

**PSD Applicability Determination
Seattle Steam Company
Wood-Fired Boiler Project
February 1, 2006**

After a review of the information submitted to the Washington State Department of Ecology (Ecology) on January 25, 2006, from the Puget Sound Clean Air Agency, Ecology finds that the Wood-Fired Boiler Project **is not subject to PSD review.**

Proposed Wood-Fired Boiler Project

Seattle Steam owns and operates a steam production facility in Seattle, Washington that has provided heat energy to business in downtown Seattle for over 115 years. They submitted a Notice of Construction application to the Puget Sound Clean Air Agency and requested authorization to replace one of the four existing natural gas and oil fired boilers with a fluidized-bed boiler. The new boiler is expected to be fueled primarily with wood. The primary constituents of the wood fuel are pallets and crate materials, wood recovered from land clearing, and sawdust and wood trimmings from cabinet shops and sawmills. In addition to the new boiler, Seattle Steam intends to discontinue firing their other boilers with number 6 fuel oil and switch over to ultra-low sulfur distillate fuel oil.

The new fluidized-bed boiler is an existing unit that will be transferred from its present location (out of state) and reassembled at the Seattle Steam facility on Western Avenue. The boiler's steam generation capacity currently rated at 70,000 lbs/hr and will be upgraded to 80,000 lbs/hr before beginning operation. The boiler has a maximum heat input rating of 100.4 million British thermal units per hour (MMBtu/hr) on wood, and 86.3 MMBtu/hr on oil or natural gas. Although the principal fuel would be wood, the boiler also would be equipped with a burner capable of firing either oil or natural gas. During periods of cold weather, fuel oil may be burned instead of wood to meet increased steam demand. Natural gas would be used chiefly to heat the fluidized bed during startup for wood fuel firing, but natural gas could also be fired to produce steam. The emission estimates below, provide for 500 hours per year of natural gas operation, 500 hours per year of distillate oil operation with the remaining being wood fuel.

The Puget Sound Clean Air Agency is requiring Seattle Steam to install a Selective Non-Catalytic Reduction (SNCR) system to reduce NO_x emissions; limestone injection into the fluidized bed to reduce sulfur dioxide (SO₂) and acid gas emissions; and a fabric filter for reducing emissions of particulate matter (PM) and PM smaller than 10 microns in diameter (PM₁₀).

The oil burner would be fired using No. 2 distillate oil. In addition, Seattle Steam plans to change the backup fuel used by the three remaining natural gas-fired boilers from high-sulfur (No. 6 residual fuel oil) to low sulfur (No 2 distillate oil). The existing boilers are permitted to burn a limited quantity of No. 6 fuel oil per calendar year. The switch from No. 6 oil, which generally contains approximately 1.7 percent sulfur by weight (i.e., 17,000 ppm), to 15-ppm No

2 distillate oil, would drastically reduce SO₂ and PM₁₀ emissions from existing boilers during periods of oil firing.

PSD Applicability Determination

Seattle Steam is an existing Major Stationary Source with respect to Prevention of Significant Deterioration (PSD) because they have actual emissions in excess of 250 tons per year as defined in 40 CFR 52.21(b)(1)(i). In order for a project to become subject to PSD review, the major stationary source must have a significant emissions increase from the project and a significant net emissions increase as calculated over the 5-year contemporaneous period.

Emissions from the proposed new unit will be calculated based upon vendor guaranteed emission factors using the actual to projected-actual applicability test, except that the projected-actual emissions are the units' potential to emit or some federally enforceable limitation.

Actual to Projected-Actual

Since this emission unit is new, its actual emissions are considered to be zero (see 40 CFR 52.21(b)(48)(iii)), and projected actual emissions are considered to be its potential to emit emissions when fired on the fuel with the highest emissions. The tables below show the different firing scenarios for the boiler (i.e. wood, oil, and natural gas). Seattle Steam, however, will be required to have a federally enforceable limitation in its Notice of Construction order that limits firing oil to 500 hours per year. Since emissions of natural gas are smaller, there is no reason to limit natural gas firing. Below are those calculations:

Table 1 shows the projected emissions from firing only wood:

Table 1. Wood Fired

Pollutant	Emission Factor ¹ (lb/MMBtu)	Emission Rate ²	
		(lb/hr)	(TPY) ³
NO _x	0.1	10.0	43.98
CO	0.1	10.0	43.98
SO ₂	0.039	3.9	17.15
PM ₁₀	0.03	3.0	13.19
VOC	0.005	0.5	2.20

1. All emission factors are based on vendor guarantees, except for SO₂, which is based on a wood fuel sulfur content of 0.02 percent.
2. Based on a maximum heat input of 100.4 MMBtu/hr.
3. Annual emission rate based on 8,760 hours of operation while firing wood.

Table 2 shows the projected emissions from firing only oil:

Table 2. Oil Fired

Pollutant	Emission Factor (lb/MMBtu)	Emission Rate		
		(lb/hr)	(TPY) ³	(TPY) ⁴
NO _x	0.3	25.9	6.47	113.40
CO	0.12	10.4	2.59	45.45
SO ₂	0.0016	0.137	0.0343	0.60
PM ₁₀	0.025	2.16	0.539	9.45
VOC	0.025	2.16	0.539	9.45

1. All emission factors are based on vendor guarantees, except for SO₂, which is based on an ultra low sulfur fuel.
2. Based on a maximum heat input of 86.3 MMBtu/hr.
3. Annual emission rate based on 500 hours of operation while firing oil.
4. Annual emission rate based on 8760 hours of operation while firing oil.

Table 3 shows the projected emissions from firing only natural gas:

Table 3. Natural Gas

Pollutant	Emission Factor (lb/MMBtu)	Emission Rate		
		(lb/hr)	(TPY) ³	(TPY) ⁴
NO _x	0.12	25.9	2.59	45.35
CO	0.075	10.4	1.62	28.35
SO ₂	0.011	0.137	0.228	4.16
PM ₁₀	0.01	2.16	0.216	3.78
VOC	0.016	2.16	0.345	6.05

1. All emission factors are based on vendor guarantees, except for SO₂, which is based on a natural gas sulfur content of 3.88 grains per 100 standard cubic feet of gas.
2. Based on a maximum heat input of 86.3 MMBtu/hr.
3. Annual emission rate based on 500 hours of operation while firing natural gas.
4. Annual emission rate based on 8760 hours of operation while firing natural gas.

Table 4 below combines the emissions shown above and is based upon 500 hr/yr oil, 500 hr/yr natural gas and 7,760 hr/yr wood. This is the expected operating rate of this boiler and is referred to as its allowable emissions. The Puget Sound Clean Air Agency will need to place these limits in the facilities federally enforceable notice of construction permit.

Pollutant		Emission Rate			Allowable emissions ¹ TPY	PSD SER TPY
		Maximum lb/hr	Proposed ¹ TPY	Maximum TPY Using 8760 hr/yr		
NO _x	Wood	10.0	38.96	43.98	48.02	40
	Oil	25.9	6.47	113.4		
	Nat Gas	25.9	2.59	45.35		
CO	Wood	10.0	38.96	43.98	43.17	100
	Oil	10.4	2.59	45.45		
	Nat Gas	10.4	1.62	28.35		
SO ₂	Wood	3.9	15.19	17.15	15.22	40
	Oil	0.137	0.0343	0.60		
	Nat Gas	0.137	0.228	4.16		
PM ₁₀	Wood	3.0	11.69	13.19	12.45	15
	Oil	2.16	0.539	9.45		
	Nat Gas	2.16	0.216	3.78		
VOC	Wood	0.5	1.95	2.20	2.83	40
	Oil	2.16	0.539	9.45		
	Nat Gas	2.16	0.345	6.05		

1. Application discussed 7760 hr/yr on wood, 500 hr on oil, and 500 hr/yr on natural gas

NO_x is the only pollutant that exceeds the PSD Significant Emission Rates.

Net Emissions Increase

A netting analysis consists of summing all of the emissions increases and decreases due to adding, retiring, or modifying emission units over a 5-year contemporaneous period.

"Contemporaneous" means the five years immediately prior to the date that construction begins plus the time between beginning construction and beginning normal operation. Seattle steam has not experienced any increases or decreases during the contemporaneous period except for the retiring of Boiler #1. The average NO_x emissions reported for Boiler #1 for 2003-2004 were 141 tons per year. Therefore, a netting analysis for NO_x emissions from this project results in 48.02 ton per year increase in NO_x emissions from the installation of the new boiler and a 141 ton per year decrease in NO_x emissions from the removal of Boiler #1 (expected to occur June 2006) for a total net emissions decrease of 92.98 tons per year. Even if the Puget Sound Clean Air Agency did not limit the number of hours oil is fired in the new boiler, the NO_x net emissions increase would be below the PSD Significant Emissions Rates for this project.

Conclusion

Seattle Steam's Wood-Fired Boiler Project is not subject to PSD review because no pollutant has a net emissions increase equal to or greater than the PSD Significant Emissions Rates as defined by 40 CFR 52.21(a)(2)(iv)(a). The Puget Sound Clean Air Agency will need to ensure that the old boiler is permanently removed from service prior to beginning normal operation of the new boiler.