds and occupies 385.3 ft^3 at 68° F and 760 mmHg pressure. (A temperature of 68° F and a pressure of 760 mmHg are standard conditions according to NWCAA Section 200). A "lb-mole" of sulfur (S) weighs 32 lb and reacts with a lb-mole of oxygen (O_2) which also weighs 32 lb to form a lb-mole of sulfur dioxide, which weighs 64 lb. Therefore, 2 lb of SO_2 are generated for every lb of sulfur in the fuel.

The energy content of the natural gas used by PSE Encogen is approximately 1,050 British thermal units per cubic foot, or, equivalently, 1.05 MMBtu per 1,000 standard cubic feet of natural gas.

When oil is burned, the gas turbines will emit about 0.0505 lb SO_2 per million Btu of energy consumed as calculated from the EPA's AP-42 emission factors (*AP-42, Section 3.1 Stationary Gas Turbines, 4/00*). The emission factor for turbines burning diesel oil is 1.01 lb SO_2 per MMBtu per %S times %S, where "%S" is percent sulfur by weight, and the calculation is shown below:

$$\frac{1.01\ lb\ SO_2}{MMBtu \cdot \%S} \times 0.05\ \%S\ = \frac{0.0505\ lb\ SO_2}{MMBtu}$$

Note that both of the calculated SO_2 emission rates are below the 1.5 lb/MMBtu limit. PSE Encogen can adequately show compliance with this requirement by burning only natural gas or "on-road spec" oil, and by maintaining fuel oil supplier-provided records of fuel oil specification, including sulfur content, for all oil burned.

5.7.4.2 Sulfur Dioxide Standards, Stack Emissions (Permit Terms 4.17 and 4.18)

These permit terms limit emissions to 1,000 parts of sulfur dioxide per million parts of stack gas, on a dry volumetric basis, corrected to 7 percent oxygen, calculated on an hourly average. During performance testing conducted in May and June of 1993 the turbines emitted an average of 0.3 ppmdv SO_2 corrected to 15% O_2 when fired on natural gas and 9.6 ppm SO_2 corrected to 15% O_2 when fired on 0.078% sulfur oil (which is equivalent to 6.2 ppm SO_2 when the turbines are fired on 0.05 wt% sulfur oil as shown in the discussion in Section 5.8.6 below).

When natural gas is burned, assuming the sulfur content of the gas is the same as it was during initial source testing, the gas turbines will emit about 0.7 ppm (corrected to 7 percent oxygen) as shown in the following calculation:

$$0.3\ ppmdv\ SO_2\ corrected\ to\ 15\%\ O_2\ \times \frac{(21-7)\%\ O_2}{(21-15)\%\ O_2} =\ 0.7\ ppmdv\ SO_2\ corrected\ to\ 7\%\ O_2$$

However, the sulfur content of natural gas varies somewhat over time. Nonetheless, even if the sulfur content of the natural gas is 100 times greater than the sulfur content of the natural gas burned during source testing, the amount of sulfur dioxide emitted (approximately 70 ppmdv SO_2) would still be much less than the 1,000 ppmdv limit.

When oil is burned, the gas turbines will emit about 14.5 ppm (corrected to 7 percent oxygen) as shown in the following calculation:

$$6.2\ ppmdv\ SO_2\ corrected\ to\ 15\%\ O_2\ \times \frac{(21-7)\%\ O_2}{(21-15)\%\ O_2} =\ 14.5\ ppmdv\ SO_2\ corrected\ to\ 7\%\ O_2$$

Both of the calculated SO_2 emission rates are below the 1,000 ppmdv limit. PSE Encogen can adequately show compliance with this requirement by burning only natural gas or "on-road spec" oil, and maintaining fuel oil supplier-provided records of fuel oil specification, including sulfur content, for all oil burned.

5.7.4.3 Sulfur Dioxide Standard, Fuel Content (Permit Term 4.19)

This condition limits sulfur content in the fuels used at the facility. Natural gas, the only gaseous fuel allowed at PSE Encogen, is limited to 412 ppm, and No.2 distillate, the only liquid fuel allowed at PSE Encogen, is limited to 0.5% by weight sulfur. Natural gas contains approximately one to two grains of sulfur per 100 standard cubic feet as supplied; the sulfur content of the natural gas is limited by Northwest Pipeline's (NWP) Federal Energy Regulatory Commission (FERC) tariff (NWP supplies natural gas to Cascade, who then supplies natural gas to PSE Encogen) to a maximum of 6 grains of total sulfur per 100 standard cubic feet.

Natural gas may contain up to 103 parts per million sulfur, as shown in the following calculation:

$$\frac{6\ gr\ S}{100\ ft^3\ natural\ gas} \times \frac{1\ lb\ S}{7{,}000\ gr\ S} \times \frac{1\ lbmol\ S}{32\ lb\ S} \times \frac{385.3\ ft^3\ S}{1\ lbmol\ S} = \frac{103.2\ ft^3\ S}{1{,}000{,}000\ ft^3\ natural\ gas} = 103\ ppmdv\ S$$

On-road specification oil is limited by OAC 400 for the turbines to 0.05% by weight sulfur, which is 1/10th of the allowable level under NWCAA 520. PSE Encogen can adequately show compliance with this requirement by burning only natural gas or "on-road spec" oil, and maintaining fuel oil supplier-provided records of fuel oil specification, including sulfur content, for all oil burned.

5.8 Section 5 Specifically Applicable Requirements

5.8.1 General, Sampling Ports (Permit Term 5.1.1)

PSE Encogen is required to have sampling ports that meet the requirements of 40 CFR 60 Appendix A Method 20 per PSD 91-02 Amendment 2 condition 7. NSPS 40 CFR 60 Subpart A

60.8(e) also requires that the facility provide safe sampling platforms, safe access to sampling platforms, and utilities for sampling and testing equipment. NWCAA determined that once per year PSE Encogen personnel shall demonstrate compliance with these requirements by confirming that the sampling platforms are intact and have not corroded away and including the results of the inspection as a line item in the annual compliance certification.

5.8.2 Opacity Standard (Permit Terms 5.1.9 and 5.2.2)

The specifically applicable opacity standards limit the combustion turbines to 5% opacity according to EPA Method 9. The specifically applicable opacity permit terms reference the MR&R for the generally applicable opacity term.

The gas turbine exhaust stacks are potential sources of visible emissions at the PSE Encogen facility. Modern gas turbines, when fueled by natural gas or low-sulfur oil, are unlikely to exceed visible emission standards if the units are properly maintained.

5.8.3 Particulate Matter (PM_{10}) Standard for Combustion Turbines (Permit Term 5.1.10)

This permit term covers condition 5 in PSD 91-02 Amendment 2, which limits PM_{10} emissions from each turbine exhaust to 60 pounds per day when fired on gas and 408 pounds per day when fired on oil. Total PM_{10} emissions from the turbine stacks are limited to 180 pounds per day when fired on natural gas or 1,224 pounds per day when fired on oil.

Particulate matter emissions from combustion turbines result from condensation of exhaust gases, carryover of noncombustible trace constituents in the fuel, or from agglomerated soot particles, particularly during liquid fuel firing. Particulate matter emissions are typically low with natural gas and distillate oil firing because of the very low ash content in both fuels. Modern gas turbines, when fueled by natural gas or low-sulfur oil, are unlikely to exceed fine particulate matter emission standards if the units are properly operated and maintained.

EPA Reference Method 5 performance tests were conducted on the turbines operating at 100 percent of full load with both natural gas and oil firing during May and June 1993, demonstrating compliance with particulate matter emission standards. The highest results when the units were operated on natural gas were approximately 70 percent of the limits in Permit Term 5.1.10. The highest results when the units were operated on oil were approximately 10 percent of the limits in Permit Term 5.1.10. It is noted that there was high variability among the individual runs that comprised the average PM result for a given turbine.

5.8.4 Oxides of Nitrogen (NO_X) Standard for Combustion Turbines (Permit Terms 5.1.11-14)

Permit Term 5.1.13 (40 CFR 60.332(a)(1)) limits NO_X emissions from each turbine to 0.0075% (equivalent to 75 ppm) corrected to 15% oxygen on a dry basis, plus allowances for heat rate and fuel bound nitrogen. According to PSE Encogen, the manufacturer's rated heat rate at load is 10,660 Btu/kW-hr, and the fuel-bound nitrogen is essentially zero (F = 0 in the equation below). The allowable NO_X concentration under 40 CFR 60.332(a)(1) is 96 ppmdv, calculated from the equation given in § 60.332(a)(1):

$$STD = 0.0075\% \times \frac{14.4}{Y} + F = 0.0075\% \times \frac{14.4}{11.246} + 0 \approx 0.009603\% = 96.03\ ppmdv\ NO_x$$

where:

$$Y = 10{,}660 \frac{Btu}{kW \cdot hr} \times \frac{1.055\ kJ}{Btu} \times \frac{1\ kW}{1{,}000\ W} = 11.246 \frac{kJ}{W \cdot hr}$$

The NO_X limitations in Permit Term 5.1.11 are more stringent than those found in Permit Term 5.1.13 at 7.0 ppmdv NO_X corrected to 15% oxygen and ISO conditions daily average when fired on natural gas and 11.0 ppmdv corrected to 15% oxygen and ISO conditions daily average

when fired on fuel oil. The limit of 96 ppmdv NO_X (@ 15% O_2 and ISO) is based on the NSPS and has a rolling four-hour averaging period. If the rolling four-hour 96 ppmdv NO_X limit is exceeded, either daily NO_X limit will also be exceeded (depending on fuel usage). PSE Encogen demonstrates compliance with NO_X emission limits by utilizing a CEMS on each turbine stack.

5.8.5 Ammonia (NH_3) Standard for Combustion Turbines (Permit Term 5.1.15)

NWCAA OAC 400e conditions 2c, 3c, and 5b limit NH_3 emissions from all three turbines to 437 pounds per day and to 10.0 ppmdv corrected to 15% O_2 and ISO conditions on an hourly average from each turbine exhaust stack. The previous version of the AOP required annual ammonia source tests, as does the current AOP; however, annual ammonia source testing is now required by the underlying OAC 400e to demonstrate compliance with the ammonia limits.

The SCR unit is the final part of the NO_X control system. SCR involves injection of ammonia into the turbine exhaust stream ahead of a catalyst grid in the HRSG section. Most of the NO_X reacts to form elemental nitrogen and water in the presence of ammonia and the catalyst. Some ammonia gets through the HRSG without reacting with the NO_X. This excess ammonia is sometimes referred to as "ammonia slip".

PSE Encogen controls stack exhaust NO_X concentration and emission rate by steam injection into the combustion zone and by varying the amount of ammonia that is injected into the exhaust stream of each gas turbine. The amount of ammonia required to adequately control NO_X depends on the amount of NO_X control achieved by steam injection. Also, the amount of ammonia required to reduce the exhaust NO_X concentration increases over time as the catalyst degrades. PSE Encogen records the ammonia flow regulator valve setting (displayed as percent open) for each gas turbine/HRSG unit in order to monitor ammonia usage. PSE Encogen sends catalyst samples to an independent laboratory for testing on a periodic basis.

PSE Encogen demonstrates compliance with ammonia limits by conducting an annual source test for ammonia and by maintaining the ammonia injection rate relative to NO_X concentration and stack flow.

5.8.6 Sulfur Dioxide Standard, Stack Emissions from Combustion Turbines (Permit Term 5.1.16)

This permit term cites condition 3 of PSD 91-02 Amendment 2, which limits SO_2 emissions from each turbine exhaust to 9.0 ppm corrected to 15% O_2 on a daily average when fired on oil. SO_2 emissions from the facility are limited to 100 pounds per day when fired on natural gas or 1,584 pounds per day when fired on oil.

Sulfur dioxide (SO_2) is formed when sulfur in the fuels reacts with oxygen in the air during the combustion process. Two pounds of sulfur dioxide are emitted from the stack for every pound of sulfur in the fuel.

The amount of SO_2 emitted depends on the amount of sulfur in the fuel. The amount of sulfur in natural gas is generally between 1 and 2 grains total sulfur per 100 standard cubic feet of natural gas, but can be as high as 6 grains total sulfur per 100 standard cubic feet of natural gas according to the FERC tariff. When the turbines operate at capacity on natural gas containing 6 grains sulfur per 100 standard cubic feet (as 0.0163 lb SO_2 per MMBtu, see section 5.7.4.1 above), approximately 517 lb sulfur dioxide are emitted per day as shown in the following calculation:

$$\frac{0.0163\ lb\ SO_2}{MMBtu} \times \frac{440\ MMBtu}{turbine \cdot hr} \times 3\ turbines \times \frac{24\ hr}{day} = \frac{517\ lb\ SO_2}{day}$$

However, the limit for sulfur dioxide emissions from the turbines is 100 lb/day. In order for PSE Encogen to meet the limit, the natural gas must contain less than 1.16 gr S/100 scf (including the 0.26 gr S/100 scf sulfur added as an odorant) as shown in the following calculations:

$$\frac{1.16\ gr\ S}{100\ scf\ natural\ gas} \times \frac{1\ lb\ S}{7000\ gr\ S} \times \frac{1{,}000\ scf\ natural\ gas}{1.05\ MMBtu} \times \frac{2\ lb\ SO_2}{1\ lb\ S} = \frac{0.003156\ lb\ SO_2}{MMBtu}$$

$$\frac{0.003156\ lb\ SO_2}{MMBtu} \times \frac{440\ MMBtu}{turbine \cdot hr} \times 3\ turbines \times \frac{24\ hr}{day} = \frac{100\ lb\ SO_2}{day}$$

Note that PSE Encogen purchases natural gas under contract from Cascade Natural Gas, and this is the same natural gas supplied to all industrial natural gas consumers in the NWCAA jurisdiction. PSE Encogen has no control over the sulfur content of the natural gas other than the purchase contract and no means by which to assure that the sulfur content of the natural gas remains below 1.16 gr S/100 scf. Since the sulfur dioxide emission limit is 1,584 lb per day when fired on oil, it is unlikely that the 100 lb per day limit for natural gas was based on an ambient standard or acceptable source impact level (ASIL – see WAC 173-460). This is a PSD permitting issue that is in the process of being addressed as the current revision of the AOP is being issued.

During performance testing conducted in May and June of 1993, the turbines emitted an average of 9.6 ppmdv SO_2 when fired on .078 wt% sulfur oil. This test was run before 0.05 wt% sulfur oil was available, and was done with the knowledge that 0.05 wt% sulfur would be required for all future operations and that the SO_2 emissions were directly proportional to the sulfur content of the oil. So the maximum theoretical SO_2 concentration is the measured value multiplied by a ratio of the maximum allowable fuel sulfur to the fuel sulfur measured at the time of the test, as shown below:

$$9.6\ ppmdv\ SO_2\ \times \frac{0.05\ wt\%\ S_{allowable}}{0.078\ wt\%\ S_{one-time}} =\ 6.2\ ppmdv\ SO_2$$

Note that this SO_2 concentration is less than the allowable 9.0 ppmdv.

When the turbines operate at capacity on 0.05 wt% sulfur oil, they will emit approximately 1,709 lb SO_2/day as shown in the following calculation:

$$\frac{0.0505\ lb\ SO_2}{MMBtu} \times \frac{470\ MMBtu}{turbine \cdot hr} \times 3\ turbines \times \frac{24\ hr}{day} = \frac{1{,}709\ lb\ SO_2}{day}$$

Note that this emission rate is greater than the 1,584 pounds per day SO_2 limit for the facility when firing 0.05 wt% sulfur oil. PSE Encogen can meet the limit by limiting fuel oil firing to less than 22.2 hours per day or by burning fuel oil containing less than 0.0468 wt% sulfur as shown by the following calculations[8]:

$$\frac{MMBtu}{0.0505\ lb\ SO_2} \times \frac{turbine \cdot hr}{470\ MMBtu} \times \frac{1}{3\ turbines} \times \frac{1{,}584\ lb\ SO_2}{day} = \frac{22.2\ hr}{day}$$

$$\frac{day}{24\ hr} \times \frac{turbine \cdot hr}{470\ MMBtu} \times \frac{1}{3\ turbines} \times \frac{1{,}584\ lb\ SO_2}{day} = \frac{0.0468\ lb\ SO_2}{MMBtu}$$

$$\frac{MMBtu \cdot \%S}{1.01\ lb\ SO_2} \times \frac{0.0468\ lb\ SO_2}{MMBtu} = 0.046\ \%S$$

Originally, the pounds SO_2 per day emission rate was calculated based on a heat input rate of 426 MMBtu per turbine per hour for fuel oil, and the maximum emission rate was calculated to be 1,549 pounds SO_2 per day, which is below the limit of 1,584 pounds SO_2 per day. As shown

[8] The EPA AP-42 emission factor (*AP-42, Section 3.1 Stationary Gas Turbines, 4/00*) for fuel oil is 1.01 lb SO_2 per MMBtu per %S times %S, where "%S" is percent sulfur by weight.

above, the correct heat input rate is 470 MMBtu per turbine per hour for fuel oil. This oversight is in the process of being corrected through PSD revision.

PSE Encogen can adequately show compliance with this permit term by burning only natural gas with less than 1.16 gr S/100 scf or "on-road spec oil" for less than 22.2 hours per day or with less than 0.046 wt% sulfur, and maintaining fuel oil supplier-provided records of fuel oil specification, including sulfur content, for all oil burned.

5.8.7 Fuel Sulfur Content (Permit Term 5.1.17)

Permit Term 5.1.17 (40 CFR 60.333) limits the sulfur content of fuel burned in the turbine to 0.8% by weight and SO_2 stack emissions to 0.015% (150 ppm) corrected to 15% O_2 on a dry basis.

As previously stated, natural gas is contractually limited to 6 grains of sulfur per 100 standard cubic feet. The sulfur content of natural gas is about 0.0171 percent by weight, as shown below[9]:

$$\frac{6\ gr\ S}{100\ ft^3\ natural\ gas} \times \frac{1\ lb\ S}{7{,}000\ gr\ S} \times \frac{378.8\ ft^3\ natural\ gas}{1\ lbmol\ natural\ gas} \times \frac{lbmol\ natural\ gas}{19\ lb\ natural\ gas} = 0.000171 \frac{lb\ S}{lb\ natural\ gas}$$

As shown in Section 5.7.4.2 above, SO_2 was measured from the turbines at 0.7 ppm when fired on natural gas and 14.5 ppm when the units were fired on oil.

Natural gas and low-sulfur oil do not contain enough sulfur to exceed the limits in 40 CFR 60.333. Therefore, the use of natural gas and low-sulfur No. 2 diesel oil will adequately demonstrate compliance with this requirement.

5.8.8 Carbon Monoxide (CO) Standard for Combustion Turbines (Permit Terms 5.1.19)

NWCAA OAC 400e conditions 2b, 3b, and 5a and PSD 91-02 Amendment 2 condition 4 limit CO emissions from each turbine exhaust stack to 10.0 ppmdv corrected to 15% O_2 and ISO on an hourly average and CO emissions from the project to 718 pounds per day. During initial performance testing in May and June 1993, the CO emissions averaged 2.6 ppmdv and 69.8 pounds per day while firing natural gas and 2.1 ppmdv and 57.6 pounds per day while firing oil. The measured CO concentration was approximately 25% of the standard and the CO emission rate was less than 10% of the standard during initial performance testing.

Compliance Assurance Monitoring (CAM) in 40 CFR 64 would require PSE Encogen to submit a CAM plan for CO at the time of permit renewal if any turbine had an uncontrolled CO potential to emit (PTE) greater than 100 tons per year and was equipped with an active CO control device. PSE Encogen initially monitored CO emissions for two years and found CO emissions were consistently less than 30% of the CO limit (limits are 10.0 ppmdv corrected to 15% oxygen and ISO conditions, one-hour average, and 718 lb/day from the three turbine stacks, which is approximately 131 tons per year). Therefore, PSE Encogen does not meet the PTE applicability requirement of 40 CFR 64.2(a)(3). In addition, because there is no active CO control device, the source is exempt from CAM under 40 CFR 64.2(a)(2).

NWCAA determined that CO is an appropriate surrogate for incomplete combustion and VOC emissions from the combustion turbine stacks at the PSE Encogen facility. In the previous version of the PSE Encogen AOP, Permit Term 5.21 limited VOC emissions (referred to as

[9] A "lb-mole" of a mixed gas weighs the molecular weight of that gas in pounds and occupies 378.8 ft^3 at 288.15 K and 101.325 kPa pressure (59° F and 1 atmosphere pressure) per International Standard Metric Conditions. The molecular weight of a mixed gas is calculated from the weight fractions of the various pure gases combining to form that gas. Natural gas is composed primarily of methane, with small amounts of higher molecular weight hydrocarbons, such as ethane and propane. A "lb-mole" of natural gas weighs approximately 19 lb. The maximum sulfur content of low-sulfur diesel oil is 0.05 percent by weight.

"unburned hydrocarbons" in the underlying OAC 400d) from each turbine exhaust stack to 7.0 ppmdv corrected to 15% O_2 and ISO on an hourly average and from the project to 362 pounds per day. During initial performance testing in May and June 1993, VOC emissions averaged 0.1 ppmdv and 3.8 pounds per day while firing natural gas and 1.3 ppmdv and 56.0 pounds per day while firing fuel oil. The maximum measured VOC concentration was approximately 20% of the standard and the maximum measured mass emission rate was approximately 15% of the standard. However, PSE Encogen requested that the unburned hydrocarbon limits be dropped from OAC 400e in return for an annual CO source testing requirement. NWCAA agreed; therefore, there are no VOC limits for the PSE Encogen facility listed in the current AOP.

5.8.9 Dry Volume and ISO Conditions

PSE Encogen's PSD permit and OAC 400e limit pollutant stack concentrations in terms of parts per million by dry volume, adjusted to 15% oxygen and corrected for ISO – International Organization for Standardization – conditions. "Dry volume" means that water vapor is removed from the exhaust gas prior to pollutant measurement, and the measurement is made on a volumetric basis (as opposed to a mass basis). Correcting pollutant concentration measurements to 15% oxygen eliminates the variability of diluting excess air in the exhaust gas.

The ISO correction applied at the plant is given in 40 CFR 60.335(b)(1). (Note that the exponential term in the equation is not clearly denoted; it should be exp (19*(Ho-0.00633)). The ISO correction equation was developed for diffusion flame units per the July 2004 Federal Register referenced in the rule; the purpose of the ISO correction is to correct the gas phase concentration to 288 K temperature (about 59 oF), 101.3 kPa pressure (about 760 mmHg), and 60% relative humidity. The New Source Performance Standard for Stationary Gas Turbines (40 CFR 60 Subpart GG) requires NO_X emissions to be adjusted for ISO conditions at units without add-on emission control devices; however, despite the fact that PSE Encogen's turbines are equipped with SCR (an add-on control device), the PSD and OAC permits require NO_X emissions be adjusted to ISO conditions anyway. The permitted limits for CO, SO_2 and ammonia concentrations in the stack exhaust are also corrected to ISO conditions.

5.9 Section 6 Acid Rain Permit for Combustions Turbines 1, 2, and 3

The permittee is required to resubmit the Acid Rain Permit Application and Certificate of Representation every five years. The current documents as of permit issuance are included in Section 6 of the AOP.

5.10 Section 7 Inapplicable Requirements

Washington Administrative Code 173-401-640(2) allows a determination regarding the applicability of requirements with which the source must comply. Section 7 of the permit lists requirements deemed inapplicable based on the applicability of the cited regulation. It is stated in the AOP that the permit shield applies to the specific, listed inapplicable requirements.

6 INSIGNIFICANT EMISSION UNITS

Categorically exempt insignificant emission units as defined in WAC 173-401-532 are not included in the AOP. The following table lists the categorically exempt insignificant emission units and activities at PSE Encogen.

Table 6-1 Insignificant Activities and Emission Units

Exempt Unit	WAC Citation	Comment
Emissions from fuel oil transfer system	WAC 173-401-530 (1) (d)	Fugitive emissions
Emissions from natural gas fuel system	WAC 173-401-530 (1) (d)	Fugitive emissions
Emissions from roadways	WAC 173-401-530 (1) (d)	Fugitive emissions
Pressure sprayer engine - gasoline-powered	WAC 173-401-533 (2) (f)	Unit rated at 7.5 HP
Pump engine - gasoline-powered	WAC 173-401-533 (2) (f)	Unit rated at 5 HP
Space heaters (3) - diesel-fueled	WAC 173-401-533 (2) (f)	Units rated at 50,000 Btu/hour
Space heaters (4) - diesel-fueled	WAC 173-401-533 (2) (f)	Units rated at 150,000 Btu/hour
Welder engine - gasoline-powered	WAC 173-401-533 (2) (f)	Unit rated at 20 HP
Welding	WAC 173-401-533 (2) (i)	Less than 1 ton per day of welding rod
2,000-Gallon sulfuric acid tank	WAC 173-401-533 (2) (s)	Tank with lid (less than 99% solution)
4,000-Gallon sodium hydroxide tank	WAC 173-401-533 (2) (s)	Tank with lid
550-Gallon corrosion control tank	WAC 173-401-533 (2) (s)	Tank with lid

7 PERMIT HISTORY

The original Air Operating Permit was issued to PSE Encogen in 1999. This section provides a brief summary of subsequent permit openings and renewals. The incorporation of new or revised Orders of Approval to Construct (OACs) is a common activity occurring during permit openings and renewals. Please refer to Section 2.4 of this Statement of Basis for greater detail on the history of OAC revisions applicable to this source.

Table 7-1 PSE Encogen Operating Permit History

Opening Type and Associated Dates	General Description
1992	Title V Air Operating Permit (AOP) program begins for all major sources.
July 1, 1993	The PSE Encogen facility begins operation.
AOP #004 Issued January 19, 1999	Original AOP issuance.
AOP #004 Renewal 1 Issued January 1, 2004	First AOP renewal. For more detail, see Appendix A of this document.
AOP #004 Renewal 1 Modification 1 Application received March 22, 2006 Issued August 18, 2006	Auxiliary boiler and applicable regulations added to AOP. Acid Rain permit and requirements also added. For more detail, see Appendix A of this document.
AOP #004 Renewal 2 Application received May 29, 2008 Issued August 4, 2011	Permit due for renewal. State Greenhouse Gas Rule applicability reviewed, and periodic source testing for CO and ammonia incorporated into OAC and subsequently AOP.

8 DEFINITIONS AND ACRONYMS

Definitions are assumed to be those found in the underlying regulation. A short list of definitions applicable to this document is included here.

An "applicable requirement" is a provision, standard, condition, or requirement in any of the listed regulations or statutes as it applies to an emission unit or facility at a stationary source.

A "cogeneration facility" is a generating facility that sequentially produces electricity and another form of useful thermal energy (such as heat or steam) in a way that is more efficient than the separate production of both forms of energy. For example, in addition to the production of electricity, large cogeneration facilities might provide steam for industrial uses in facilities such as paper mills, refineries, or factories, or for HVAC applications in commercial or residential buildings.

"Ecology" means the Washington State Department of Ecology.

An "emission unit" is any part or activity of a stationary source that emits or has the potential to emit any regulated air pollutant.

"Oil" or "on-road spec oil" means "on-road specification diesel fuel," containing no more than 0.05 percent sulfur by weight, as specified in 40 CFR § 80.29, as amended through January 18, 2001. The terms "On-road specification diesel fuel", "No. 2 distillate", "diesel fuel", "diesel oil", "No. 2 diesel", "fuel oil", and "oil" all are synonymous with the term "on-road spec oil" within the context of the PSE Encogen AOP and Statement of Basis.

A "permit" means for the purposes of the air operating permit program an air operating permit issued pursuant to Title V of the 1990 Federal Clean Air Act.

"PSE Encogen" means Puget Sound Energy – Encogen Generating Station.

"State" means for the purposes of the air operating permit program NWCAA or the Washington State Department of Ecology.

The following is a list of acronyms and abbreviations used in the Air Operating Permit and/or Statement of Basis:

AIRS	Aerometric Information Retrieval System
ASIL	Acceptable source impact level
ASTM	American Society for Testing and Materials
CAM	Compliance Assurance Monitoring (40 CFR 64)
CEM	Continuous emission monitor
CEMS	Continuous emission monitoring system
CFR	Code of Federal Regulations
CO	Carbon monoxide
EPA	The United States Environmental Protection Agency
FCAA	Federal Clean Air Act
gr	grains (there are 7,000 grains in one pound)
GP	Georgia-Pacific
HRSG	Heat Recovery Steam Generator
ISO	International Organization for Standardization
MMBtu	Million British thermal units (units of energy)
MMBtu/hr	Million British thermal units per hour (units of power)
MR&R	Monitoring, recordkeeping and reporting requirements
MWe	Megawatts electrical (units of power)
MWh	Megawatt hours (units of energy)
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOC	Notice of Construction
NO_X	Oxides of nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
NWCAA	Northwest Clean Air Agency

O_2	Oxygen
OAC	Order of Approval to Construct (minor New Source Review)
PM	Particulate matter
PM_{10}	Particulate matter less than 10 microns in diameter
ppmdv	parts per million dry volume; parts of pollutant per million parts of dry stack gas on a volumetric basis
PSD	Prevention of Significant Deterioration (federally required program for pre-construction review of sources)
psia	pounds per square inch absolute
QA/QC	Quality assurance/quality control
RCW	Revised Code of Washington
scf	standard cubic feet
SCR	Selective Catalytic Reduction
SIP	State Implementation Plan
SO_2	Sulfur dioxide
STP	Standard Temperature and Pressure: 20° C (68° F) and 760 mm Hg (29.92 in. Hg) per NWCAA Regulation (e.g. applies to fuel sulfur limit) 288 K (15° C, 59° F) and 101.3 kPa (1 atmosphere) per ISO (e.g. applies to natural gas volume measurement)
VE	Visible emissions
VOC	Volatile Organic Compound
WAC	Washington Administrative Code

9 PUBLIC DOCKET

Copies of PSE Encogen's Air Operating Permit, permit application, and any technical support documents are available online at www.nwcleanair.org or at the following location:

Northwest Clean Air Agency
1600 South Second Street
Mount Vernon, WA 98273-5202

APPENDIX A

Changes Incorporated into Previous Air Operating Permits

AOP Changes in the 2004 Renewal and 2006 Modification

The first AOP renewal was issued on January 1, 2004 and expired on January 1, 2009.

Permit Information Page

- Updated Corporate Inspection Contact (Charles Morton)
- Changed facility name to PSE Encogen here and in remainder of permit
- Changed permit applicability dates

Section 1 - Emission Unit Group Identification

- Included the new Auxiliary Boiler in the listing of sources at PSE Encogen

Section 2 – Standard Terms and Conditions

- Included the latest version (May 2006) of this section with new dates and language from revisions to WAC 173-400 and NWCAA Regulations

Section 3 - Standard Terms and Conditions for NSPS

- Added a new section that includes Standard Terms for New Source Performance Standards

Section 4 – Generally Applicable Requirements

- Changed WAC 173-400 and NWCAA Regulations applicability dates

Section 5 – Specifically Applicable Terms and Conditions

- Added a paragraph to the introduction for this section to explain that emission limits with no testing requirements are due to one-time performance testing required by an OAC or PSD
- Added new NSPS Subpart GG requirements for NO_X and SO_2 for gas turbines
- Added permit terms for auxiliary boiler per OAC 951
- Added Subpart Dc regulations for auxiliary boiler
- Removed references to testing requirements from 40 CFR 60 and included the Appendix A requirement for monitoring and testing that references 40 CFR 75

Section 6 – Acid Rain Permit for Turbines 1, 2 and 3

- Added new section with Acid Rain provisions including applicability information, the Acid Rain permit application for PSE Encogen, and the Certificate of Representation

Section 7 – Inapplicable Requirements

- Removed the Acid Rain provisions since these rules are no longer inapplicable
- Removed NSPS Subpart Dc provisions since these rules are no longer inapplicable