

**DRAFT
ENVIRONMENTAL ASSESSMENT
FOR
SEATTLE STEAM COMPANY
COMBINED HEAT AND POWER AT
POST AVENUE IN DOWNTOWN
SEATTLE, WASHINGTON**

**U.S. Department of Energy
National Energy Technology Laboratory**



June 2010

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ACRONYMS AND ABBREVIATIONS

Btu	British thermal unit
CFR	Code of Federal Regulations
CHP	combined heat and power
CO	carbon monoxide
dB(A)	A-weighted decibel
DOE	U.S. Department of Energy (also called the Department)
EA	environmental assessment
EPA	U.S. Environmental Protection Agency
FR	Federal Register
NEPA	National Environmental Policy Act, as amended
NO _x	nitrogen oxides
PM ₁₀	particulate matter with median aerodynamic diameter of 10 micrometers or less
PM _{2.5}	particulate matter with median aerodynamic diameter of 2.5 micrometers or less
PSD	prevention of significant deterioration
PSCAA	Puget Sound Clean Air Agency
PSE	Puget Sound Energy
Recovery Act	American Recovery and Reinvestment Act of 2009
SMC	Seattle Municipal Code
VOC	volatile organic compound

Note: Numbers in this EA generally have been rounded to two or three significant figures. Therefore, some total values might not equal the actual sums of the values.

COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy (DOE)

TITLE: *Draft Environmental Assessment (Draft EA) for Seattle Steam Company Combined Heat and Power at Post Avenue in Downtown Seattle, Washington* (DOE/EA-1741D)

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Abstract: DOE prepared this Draft EA to evaluate the potential environmental consequences of providing an *American Recovery and Reinvestment Act of 2009* (Recovery Act; Public Law 111-5, 123 Stat. 115) financial assistance grant to the Seattle Steam Company to facilitate the installation of a combined heat and power (CHP) plant in downtown Seattle, Washington. The CHP plant would be integrated into the existing electrical and thermal energy distribution networks and capable of producing about 50 megawatts of electricity as well as providing steam to Seattle Steam's existing energy distribution system. This Draft EA analyzes the potential environmental consequences of DOE's Proposed Action of providing the Recovery Act grant, Seattle Steam Company's proposed project of installing and operating a CHP system, and the No-Action Alternative.

In this Draft EA, DOE evaluated in detail potential impacts to air quality, cultural resources, socioeconomics, health and safety, sound levels, and energy use. After performing a screening analysis of other resource areas, DOE concluded that impacts to other aspects of the environment would not occur or would not be detectable. The proposed project would be in compliance with federal and Washington air quality regulations, reduce greenhouse gas emissions, and have a net beneficial impact on air quality in the region. The CHP system would be installed in a facility of historic significance, which would require some temporary and, perhaps, permanent changes to the building's exterior. Seattle Steam would take measures to maintain the building's characteristics as well as make structural improvements to the interior that would increase the building's longevity. Manufacturing and installation of the equipment would result in a minor to moderate, temporary beneficial impact to the economy. Operation of the CHP system would add an increment of sound levels to the local area but would be in compliance with the city's Noise

Control ordinance. Cumulative impacts from the proposed project, relative to impacts from other activities in the surrounding area, would be negligible to small.

Availability: The Draft EA is available on DOE's National Energy Technology Laboratory (NETL) web site (<http://www.netl.doe.gov/publications/others/nepa/ea.html>) and at the following public library:

The Seattle Public Library
Central Library
1000 Fourth Avenue
Seattle, WA 98104-1109

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SUMMARY

The U.S. Department of Energy proposes to award an *American Recovery and Reinvestment Act of 2009* financial assistance grant to the Seattle Steam Company to facilitate the installation of a new combined heat and power system at an existing district energy plant that supplies steam to about 200 buildings in about 1 square mile of Seattle, Washington's, Central Business District and First Hill neighborhoods. The Department's Proposed Action is to provide Seattle Steam Company with an \$18.8 million grant in a cost-sharing arrangement to facilitate installation of the combined heat and power system. The system would have the capacity to produce about 50 megawatts of electricity and, along with another energy plant, support steam demand from the district energy distribution system. Seattle Steam estimates the proposed plant would use only about 60 percent as much fuel as the current steam and electricity generating capacity it would replace.

The combined heat and power system would be installed in the Seattle Steam Company's existing facility at 633 Post Avenue in south downtown Seattle. Electricity from the system would be produced using a natural gas-powered combustion turbine. The exhaust gas from the turbine would be routed to a once-through (heat recovery) steam generator, which would be equipped with natural gas-fired duct burners to increase steam production. Excess steam from the steam generator would be routed through a steam turbine, providing a secondary electricity generation source. Steam would be sent to the district energy distribution system from either the steam generator or steam turbine. A selective catalytic reduction system would be installed in the off-gas system to reduce emissions of nitrogen oxides.

Seattle Steam's facility is located in an area classified under the *Clean Air Act* as "in attainment" for all criteria air pollutants. An estimated 23 tons of carbon monoxide, 19 tons of nitrogen oxides, and 83 tons of particulate matter would be emitted per year during operation of the system. These emissions would be expected to be generally higher than those currently emitted from the existing facility and prior to construction and operation of the new system, Seattle Steam would obtain the necessary permits and air emission limitations to ensure compliance with federal and Washington air quality regulations. Although emissions from the existing facility would increase, operation of the combined heat and power system would result in a net decrease in air pollutant emissions by offsetting emissions from the current steam plant and regional electricity generating plants. Thus, the project would have a net beneficial impact on air quality in the region.

The Seattle Steam facility is within the Pioneer Square – Skid Road Historic District, which is on both the Washington Heritage Register and the National Register of Historic Places. The building itself is identified as a contributing source to the Pioneer Square District's placement on the National Register. As such, the proposed project would affect a building of historic significance. Temporary changes would likely be required to the building's façade and possibly permanent changes to the building's roof in order to incorporate necessary air handling components. However, the building's exterior would be restored to the extent practicable to

maintain the characteristics that made it eligible for the National Register of Historic Properties. The interior actions would include structural improvements that should help extend the life of the building. The Pioneer Square Preservation Board would need to review and approve detailed plans before Seattle Steam began facility modification and restoration activities. DOE concludes that the proposed project would maintain the cultural significance of the existing building.

Installation and operation of the combined heat and power system would not have any meaningful or detectable impacts on land use; geology and soils; water, biological, and visual resources; waste and hazardous materials; environmental justice; and transportation and traffic. Further, operation of the system would not cause significant hazards to workers or the public.

Manufacturing of the combined heat and power equipment would result in a minor to moderate and mostly temporary, beneficial impact to the economy in the areas where the equipment would be manufactured and in the Seattle area during installation and subsequent operation.

The proposed project would cause unavoidable increases in noise within the existing facility. The City of Seattle's Noise Control ordinance would require the facility to create no more than 60 dB(A) of sound at adjacent receptors. Achieving the City's required noise reduction level would ensure that there would be no significant noise impacts to people or property use in the area.

Operation of the combined heat and power system would require more natural gas (or diesel fuel in times of natural gas curtailment) than currently being used at the existing facility. However, this would be offset by the production of electricity that would go to the region's electrical grid. Overall, the system would use less fuel energy than currently being used to produce the corresponding amounts of steam (in the Seattle Steam boiler plant) and electricity (in regional generating units).

Relative to the cumulative changes in the environment from ongoing and planned activities in south downtown Seattle, installation and operation of the combined heat and power system would cause small, adverse incremental changes in air quality and noise in the area. The increasing demand for electricity and natural gas in the future will undoubtedly increase the need for more efficient uses of fuel, such as that provided with a combined heat and power system.

Under the No-Action Alternative, DOE would not provide funding to Seattle Steam and assumes for purposes of this analysis that the combined heat and power system would not be installed and operated. No impacts to the existing environment would occur, and beneficial impacts of the proposed project would not be realized.

On the basis of the evaluations in this environmental assessment, the Department of Energy determined that its Proposed Action, providing financial assistance to Seattle Steam to facilitate installation of a combined heat and power system, would have no significant impact on the human environment.

1. INTRODUCTION

As part of the *American Recovery and Reinvestment Act of 2009* (the Recovery Act; Public Law 111-5, 123 Stat. 115), the U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL), on behalf of the Office of Energy Efficiency and Renewable Energy's Industrial Technologies Program, is providing up to \$156 million in federal funding for competitively awarded grants for the deployment of projects for district energy systems, combined heat and power (CHP) systems, waste energy recovery systems, and energy-efficient industrial equipment and processes at single installations or multiple installations at multiple sites. The funding of these projects requires compliance with the *National Environmental Policy Act of 1969*, as amended (NEPA; 42 U.S.C. 4321 et seq.), Council on Environmental Quality regulations (40 CFR Parts 1500 to 1508), and DOE NEPA implementing regulations (10 CFR Part 1021).

To comply with NEPA, DOE has prepared this *Draft Environmental Assessment for Seattle Steam Company Combined Heat and Power at Post Avenue in Downtown Seattle, Washington* (Draft EA). This Draft EA examines the potential environmental consequences of DOE's Proposed Action—providing a financial assistance grant—and the Seattle Steam Company's (Seattle Steam's) proposed project—transitioning one of their existing steam energy plants in downtown Seattle, Washington, into a CHP plant. Under this project equipment already in the plant would be removed as necessary and new equipment would be installed with the capacity to more efficiently produce both electricity and steam. Seattle Steam would continue to utilize the steam in their existing distribution system and the electricity produced would be purchased by an electrical utility in the area. This EA also examines the No-Action Alternative, under which DOE would not provide the proposed financial assistance and, for purposes of this evaluation, assumes Seattle Steam would not proceed with the project.

This section explains NEPA and the related procedures (Section 1.1), the background of this project (Section 1.2), its purpose and need (Section 1.3), and the environmental considerations DOE did not carry forward to detailed analysis (Section 1.4). Chapter 2 discusses DOE's Proposed Action, Seattle Steam's proposed project, action alternatives, and the No-Action Alternative. Chapter 3 details the affected environment and potential environmental consequences of the Proposed Action, proposed project, and of the No-Action Alternative. Chapter 4 addresses cumulative impacts, and Chapter 5 provides DOE's conclusions from the analysis. Chapter 6 lists the references for this document. Appendix A contains the distribution list for this document, and Appendix B lists consultations with other agencies.

1.1 National Environmental Policy Act and Related Procedures

In accordance with the DOE NEPA implementing procedures, DOE must evaluate the potential environmental impacts of its proposed actions, including funding decisions, which may have a significant impact on human health or the environment. In compliance with these regulations and DOE's procedures, this EA:

- Examines the potential environmental impacts of the Proposed Action and the No-Action Alternative;
- Identifies unavoidable adverse environmental impacts of the Proposed Action;
- Describes the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and
- Characterizes any irreversible and irretrievable commitments of resources that would be involved should DOE decide to implement its Proposed Action.

DOE must meet these requirements before it can make a final decision to proceed with any proposed federal action that could cause adverse impacts to human health or the environment. This EA fulfills DOE's obligations under NEPA and provides DOE with the information needed to make an informed decision about helping finance Seattle Steam Company's proposed installation of a CHP system in downtown Seattle, Washington.

This EA evaluates the potential individual and cumulative impacts of Seattle Steam Company's project. No other action alternatives are analyzed. For purposes of comparison, this EA also evaluates the impacts that could occur if DOE did not provide funding (the No-Action Alternative), under which DOE assumes that Seattle Steam Company would not proceed with the project. This assumption may be incorrect—that is, Seattle Steam might proceed without federal assistance. However, this assumption allows DOE to compare the impacts of an alternative in which the project occurs with one in which it does not.

1.2 Background

The U.S. Department of Energy's (DOE's or The Department's) National Energy Technology Laboratory (NETL) manages the research and development portfolio of the Industrial Technologies Program for the Office of Energy Efficiency and Renewable Energy. The mission of the Industrial Technologies Program is to establish U.S. industry as a world leader in energy efficiency and productivity. The program leads the national effort to reduce industrial energy intensity and carbon emissions, and strives to transform the way U.S. industry uses energy by supporting cost-shared research and development that addresses the top energy challenges facing industry. In addition, the Industrial Technologies Program fosters the adoption of advanced technologies and energy management best practices to produce meaningful progress in reducing industrial energy intensity.

Congress appropriated significant funding for the Industrial Technologies Program in the Recovery Act to stimulate the economy and reduce unemployment in addition to furthering the objectives of the existing program. DOE solicited applications for this funding by issuing a competitive Funding Opportunity Announcement (DE-FOA-0000044), *Recovery Act: Deployment of Combined Heat and Power (CHP) Systems, District Energy Systems, Waste*

Energy Recovery Systems, and Efficient Industrial Equipment, in June, 2009. The announcement invited applications in four areas of interest:

- Area of Interest 1 – Combined Heat and Power; the generation of electric energy and heat in a single, integrated system, with an overall thermal efficiency of 60 percent or greater on a higher-heating-value basis.
- Area of Interest 2 – District Energy Systems; systems providing thermal energy from a renewable energy source, thermal energy source, or highly efficient technology to more than one building or fixed energy-consuming use from one or more thermal energy production facilities through pipes or other means to provide space heating, space conditioning, hot water, steam, compression, process energy, or other end uses.
- Area of Interest 3 – Industrial Waste Energy Recovery; the collection and reuse of energy from sources such as exhaust heat or flared gas from any industrial process; waste gas or industrial tail gas that would otherwise be flared, incinerated, or vented; or a pressure drop in any gas, excluding any pressure drop to a condenser that subsequently vents the resulting heat.
- Area of Interest 4 – Efficient Industrial Equipment; any proven commercially available technology that can provide a minimum 25-percent efficiency improvement to the industrial sector.

The Department announced its selections on November 3, 2009, with multiple awards in three of the four areas of interest and selected 9 projects based on the evaluation criteria in the funding opportunity announcement and gave special consideration to projects that promoted the objectives of the Recovery Act—job preservation or creation and economic recovery—in an expeditious manner.

This proposed project, installation of a CHP system at Post Avenue in downtown Seattle, was one of the 9 selected for funding by DOE. The Department’s Proposed Action is to provide an \$18.8 million in financial assistance grant under a cost-sharing arrangement with Seattle Steam Company. The total cost of the project is estimated at \$80 million.

1.3 Purpose and Need

The purpose of the Proposed Action is to support the mission of DOE’s Industrial Technologies Program and the goals of the Recovery Act. The mission of the Industrial Technologies Program is to have U.S. industry lead the world in energy efficiency and productivity. The Program leads the national effort to reduce industrial energy intensity and carbon emissions, and strives to transform the way U.S. industry uses energy by supporting cost-shared research and development that addresses the top energy challenges facing industry. Additionally, the Program fosters the adoption of today’s advanced technologies and energy management best practices to produce meaningful progress in reducing industrial energy intensity.

The Industrial Technologies Program's three-part strategy pursues this mission by:

- Sponsoring research, development, and demonstration of industry-specific and crosscutting technologies to reduce energy and carbon intensity;
- Conducting technology delivery activities to help plants access today's technology and management practices; and
- Promoting a corporate culture of energy efficiency and carbon management within industry.

To align with its mission, the program has established a goal of achieving a 25-percent reduction in industrial energy intensity by 2017, guided by the *Energy Policy Act of 2005*. The strategy also calls for an 18-percent reduction in U.S. carbon intensity by 2012. The Department seeks to identify projects and technologies that it can fund to meet this goal.

In June 2009, DOE initiated a process to identify suitable projects by issuing Funding Opportunity Announcement DE-FOA-00000044, *Recovery Act: Deployment of Combined Heat and Power (CHP) Systems, District Energy Systems, Waste Energy Recovery Systems, and Efficient Industrial Equipment*. This Funding Opportunity Announcement is funded by the Recovery Act.

The Recovery Act seeks to create jobs, restore economic growth, and strengthen America's middle class through measures that modernize the nation's infrastructure, enhance America's energy independence, expand educational opportunities, preserve and improve affordable health care, provide tax relief, and protect those in greatest need. Provision of funds under this Funding Opportunity Announcement would achieve these objectives.

The capital cost of new equipment is often a roadblock for use of more efficient equipment and processes. Although the newer technologies would provide lower energy requirements and operating costs, the payback period for some technologies does not meet internal business goals. DOE's provision of financial assistance allows companies to reduce the payback period, making these new technologies an acceptable option for them.

1.4 Environmental Resources Not Carried Forward

Chapter 3 of this EA examines the potential environmental impacts of the proposed Seattle Steam project and No-Action Alternative in the following resource areas:

- Air quality,
- Cultural resources,
- Socioeconomics,
- Occupational health and safety,
- Noise, and

- Utilities, energy, and materials.

The Department’s EAs commonly address the resource areas in Table 1-1 in addition to those identified above. However, in an effort to streamline the NEPA process and enable timely awards to the selected projects, this assessment did not examine these areas at the same level of detail as the resource areas listed above. The focus for the more detailed analysis was on those activities or actions that would require new or revised permits, have the potential for significant adverse environmental impacts, or have the potential for controversy. DOE concludes that the Seattle Steam proposed project would result in no or very minor impacts to the resource areas in Table 1-1, which includes explanations for why further analysis is unnecessary.

Table 1-1. Resource areas with no or minimal impacts.

Resource area	Reasons for Not Requiring a Detailed Analysis
Land Use	The new equipment would be installed in the existing Seattle Steam boiler plant on Post Avenue. Seattle Steam owns the existing facility, which has provided energy services to the core area of downtown Seattle for over 115 years. Installation of the new CHP system would improve the efficiency of the Seattle Steam district energy system and would not disrupt the primary land use, which is an industrial facility to generate steam for an existing district energy system. Although this location is in downtown Seattle and within the Pioneer Square – Skid Road National Historic District, the historic use of the facility has been as an energy generation plant. The project would involve no change in land use at this or surrounding locations.
Geology and Soils	Because the new equipment would go into an existing facility, the project would have no affect on geology and soils of the area. Similarly, geologic and soil conditions would have no different effect than on the current facility, with the exception that the interior of the building would undergo an extensive renovation, including actions to strengthen its structure to meet current building codes. It is recognized that Seattle, Washington is in an active seismic area (USGS 2008), so actions to strengthen the facility could be important with regard to its longevity and the longevity of the new equipment.
Water Resources	Water use during construction and equipment installation actions would be minor and basically limited to the personal needs of the workers and possibly the cleaning of building materials and tools. Similarly, there would be no discharges of wastewater, other than the minor increases in the quantities going to the existing sewer system as a result of the additional workers that would be present during construction and from rinsing done inside the building. The new CHP plant would produce quantities of steam similar to those currently produced by the existing plant. Therefore, there would be no significant change in the amount of water that would be required by the operating CHP plant. Housed within an existing facility, the new CHP plant would involve no change to existing storm water runoff quantities or quality. Existing discharge of soft water regenerant solution from the energy plant is to the bay and is done under a permit. These conditions would not change.

Table 1-1. Resource areas with no or minimal impacts (continued).

Resource area	Reasons for Not Requiring a Detailed Analysis
Biological Resources	<p>Since all project activities would take place within an existing building, there would be no potential for impacting biological resources. This would include no potential to impact any threatened or endangered species and, as a result, there would be no reason for consultations with the U.S. Fish and Wildlife Service (FWS) under Section 7(a) (2) of the Endangered Species Act. This was verified in an informal conversation with a manager from the Washington Fish and Wildlife Office of the FWS (Michaels 2010).</p>
Aesthetics and Visual Resources	<p>During construction and equipment installation, there would be increased activities at and around the existing Seattle Steam energy plant on Post Avenue. Some observers may find this disruptive of the aesthetic and visual values of the immediate area, but these activities would be temporary and of relatively short duration.</p> <p>Once the CHP plant was operational, aesthetic and visual resources of the area would be no different than under current conditions for the existing facility. There would be no, or very minor, changes to the exterior of the building. There could be minor changes on the roof of the existing building in the form of air handling devices for the new equipment, but these would not be visible from ground level. As a property of historical value, the existing energy plant’s visual characteristics are further addressed in Section 3.2.</p>
Waste and Hazardous Materials	<p>It is expected that only minor amounts of construction debris waste would be generated during the proposed project’s construction and equipment installation phase. Some old, asbestos-covered equipment would likely be removed from the facility before the new equipment would be installed. Seattle Steam has personnel certified to manage asbestos removal actions and both the asbestos containing materials and the equipment, as well as any other construction debris would be managed and disposed of in accordance with local regulations.</p> <p>Fuels and other petroleum products used in construction equipment would be present at the site during construction. Any significant spillage or leakage from this equipment would be cleaned up at the time it occurred. There would be no significant quantities of hazardous materials present at the site during operations other than the possible lubricants and cleaning materials present inside the facility to support equipment and facility maintenance actions.</p>

Table 1-1. Resource areas with no or minimal impacts (continued).

Resource area	Reasons for Not Requiring a Detailed Analysis
Environmental Justice	<p>Executive Order 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,” directs federal agencies to address environmental and human health conditions in minority and low-income communities. The evaluation of impacts to environmental justice is dependent on determining if high and adverse impacts from the proposed project would disproportionately affect any low-income or minority group in the affected community. The Department determined that no high and adverse impacts would occur to any member of the community; therefore it was determined there would be no adverse and disproportionate impacts to minority or low-income populations. Section 3.3.1 presents demographic information for the area.</p>
Transportation	<p>During construction and equipment installation actions, workers at the existing energy plant would represent an increase in the local area workforce that would be vying for the same public parking places and public transportation capacity as the existing workforce. There would be no new or unique parking places made available for the construction workers. However, the size of the construction workforce would be minor in comparison to workers already in the area and the additional demands on public parking and transportation would be temporary.</p> <p>It is anticipated that limited (and temporary) road lane modifications would be necessary for safe delivery of large pieces of equipment, but the number of such actions would be relatively small and would be coordinated with local traffic management authorities.</p>

2. DOE PROPOSED ACTION AND ALTERNATIVES

This chapter describes DOE's Proposed Action (Section 2.1), Seattle Steam's proposed project (Section 2.2), the bases for not considering other alternatives (Section 2.3), and the No-Action Alternative (Section 2.4).

2.1 DOE's Proposed Action

The Department of Energy's Proposed Action for the Industrial Technologies Program is to provide Seattle Steam with a financial assistance grant through the Recovery Act to facilitate Seattle Steam's installation of a CHP plant in downtown Seattle. DOE would provide an \$18.8 million grant in a cost-sharing arrangement with Seattle Steam. The total cost of the proposed project is estimated to be \$80 million.

2.2 Seattle Steam's Proposed Project

Seattle Steam's proposed project would install a new CHP system, with the capacity to generate approximately 50 megawatts of electricity, within an existing energy plant in downtown Seattle, Washington. The proposed project would improve energy efficiency by producing electricity as well as contributing steam to an existing steam distribution system.

Seattle Steam is a privately owned utility, founded in 1893, that currently operates a district energy system in Seattle, Washington. Seattle Steam produces thermal energy (steam) from five boilers in two plants located in downtown Seattle, and distributes the energy through approximately 18 miles of underground pipe to about 200 buildings in 1 square mile of Seattle's Central Business District and First Hill neighborhoods. Buildings served by the district energy system include office buildings, hospitals, hotels, and college campuses (Seattle Steam 2010a). Figure 2-1 shows the locations of the two energy plants and the approximate extent of the district energy system.

Seattle Steam operates five boilers in its two energy plants, four in the plant on Western Avenue and one in the plant on Post Avenue. The Seattle Steam boilers used natural gas, diesel (No. 2) fuel oil, or residual (No. 6) fuel oil. Natural gas is the primary fuel and fuel oil is used as secondary or standby fuel source, used primarily during periods of natural gas curtailment. This was changed slightly in the fall of 2009 when Seattle Steam started using its first biomass boiler. The primary fuel source for this boiler is urban waste wood, including materials such as woody yard waste, broken wood pallets, clean construction demolition wood, and wood waste from sawmills. The new boiler system provides Seattle Steam additional flexibility and price stability in the fuels it uses to produce energy.

Seattle Steam's proposed project would transition its plant on Post Avenue (Figures 2-1 and 2-2), into a combined heat and power (CHP) plant. Under this project, non-operating existing boiler equipment in the Post Avenue plant would be removed if necessary and new equipment would be installed with the capacity to produce both electricity and steam. With the new equipment

configuration, a gas turbine would be used to produce electricity. Heat from this process would be recovered by being sent through a heat recovery steam generator for the production of steam. As another energy recovery step, the CHP plant would include a steam generator that would provide additional electricity and a combined cycle design. Figure 2-3 provides a generic

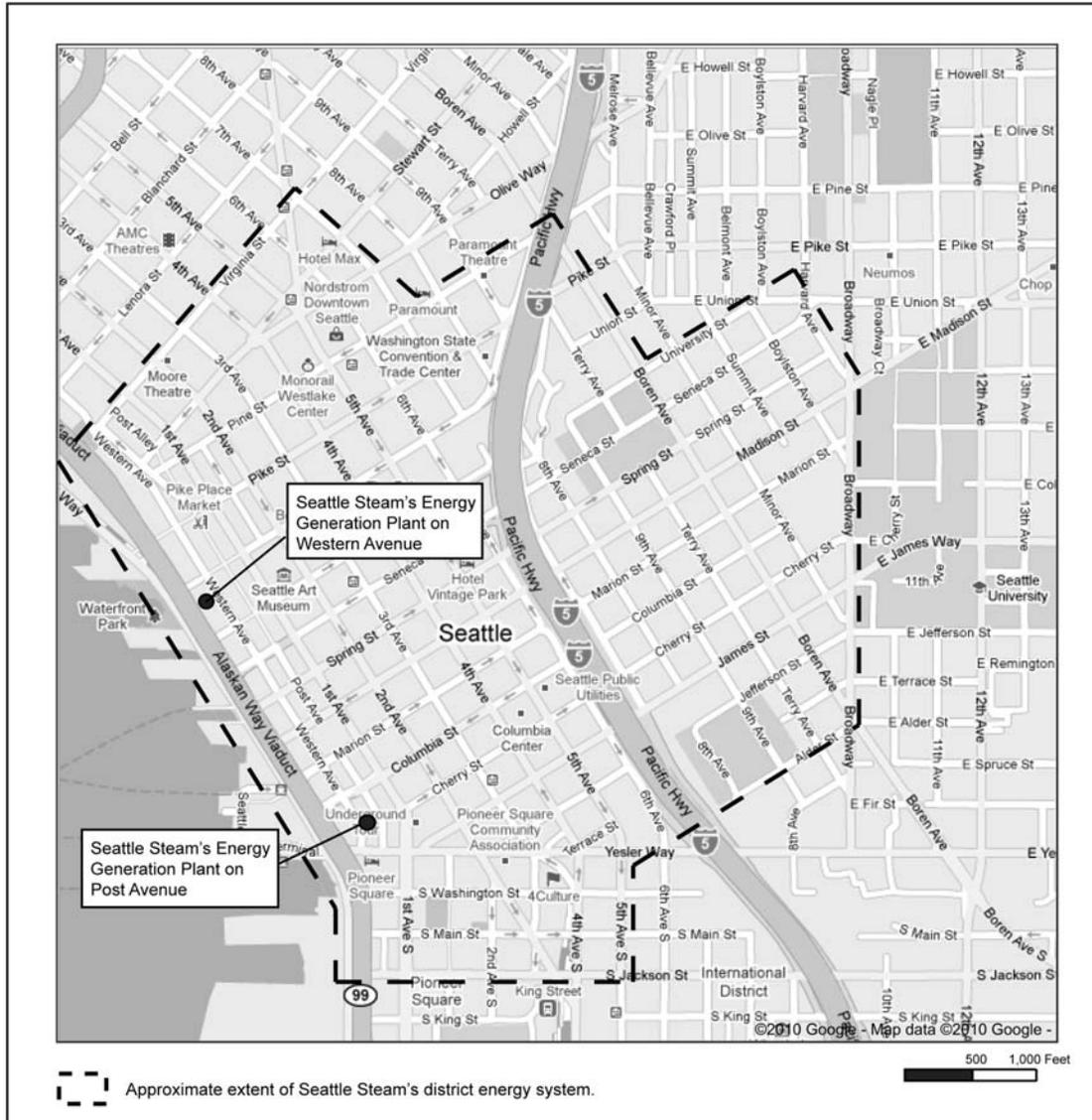


Figure 2-1. Locations of Seattle Steam's energy generation plants and district energy system.

representation of the equipment configuration that would be used in the CHP plant. As depicted in the figure, steam would be diverted to the Seattle Steam distribution system from the outlet of the steam turbine. In addition, low pressure steam is generated at the low temperature end of the heat recovery steam generator to further increase efficiency. Electricity would be transmitted to the electrical grid from both the gas turbine and the steam turbine.

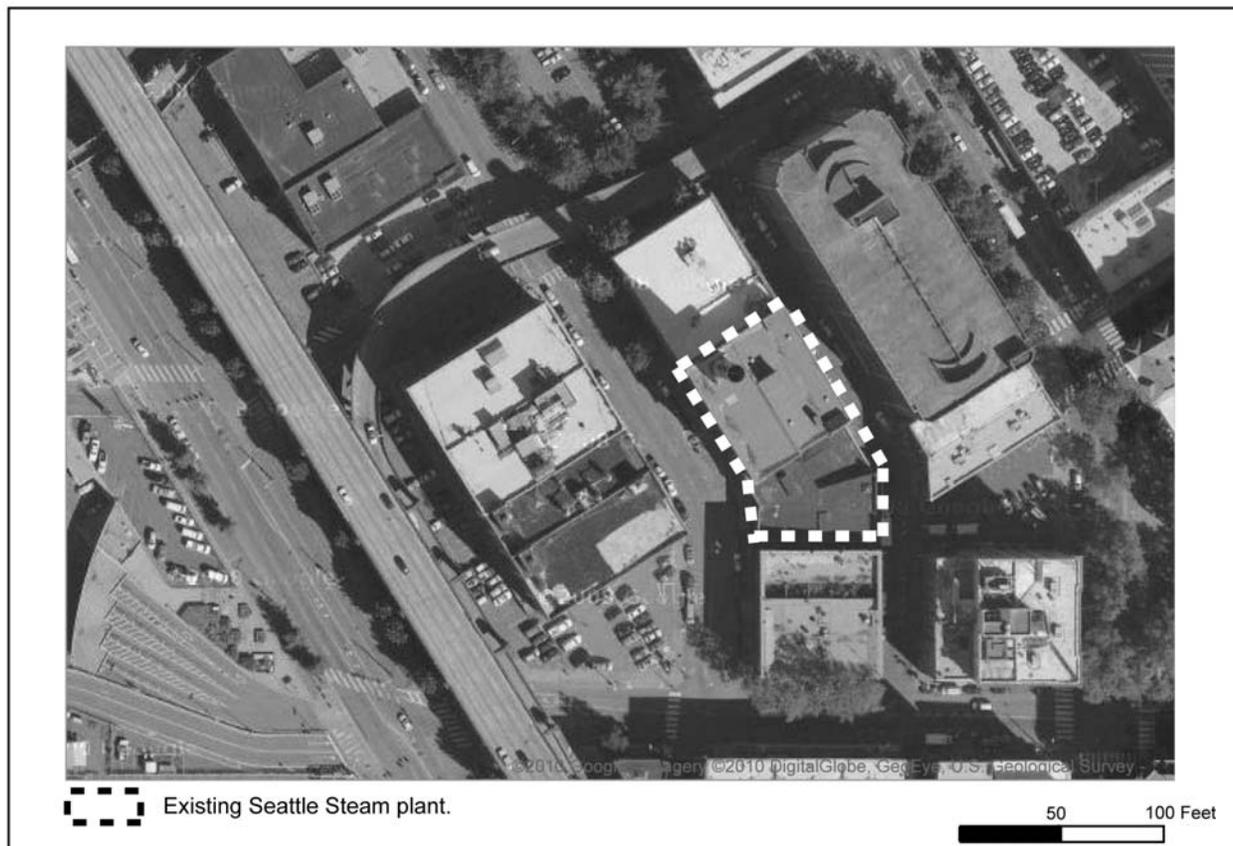


Figure 2-2. Aerial view of the Seattle Steam plant on Post Avenue, Seattle.

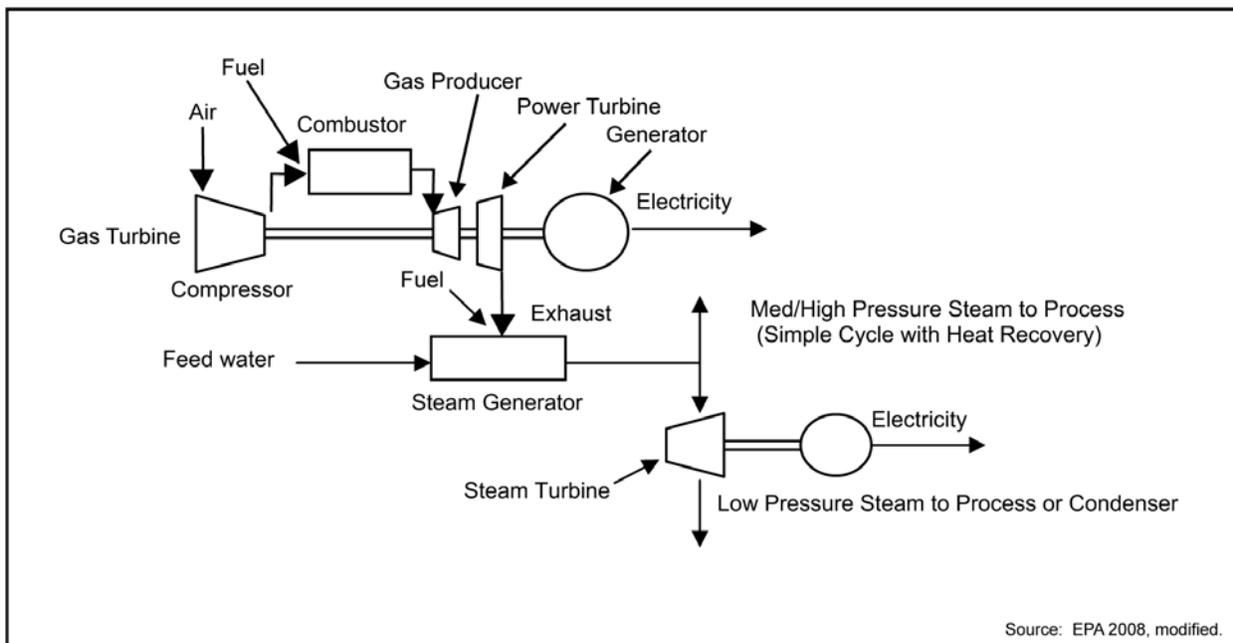


Figure 2-3. Generic representation of a CHP plant as would be deployed by Seattle Steam.

The gas turbine would use natural gas as its primary fuel with No. 2 fuel oil as its secondary fuel, and would produce electricity as well as provide heat to the steam generator. The steam generator (designated as a once-through steam generator) would use the hot exhaust from the gas turbine to generate steam, which would be sent to the steam turbine (with the option of also producing low pressure steam). This once-through configuration also allows the generator to be left dry, so if steam is not needed, the gas turbine could still be used to produce electricity without requiring the exhausted heat to bypass the generator. Seattle Steam's proposed CHP configuration also allows supplemental firing of fuel at the duct between the gas turbine and the steam generator. Fuel added at this point of the system takes advantage of the preheated combustion air and the relatively high concentration of oxygen remaining in the gas turbine exhaust to significantly increase the amount of steam that can be produced in the steam generator. Supplemental firing at this point in the system produces an increment of steam more efficiently (uses less fuel) than a comparable increment of steam from a stand-alone boiler (EPA 2008).

CHP systems typically require about three-quarters as much primary energy as that used by separate heat and power systems (EPA 2008). Seattle Steam estimates its proposed CHP system would be even more efficient, using only about 60 percent as much energy as would otherwise be used by separate power and heat systems fueled with coal, petroleum, or natural gas (Gent 2010).

As Figure 2-3 shows, excess steam from the steam generator would pass through the back pressure steam turbine for another source of electricity production. The amount of steam used to produce electricity could be varied depending on the process needs and the remaining steam would travel to the distribution system. The combination of these primary CHP components would allow the operator wide flexibility in making the most efficient use of the fuel energy originally sent to the gas turbine, while still meeting the demands for steam production.

The flow of air through the CHP system is only partially shown in Figure 2-3. Air going through the gas turbine would be exhausted to the steam generator for heat recovery, it would then be sent to the plant's off-gas system. Before discharging through the building's stack, the air flow would be sent through a selective catalytic reduction unit for control of nitrogen oxides in the off-gas. This system works by first injecting ammonia in the flue gas, which reacts in the presence of a catalyst to produce nitrogen gas and water. The selective catalytic reduction unit would reduce between 80 and 90 percent of the nitrogen oxides in the gas turbine exhaust (EPA 2008) and would be located at or near the steam generator in order to maintain necessary temperatures for the reaction.

The CHP plant was proposed with key roles played by the Seattle Steam Company and Puget Sound Energy (PSE), which is a local electricity and natural gas utility. Seattle Steam's proposed function in the project is to lease the Post Avenue plant to a project developer with a contract to purchase steam. PSE would similarly be under contract with the CHP plant developer to sell natural gas and purchase electrical energy. PSE also expressed a possible interest in being

the owner of the CHP plant and supplier of steam energy to Seattle Steam. A third identified player, Seattle City Light (a public owned utility), agreed to provide electric connections to the Post Avenue plant facility and sell transmission services through its electrical system. Although PSE provides natural gas utility services in the city of Seattle, Seattle City Light is the sole provider of electricity in the city. PSE provides electricity to areas bordering the city. Therefore, there would be transmission agreements and fees involved in moving the electrical energy from the CHP plant to the PSE distribution system where the energy would ultimately be sold and used.

A significant characteristic of the project site, specifically the Post Avenue building, is its location within the Pioneer Square – Skid Road Historic District, which is on both the Washington Heritage Register and the National Register of Historic Places (DAHP 2009). In 2007, the Washington State Historic Preservation Office submitted a National Registration of Historic Places Registration Form to the National Park Service to document a more complete record of the existing resources within the district. The application expanded the number of resources designated as contributing to the Pioneer Square District’s placement on the National Register (SHPO 2007). The registration form increased the number of contributing sources from the 10 already on the National Register to 131. The Seattle Steam facility on Post Avenue was identified as two of the additional contributing sources: the “New Post Station, Seattle Steam Company” at 633 Post Avenue and the “Old Post Station, Seattle Steam Company” at 619 Post Avenue.

The 633 Post Avenue portion (Figures 2-4 and 2-5), designated the New Post Station in the registration form, was constructed in 1902 and is recognized for its striking architecture and as one of the last working remnants of the original industrial fabric of the Pioneer Square – Skid Road National Historic District. The building’s smokestack, visible in many parts of downtown Seattle, is also identified as an important visual marker within the city (SHPO 2007). The 619 Post Avenue portion, designated the Old Post Station in the registration form, was constructed in the 1890 timeframe and altered in 1903. It combines two masonry buildings that form a structure of irregular shape and varying roof and floor levels (SHPO 2007). In Figure 2-4, it is the low building (partially covered with ivy) at the southern end of the New Post Station. Although 619 Post Avenue is the address on tax records for the entire facility, the CHP plant would be installed in the larger portion of the overall facility; that is, the portion designated as 633 Post Avenue on the National Register of Historic Places. This Draft EA refers to the location of the proposed project as 633 Post Avenue.

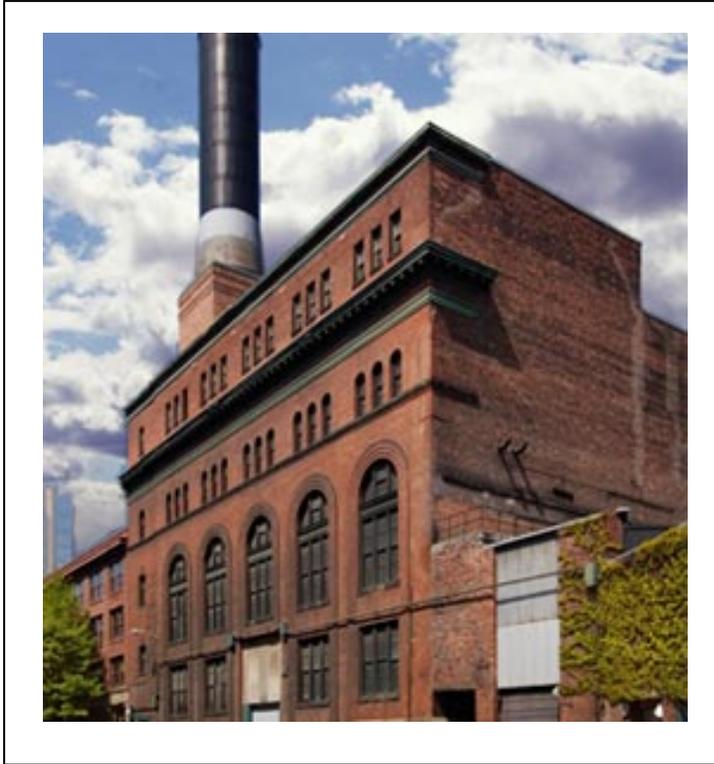


Figure 2-4. Photograph of the Seattle Steam plant at 633 Post Avenue, showing the western side of the building (the side facing Western Avenue) and a portion of the Old Post Station (lower right).

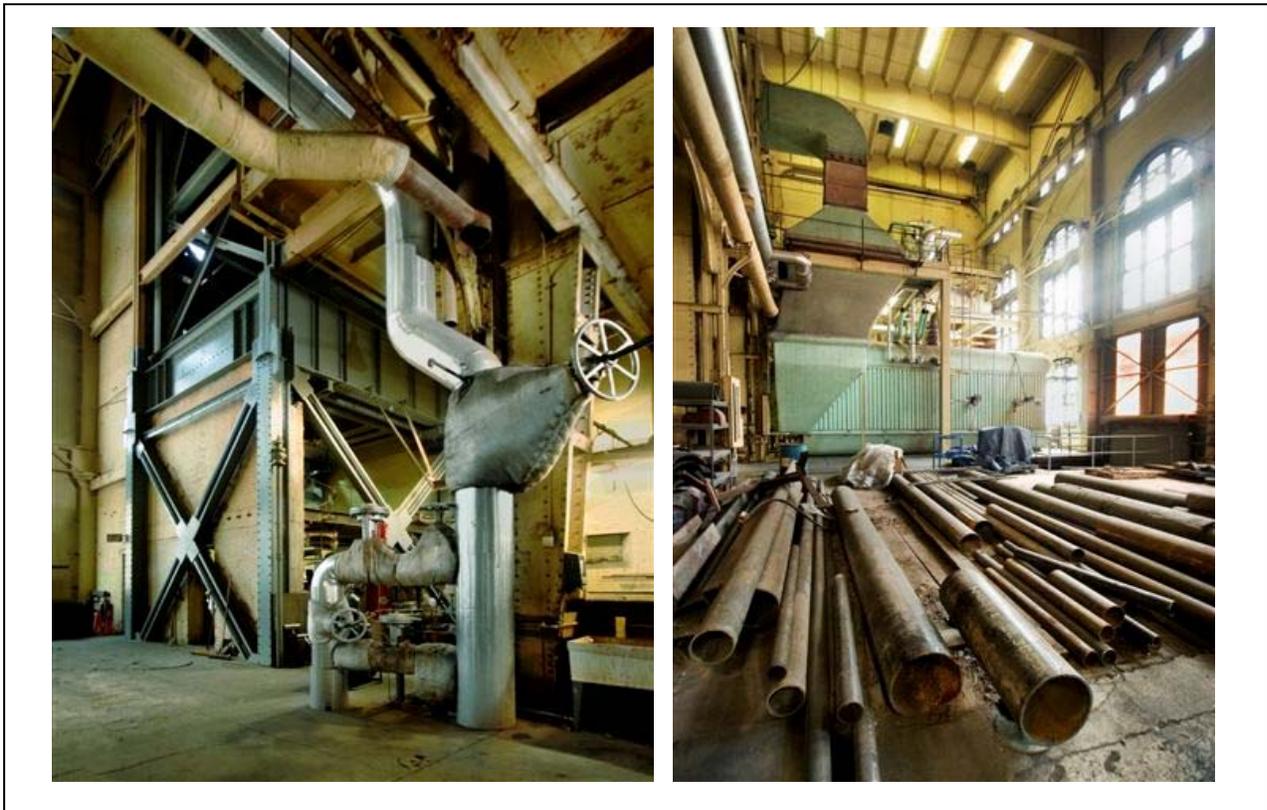


Figure 2-5. Interior views of the Seattle Steam plant at 633 Post Avenue, showing the steel frame and concrete floor construction.

2.3 Alternatives

The Department's alternatives to its Proposed Action for the Industrial Technologies Program consist of other technically acceptable applications received in response to the Funding Opportunity Announcement DE-FOA-0000044, *Recovery Act: Deployment of Combined Heat and Power (CHP) Systems, District Energy Systems, Waste Energy Recovery Systems, and Efficient Industrial Equipment*. Prior to selection, DOE made preliminary determinations regarding the level of review required by NEPA based on potentially significant impacts identified during reviews of the technically acceptable applications. DOE conducted these preliminary environmental reviews pursuant to 10 CFR 1021.216 and a variance to certain requirements in the regulation granted by the Department's General Counsel (74 FR 41693, August 18, 2009). These preliminary NEPA determinations and environmental reviews were provided to the selecting official for consideration during the selection process.

Because DOE's Proposed Action under the Industrial Technologies Program is limited to providing financial assistance in cost-sharing arrangements to projects submitted by applicants in response to a competitive funding opportunity, DOE's decision is limited to either accepting or rejecting the project as proposed by the proponent, including its proposed technology and selected sites. The Department's consideration of reasonable alternatives is therefore limited to the technically acceptable applications and a No-Action Alternative for each selected project.

2.4 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to Seattle Steam for the proposed CHP system. As a result, installation of the CHP system would be delayed while Seattle Steam looked for other funding sources, or abandoned if other funding sources could not be obtained. Furthermore, demonstration and adoption of advanced technologies and energy best management practices would not occur or would be delayed and DOE's ability to achieve its objectives under the Industrial Technologies Program and the Recovery Act would be impaired.

Although Seattle Steam's proposed project might proceed if DOE decided not to provide any form of financial assistance, DOE assumes for purposes of this EA the project would not precede without this assistance. If the project did proceed without DOE's financial assistance, the potential impacts would be essentially identical to those under DOE's Proposed Action (that is, providing assistance that allows the project to proceed). In order to allow a comparison between the potential impacts of a project as implemented and the impacts of not proceeding with a project, DOE assumes that if it decided to withhold assistance from this project, construction and operation of the Seattle Steam proposed CHP system would not proceed.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

In this chapter, DOE assesses the following resources: air quality, cultural resources, socioeconomics, occupational health and safety, noise, utilities, energy, and materials. The “environmental baseline” for each of these resource areas is described first, followed by an assessment of the potential consequences of the proposed project and of the No-Action Alternative.

3.1 Air Quality

3.1.1 AFFECTED ENVIRONMENT

The ambient air quality in an area can be characterized in terms of whether it complies with the primary and secondary National Ambient Air Quality Standards. The *Clean Air Act* (42 U.S.C. 7401 et seq.) requires the U.S. Environmental Protection Agency (EPA) to set national standards for pollutants considered harmful to public health and the environment. National Ambient Air Quality Standards have been established for six criteria pollutants: carbon monoxide; lead; nitrogen dioxide; ozone; particulate matter (including particulate matter with both an aerodynamic size less than or equal to 10 microns and less than or equal to 2.5 microns); and sulfur dioxide. Primary standards define levels of air quality the EPA has determined necessary to provide an adequate margin of safety to protect public health, including the health of “sensitive” populations such as children and the elderly. Secondary standards define levels of air quality deemed necessary to protect the public welfare, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.

Table 3-1 lists the National Ambient Air Quality Standards primary standards for each criteria pollutant. Regions that are not in compliance with the standards are designated “nonattainment” areas. Also shown in Table 3-1 are the most recent records available in EPA’s Air Data database for King County, Washington, which includes all of Seattle and much of the adjoining metropolitan area, including just north of Tacoma, Washington. King County is currently classified as an attainment area for all criteria pollutants (EPA 2010), which is consistent with the latest ambient air quality data shown in the table, although no ambient air concentrations were available for lead. Based on the information in the table, 2006 was the last year with any nonattainment issues as indicated with the bolded values for ozone and PM_{2.5}. Ambient air quality values reported for 2007 and 2008 were all within applicable air quality standards.

If a region is identified as a nonattainment area, the state is required to develop and implement plans to bring the region into compliance with ambient air quality standards. Once the region has attained the standard, the state is required to develop a maintenance plan to keep it in compliance. According to EPA’s Green Book (that is, EPA’s web-based records on nonattainment areas found at <http://www.epa.gov/air/oaqps/greenbk>), all of King County, Washington, requires a maintenance plan for ozone to keep the County in compliance with

ambient air standards for ozone. The Green Book also identifies the Seattle-Tacoma urban area as a maintenance area for carbon monoxide. The existing Seattle Steam plant is within both of these air quality maintenance areas.

Table 3-1. National Ambient Air Quality Standards and air quality data for King County, Washington in 2006, 2007, and 2008.

Pollutant	National Ambient Air Quality Standards ^a		Ambient air quality in King County, WA ^b		
	Averaging period	Primary standard	2006	2007	2008
Carbon monoxide	8 hours	9 ppm	3.4 ppm	2.6 ppm	1.9 ppm
	1 hour	35 ppm	4.4 ppm	3.5 ppm	3.1 ppm
Lead	Quarterly	1.5 µg/m ³	Not Available	Not Available	Not Available
Nitrogen dioxide	Annual	0.053 ppm	0.018 ppm	Not Available	Not Available
Ozone	8 hours	0.075 ppm	0.087 ppm	0.068ppm	0.075 ppm
	1 hour	0.12 ppm	0.129 ppm	0.091 ppm	0.104 ppm
PM ₁₀	Annual	50 µg/m ³	26 µg/m ³	20 µg/m ³	Not Available
	24 hours	150 µg/m ³	63 µg/m ³	58 µg/m ³	Not Available
PM _{2.5}	Annual	15.0 µg/m ³	12.09 µg/m ³	9.59 µg/m ³	10.12 µg/m ³
	24 hour	35 µg/m ³	37.3 µg/m ³	30.3 µg/m ³	33.4 µg/m ³
Sulfur dioxide	Annual	0.03 ppm	Not Available	0.002 ppm	0.001 ppm
	24 hours	0.14 ppm	Not Available	0.007 ppm	0.011 ppm

a. Source: 40 CFR 50.4 through 50.13.

b. Sources: EPA 2009a, 2009b, and 2009c.

µg/m³ = micrograms per cubic meter.

PM₁₀ = particulate matter with median aerodynamic diameter of 10 micrometers or less.

PM_{2.5} = particulate matter with median aerodynamic diameter of 2.5 micrometers or less.

ppm = parts per million.

3.1.2 ENVIRONMENTAL CONSEQUENCES

3.1.2.1 Proposed Project

Impacts on air quality during installation of the CHP system would be short term and negligible. The primary source of air pollutants during installation would be vehicle exhaust from the operation of heavy equipment such as trucks, forklifts, and cranes. These activities would be temporary, occur in a localized area, and be very small compared with the emissions from vehicles and other sources in the Seattle area. The project would involve no earthwork, and fugitive dust emissions from other types of work would be minor.

Air emissions from the CHP system would include the products of combustion from the gas turbine, which would be incorporated into the air exhausted to the steam generator. At the duct between the gas turbine and the steam generator, additional products of combustion would join the flow when additional fuel was added at that point (Figure 2-3). The primary fuel for the CHP

system would be natural gas, but as with the existing steam boiler, the CHP system would be configured to support the use of fuel oil during periods of natural gas curtailment. The air emissions from the CHP plant would include the criteria pollutants carbon monoxide, nitrogen dioxide, particulate matter (that is, PM₁₀ and PM_{2.5}), and sulfur dioxide. In addition, emissions would include volatile organic compounds (VOCs), an ozone precursor. Table 3-2 provides the preliminary estimate of the quantities of these criteria pollutants that would be emitted from the CHP plant during a single year. The plant’s off gas would not be expected to include lead, but Seattle Steam did estimate the amounts of other hazardous air pollutants that would be present; this estimate is provided in the table. For comparison with the emission estimates for the proposed CHP plant, Table 3-2 also shows the current permit limits for the existing plant and the reported annual emissions for all of King County, Washington. Seattle Steam operates its Western Avenue and Post Avenue facilities as a single plant. The operating boiler at the Post Avenue facility, because it is the least efficient, is last on the list of boilers to be used in response to increased energy demand. As a result, air emissions from the Post Avenue facility have been well below permit limits in recent years.

Table 3-2. Preliminary estimates of air emissions from the Seattle Steam proposed CHP plant compared with existing energy plant permit limits and King County total emissions.

Pollutant	Emissions (tons per year)		
	Proposed CHP plant ^a	Existing energy plant – allowed by permit ^b	King County in 2005 (2002 for HAPs) ^c
Carbon monoxide	23	Not in current permit	561,582
Nitrogen oxides	19	< 99	74,193
PM ₁₀	83	Not in current permit	21,488
PM _{2.5}	83	Not in current permit	7,374
Sulfur dioxide	6	< 99	6,643
Volatile organic compounds	12	Not in current permit	83,157
Hazardous air pollutants ^d	0.63	Not in current permit	5,082

a. Source: Seattle Steam 2009.

b. Source: PSCAA 1999.

c. Sources: EPA 2009d for HAPs, EPA 2009e for others.

d. The HAPs value reported is for the sum of 33 urban hazardous air pollutants.

As Table 3-2 shows, the estimated emissions from the proposed CHP plant would be well below the existing permit limits for the regulated pollutants nitrogen oxides (NO_x) and sulfur dioxide. The estimated emissions would represent a very small portion of King County’s total annual emissions. Although the available comparisons in the table indicate the proposed project’s air emissions would be relatively minor, the project has not yet initiated formal permitting actions, which would require more detailed analysis and would establish specific requirements for the proposed project. According to Seattle Steam, the permit application would include criteria and toxic air pollutant emission rate calculations, a regulatory analysis, a best available control technology analysis, and air dispersion modeling analyses to evaluate compliance with ambient standards or other regulatory requirements. Based on preliminary conversations with the applicable regulatory agency, the Puget Sound Clean Air Agency (PSCAA), Seattle Steam

expects that required air dispersion modeling will include both ground-level and on-building receptors as was done in the modeling analysis developed in support of its Western Avenue facility wood-fired boiler project. Seattle Steam anticipates the project would not be subject to the Prevention of Significant Deterioration (PSD) air permit program.

3.1.2.1.1 Air Quality Conformity

Section 176(c) (1) of the *Clean Air Act* requires federal agencies to ensure that their actions conform with applicable implementation plans for the achievement and maintenance of the National Ambient Air Quality Standards for criteria pollutants (DOE 2000). To achieve conformity, a federal action must not contribute to new violations of standards for ambient air quality, increase the frequency or severity of existing violations, or delay timely attainment of standards in the area of concern. The EPA general conformity regulations (40 CFR 93, Subpart B) contain guidance for determining whether a proposed federal action would cause emissions to be above specified levels in nonattainment or maintenance areas.

A conformity determination is not required if estimated emissions of criteria pollutants are: (1) below applicable threshold emission rates for nonattainment or maintenance areas; and (2) below 10 percent of the nonattainment or maintenance area's emission inventory for the pollutants of concern (DOE 2000). Seattle Steam's proposed CHP project would occur in an area that is in attainment for all criteria pollutants, but in maintenance areas for ozone and carbon monoxide (CO). Threshold emission rates for ozone in a maintenance area are established in terms of the ozone precursors NO_x and VOCs and both are set at 100 tons per year [40 CFR 93.153(b)(2)]. The threshold emission rate for CO in a maintenance area is similarly set at 100 tons per year. As can be seen in Table 3-2, estimated emissions of CO, NO_x, and VOCs from the proposed CHP system are each below the threshold rate of 100 tons per year, and each is well below 10 percent of the corresponding quantity emitted in King County during a year. The maintenance area criteria pollutant that would be emitted at the largest percentage of the County's total emissions would be NO_x, but it would represent less than 0.03 percent of the County's annual emissions. Although not an applicable maintenance area pollutant, PM_{2.5} emissions, at about 1.1 percent, would represent the highest portion of the County's total annual emissions. Since the proposed project would not exceed the applicable threshold emission rates and would not represent 10 percent or more of the area's emissions inventory for these pollutants, no conformity determination under the *Clean Air Act* would be necessary (DOE 2000).

As noted above, Seattle Steam does not expect that its proposed project would require a PSD permit; however, other operating permit requirements set by Washington and the PSCAA would be applicable. If Seattle Steam was required to obtain a PSD permit, a conformity determination would still be unnecessary. In accordance with EPA regulations at 40 CFR 93.153(d)(1), the conformity determination requirements do not apply to federal actions if "the portion of an action includes major new or modified stationary sources that require a permit under the new source review program (Section 173 of the [Clean Air] Act) or the prevention of significant deterioration program (title I, part C of the Act)." Similarly, if the permit required by PSCAA

was issued under regulations developed pursuant to the EPA's new source review program, the conformity determination would not be required.

3.1.2.1.2 Greenhouse Gas Emissions

The burning of fossil fuels, such as natural gas, diesel, and gasoline, emits carbon dioxide, which is a greenhouse gas. Greenhouse gases can trap heat in the atmosphere and have been associated with global climate change. The Intergovernmental Panel on Climate Change, in its Fourth Assessment Report issued in 2007, stated that warming of the earth's climate system is unequivocal, and that most of the observed increase in globally averaged temperatures since the mid-20th century is very likely due to the observed increase in concentrations of greenhouse gases from human activities (IPCC 2007). Greenhouse gases are well mixed throughout the lower atmosphere, such that any emissions would add to cumulative regional and global concentrations of carbon dioxide. The effects from any individual source of greenhouse gases therefore cannot be determined.

The basis of Seattle Steam's proposed CHP system is that it provides very efficient use of the fuel that would be combusted in the gas turbine and at the duct leading to the steam generator. The CHP system's combustion processes would result in carbon dioxide emissions [estimated at about 207,000 tons per year (Seattle Steam 2009)]; the emissions would be offset by reductions in the carbon dioxide emissions of the existing steam boiler and the reduction of emissions from traditional electricity production plants. If it is assumed that the electricity produced by the proposed CHP system reduces the amount of electricity produced from some other fossil fuel-fired generation plant, then there would be an expectation of a net decrease in carbon dioxide production. That is, the carbon dioxide produced by the CHP system should be less than what would be produced from the existing steam plant plus the increment from a fossil-fuel fired electricity generation plant. Based on the anticipated improved energy efficiency of the CHP system, the carbon dioxide emissions estimated for the new plant would be expected to be only 60 to 75 percent of the carbon dioxide emissions now resulting from the production of comparable quantities of heat and power.

3.1.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to Seattle Steam for the proposed CHP system, and DOE assumes the project would not proceed without this assistance. Further, Seattle Steam would continue to obtain steam from the existing boiler and there would be no change in emissions of pollutants from this plant; however, there would be no beneficial decrease in regional emissions of pollutants from the use of the energy-efficient CHP system.

3.2 Cultural Resources

3.2.1 AFFECTED ENVIRONMENT

This section describes the existing cultural resource conditions in the area of the proposed project site. The area of potential impacts to cultural resources includes the existing Seattle Steam facility on Post Avenue and property adjacent to the proposed project area that could be affected by the action, during construction and/or during operation of the CHP plant. Cultural resources are historic properties as defined by the *National Historic Preservation Act*, cultural items as defined by the *Native American Graves and Repatriation Act*, archaeological resources as defined by the *Archaeological Resources Protection Act*, sacred sites as defined in Executive Order 13007 to which access is afforded under the *American Indian Religious Freedom Act*, and collections and associated records as defined in 36 CFR Part 79. Since the proposed project would occur in the downtown area of Seattle, Washington, and would only involve alterations to and work inside an existing building, only the historic properties as defined by the *National Historic Preservation Act* would be of concern. The following material summarizes the historic background of the area, followed by the status of cultural resources inventories and consultations.

3.2.1.1 Historic Background

The area known locally as Pioneer Square is the site of the first permanent European settlement in what is now Seattle, Washington. Settlers selected the site because it was the only flat area along the deep and protected harbor on Elliot Bay. In 1853, Henry Yesler began operating a steam saw mill near what is now the intersection of Yesler Way and First Avenue. Logs from the hillsides to the east were skidded down to the saw mill and the wharf. This began the terminology of “skid road” and business activity grew up near the mill, primarily along what is now First Avenue South (Seattle n.d.).

In 1889, a fire destroyed approximately 30 blocks of mostly wood buildings in the city’s central core. The local economy was strong at the time and rebuilding began almost immediately, but as a result of the fire, the City Council passed an ordinance requiring buildings to be constructed of brick and stone. In this same time frame, much of the city’s boggy, marshy ground was filled in and street levels were raised. Because the area was rebuilt quickly (most occurring within two years) and primarily designed by a handful of architects, the buildings are generally considered to be of unusually harmonious architectural character.

The Pioneer Square area had its heyday in the late 1890s during the Alaska gold rush, but this began changing after the turn of the century, and the city’s commercial district began moving toward the north, primarily along Second Avenue. Correspondingly, the Pioneer Square area began changing to a “honky-tonk district of taverns, entertainment houses and bawdy hotels” (Seattle n.d.). Redevelopment of this area became a low priority, and the turn-of-the century buildings remained largely intact. In the 1960s and 1970s, merchants and citizens began campaigns to restore the area and recognize its historic significance and commercial potential.

The Pioneer Square – Skid Road District first appeared on the National Register of Historic Places in 1970.

3.2.1.2 Status of Cultural Resource Inventories and Section 106 Consultations

The Department searched the National Register of Historic Places to identify historic places near the proposed project site. The National Park Service plotted National Properties into Google Earth layers so the properties could be located via the internet. Figure 3-1 provides the results of the data search in the area of the proposed CHP plant. The figure shows sites within 0.5 mile of the project site, labeled with numbers that correspond to the information presented in Table 3-3. Taking the search radius to 0.5 mile was done in order to include all of the Pioneer Square – Skid Road Historic District, which extends to the south as far as just beyond (toward the bottom of the figure) locations 19 and 25 in the figure.

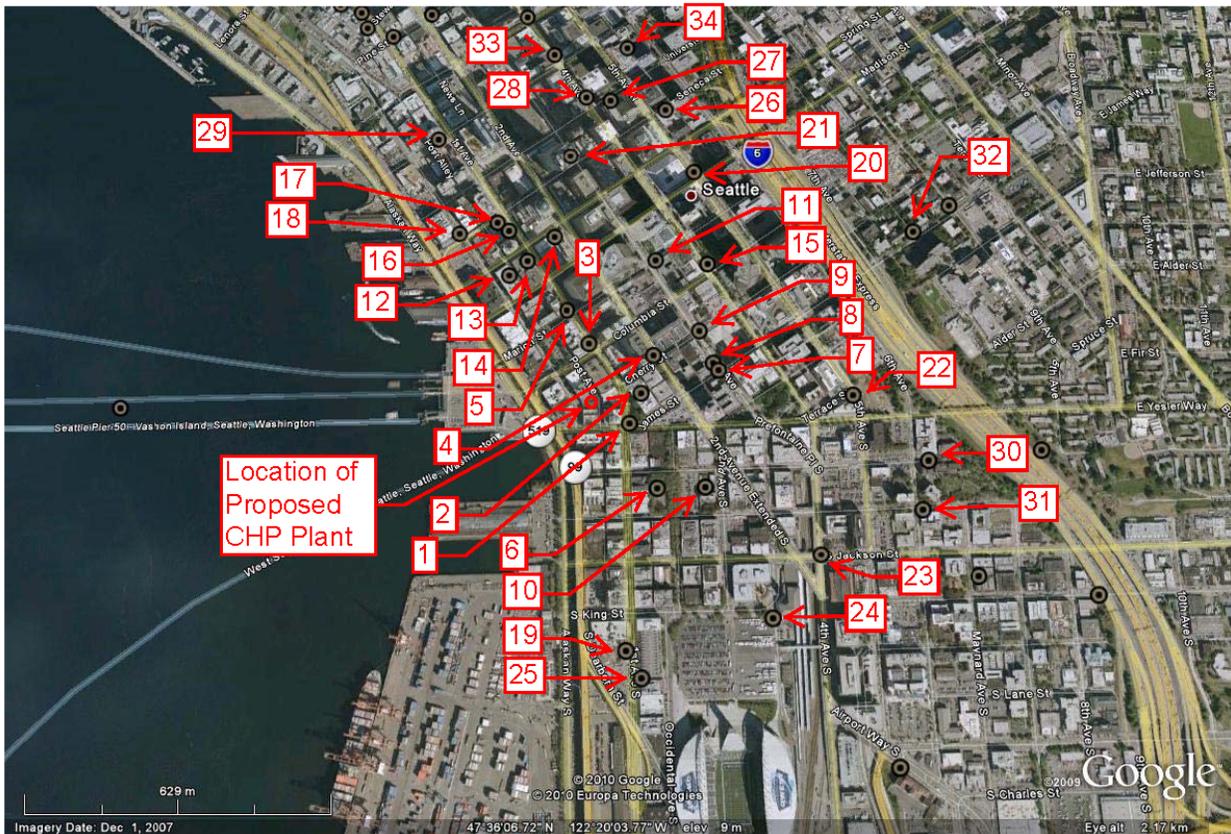


Figure 3-1. Locations of properties on the National Register of Historic Places (with labels corresponding to information in Table 3-3).

Table 3-3. Properties on the National Register of Historic Places within 0.5 mile of the proposed project site (with number designations per Figure 3-1).

Historic Place Name	Address	Description	NPS Ref. No.	Date listed	Distance from project site (miles)
1. Iron Pergola	1 st Ave and Yesler Way	1909, elaborate waiting shelter for cable car	71000875	08/1971	0.06
2. Pioneer Building, Pergola, and Totem Pole	1 st Ave and Yesler Way	1892, 6-story brick masonry and stone building, totem pole from Alaska	77001340	05/1977	0.07
3. Colman Building	811 1 st Ave	1904, 6-story, concrete and brick building	72001272	03/1972	0.07
4. Hoge Building	705 2 nd Ave	1920, 17- to 18-story, brick and ast-stone building	83003339	04/1983	0.10
5. Old Federal Office Building	909 1 st Ave	1933, 11-story (at highest portion) Art Deco building and the first building in Seattle built specifically for federal offices	79003155	04/1979	0.12
6. Pioneer Square – Skid Road District	Roughly bounded by Elliot Bay, King, 3 rd , Columbia, and Cherry Sts	52-acre district with buildings of distinctive and homogeneous late Victorian style	70000086	06/1970	0.15 (to dot in Figure 3-1)
7. Lyon Building	607 3 rd Ave	1910, 6-story, reinforced concrete and block building	95000806	06/1995	0.17
8. Rector Hotel	619-621 3 rd Ave	1911, 6-story building with reinforced concrete structure with brick, terra cotta, and limestone surfaces	02000809	08/2002	0.17
9. Arctic Building	306 Cherry St	1916, 8-story building with terra cotta panels over a steel reinforced concrete frame	78002749	11/1978	0.17
10. Pioneer Square – Skid Road District (boundary increase)	Roughly bounded by the Viaduct, King St, 6 th and 5 th Aves, James and Columbia Sts	See #6 – district size increased to 88 acres	7800341	07/1978	0.19 (to dot in Figure 3-1)

Table 3-3. Properties on the National Register of Historic Places within 0.5 mile of the proposed project site (with number designations per Figure 3-1; continued).

Historic Place Name	Address	Description	NPS Ref. No.	Date listed	Distance from project site (miles)
11. Leamington Hotel and Apartments	317 Marion St	1915, 4-story building combining a transient hotel and apartments	94000419	05/1994	0.20
12. National Building	1006 – 1024 Western Ave	Not available	82004244	04/1982	0.20
13. Globe Building, Beebe Building, and Hotel Cecil	1001 – 1023 1 st Ave	Not available	82004235	04/1982	0.21
14. Holyoke Building	1018 – 1022 1 st Ave	1890 timeframe, 4-story plus ground level with red brick and stone building	76001888	06/1976	0.23
15. Rainier Club	810 4 th Ave	1910 timeframe, 4- and 5-story building of Dutch or Flemish influences. Built of brick with elaborate parapets with cast stone	76001889	04/1976	0.24
16. Grand Pacific Hotel	1115 – 1117 1 st Ave	1890 timeframe, 4-story building with brick and limestone (or sandstone)	82004236	05/1982	0.26
17. Colonial Hotel	1119 – 1123 1 st Ave	1901, 3-story plus ground floor, gray brick building	82004232	04/1982	0.27
18. Agen Warehouse (also Olympic Cold Storage Warehouse)	1201 Western Ave	Not available	97001673	01/1998	0.29
19. Triangle Hotel and Bar	551 1 st Ave, S	1910, 3-story triangular building of brick masonry and steel	76001892	05/1976	0.32
20. U.S. Court House	1010 5 th Ave	1939, 10-story marble and limestone office building	80004003	01/1980	0.33
21. Northern Life Tower	1212 3 rd Ave	1928, 27-story building and the first Art Deco-style building in Seattle	75001857	05/1975	0.34
22. Old Public Safety Building	4 th Ave and Terrance St and 5 th Ave and Yesler Way	1909, 6-story building of Beaux Arts – American Renaissance style	73001878	06/1973	0.34

Table 3-3. Properties on the National Register of Historic Places within 0.5 mile of the proposed project site (with number designations per Figure 3-1; continued).

Historic Place Name	Address	Description	NPS Ref. No.	Date listed	Distance from project site (miles)
23. Union Station	4 th , S and S Jackson Sts	1911, 4-story building with steel frame and concrete construction and a light-filled barrel vault roof	74001960	08/1974	0.36
24. King Street Station	3 rd St, S and S King St	1906, rail station with deep red brick construction and distinctive tower	73001877	04/1973	0.36
25. Pioneer Square – Skid Road Historic District (boundary increase)	500 block of 1 st Ave, S	See #6 – district size increased to about 92 acres	88000739	06/1988	0.36 (to dot in Figure 3-1)
26. YWCA Building - Seattle	1118 5 th Ave	1913, 8-story building of Renaissance Revival style, with light colored brick and stone on the base contrasted with red brick mid and top sections	06001215	12/2006	0.41
27. Olympic Hotel	1200 – 1220 4 th Ave	1921, 12-story hotel of brick and cast stone and Beaux Art style	79002538	06/1979	0.42
28. Cobb Building	1301 – 1309 4 th Ave	1910 timeframe, 11-story building with terra cotta ornamentation at the top and street levels and brick in between	84003485	08/1984	0.42
29. U.S. Immigration Building	84 Union St	Not available	87001524	09/1987	0.42
30. Nippon Kan (also Astor Hotel)	622 S Washington St	1909, former Japanese theater	78002754	05/1978	0.44
31. Panama Hotel	605 S Main St and 302 6 th Ave, S	1910, hotel containing last remaining Japanese bathhouse in the United States	06000462	03/2006	0.45
32. Trinity Parish Church	609 8 th Ave	After fires in 1889 and 1902, last rebuilt English Gothic Revival style, is one of Seattle's oldest continually used churches	91001440	09/1991	0.47

Table 3-3. Properties on the National Register of Historic Places within 0.5 mile of the proposed project site (with number designations per Figure 3-1; continued).

Historic Place Name	Address	Description	NPS Ref. No.	Date listed	Distance from project site (miles)
33. 1411 Fourth Avenue Building	1411 4 th Ave	1929, 15-story L-shaped building, which at the time of construction was the tallest building in the city to be surfaced in stone	91000633	05/1991	0.49
34. Skinner Building	1300 – 1334 5 th Ave	1926, 6- to 8-story building with sandstone facing and 2 symmetrically placed towers providing the top two floors	78002756	11/1978	0.50

Table 3-3 lists properties in order of proximity to the Seattle Steam plant. The table lists Pioneer Square – Skid Road Historic District three times (locations 6, 10, and 25). These entries in the figure represent the initial listing of the district in 1970 and two subsequent boundary increases in 1978 and 1988. In these cases, the locations of the dots in the overlay and the distance from the dot to the proposed project site have little, if any, meaning.

There are several circles in the Figure 3-1 that represent additional historic properties, but which are not labeled with numbers and are not identified in Table 3-3. These are properties further than 0.5 mile from the proposed project site. These outlying properties would not be affected by the proposed project and, for that matter, those inside the distance should not be affected. As noted previously, the intent of identifying properties within 0.5 mile was to capture all of the Pioneer Square – Skid Road Historic District. Further, the 0.5 mile distance was adequate to provide an indication of the large number, or richness, of historic properties in the vicinity of the project site. In this regard, it should be noted that the Washington State Historic Preservation Office has submitted documentation to the National Park Service that identifies and characterizes more than 100 resources, such as Seattle Steam’s building, or buildings, on Post Avenue, that contribute to the Pioneer Square District’s placement on the National Register (SHPO 2007), but which are not shown in Figure 3-1 or listed in Table 3-3. As described in Section 2.2 of this EA, the list of buildings that contribute to the Pioneer Square District’s placement on the National Register identifies the Seattle Steam facility as two buildings: one at 619 Post Avenue and one at 633 Post Avenue. These are contiguous buildings, operated as a single facility by Seattle Steam. However, because the CHP plant would be located in the larger, multi-story portion of the overall facility, potential project impacts are described with respect to the 633 Post Avenue building for consistency with state and federal records of historic places. Both the 619 Post Avenue and 633 Post Avenue buildings are identified as Parcel Number 8591400100 in the State’s submission to the National Park Service.

On March 18, 2010, DOE sent a letter to the Washington State Historic Preservation Office requesting additional information the office has developed or obtained on historic properties in the vicinity of the proposed project site. Appendix B contains a copy of this letter; DOE is currently working with the State Historic Preservation Office in identifying any concerns the Office might have with the proposed project. Any comments or concerns formally identified by the Washington State Historic Preservation Office will be addressed in the Final EA.

3.2.2 ENVIRONMENTAL CONSEQUENCES

3.2.2.1 Proposed Project

The proposed project would involve both temporary and permanent alterations to Seattle Steam’s existing building at 633 Post Avenue as necessary to install new equipment and convert the facility to a CHP plant. Other facilities in the area, including historic properties, would not be adversely affected by such actions. Secondary impacts, such as those that might be associated with noise or air emissions, are addressed separately in other sections of this EA. Potential

impacts to historic properties from the proposed project would be basically limited to impacts to the Seattle Steam building, itself.

The building currently houses one operating boiler and several old boilers that are not operational and were abandoned in place. Under Seattle Steam's proposed project, old equipment would be removed to the extent necessary to accommodate the new equipment, the structure of the building interior would be upgraded, and the new equipment would be installed. Most of the historic equipment has already been removed from the building (Gent 2010). The items that would be removed for the proposed project would primarily consist of asbestos from old equipment remaining in the building. Once the asbestos was removed, remaining equipment parts would be removed as scrap. Seattle Steam has personnel trained in the management of asbestos removal projects and would ensure that the activity was conducted in accordance with appropriate standards, protecting the workers and keeping any loose asbestos particles contained within the building until recovered and packaged for disposal. The interior of the facility would then be extensively renovated, primarily to strengthen the existing structure to meet today's building code standards and to support the new equipment. With respect to the building's exterior, temporary openings might be required for equipment installation, and the roof penthouse, which cannot be seen from ground level, might be modified to accommodate the turbine inlet air requirements (Gent 2010). Detailed plans for interior modifications and any necessary exterior openings have not yet been developed, but Seattle Steam believes that changes to the building's exterior would be limited to actions such as replacing windows with like windows and cleaning brickwork, and that these actions would not affect the historic nature of the building's exterior. Seattle Steam has further informed DOE that all modifications to the facility would be in accordance with City of Seattle standards.

With regard to City of Seattle standards, the Land Use Code of the Seattle Municipal Code (specifically SMC Title 23) requires that, within Special Review Districts, any action to "alter, demolish, construct, reconstruct, restore, remodel, or make any visible change to the exterior appearance of any structure" must receive a Certificate of Approval from the Department of Neighborhoods Director (SMC 23.66). A Pioneer Square Preservation District was established in 1970 as a Special Review District, and the Pioneer Square Preservation Board was formed with the responsibility for reviewing all project plans within the District and making recommendations to the Department of Neighborhoods Director as to whether a Certificate of Approval should be issued. The Seattle Steam building is within District boundaries (SMC 23.66.100). The Pioneer Square Preservation Board's project reviews are based on criteria set by Rules for the Pioneer Square Preservation District and the U.S. Secretary of the Interior's Standards for Rehabilitation, which are codified in 36 CFR Part 67 (Seattle DOT n.d.). DOE believes the Board's review process will ensure that Seattle Steam takes appropriate actions to minimize possible effects to the historic characteristics of the Post Avenue facility.

3.2.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to Seattle Steam for the proposed CHP system, and DOE assumes the project would not proceed without this assistance. Further, there would be no change in the historic characteristics of the facility. However, there would be no beneficial action to strengthen the facility’s internal structure.

3.3 Socioeconomics

3.3.1 AFFECTED ENVIRONMENT

Table 3-4 presents a summary of socioeconomic characteristics for King County, Washington, and the City of Seattle. Also presented in the table, for comparison, are many of the same indicators for the state of Washington and for the entire country. The populations shown for King County and Seattle represent increases of about 8.0 and 6.2 percent, respectively, from the 2000 populations in these areas (USCB n.d.). It should be noted that the Seattle vicinity is also part of the Seattle-Tacoma-Bellevue metropolitan statistical area, which extends to the south into Pierce County and to the north into Snohomish County. The 2008 population of the metropolitan statistical area was about 3,360,000, or roughly half of the state’s population.

Table 3-4. Summary of socioeconomic characteristics for King County and Seattle.

Socioeconomic Indicator	United States	Washington	King County	Seattle
Population (2008) ^a	304,060,000	6,549,000	1,876,000	599,000
Minorities (2006 to 2008) ^b - partial ^c	25.7%	19.5%	27.0%	28.7%
Hispanic or Latino (of any race) ^{b,c}	15.1%	9.5%	7.4%	5.6%
Individuals living in poverty (2006 to 2008) ^b	13.2%	11.6%	9.5%	12.5%
Labor force (2006 to 2008) ^b	153,990,000	3,392,000	1,052,000	352,000
Unemployment (February 2010) ^d	9.7%	9.5%	8.7%	7.7%
Per capita income (2006 to 2008) ^b	\$27,500	\$29,900	\$39,200	\$41,900
Total income (2006 to 2008) ^b - \$ millions		\$195,800	\$75,300	\$25,100
Output (2002 shipments and sales) ^a - \$ millions		\$238,000	\$112,000	Incomplete data

Note: Population and dollar values have been rounded from those presented in the references.

a. Source: USCB 2010.

b. Source: USCB 2009.

c. The Minority percentages shown here include those reporting as Black or African American, American Indian and Alaska Native, Asian, Native Hawaiian and Other Pacific Islander, some other race, and two or more races. The percentages of those reporting as Hispanic or Latino are shown separately because an unknown portion of those reporting in that category might also be included in the numbers shown for “Minorities.”

d. Source: BLS 2010a, 2010b.

Table 3-4 shows that the per capita income for the state is slightly above the national average, but notably higher within King County and Seattle. The improved economics at the county and city level is echoed by the lower unemployment rates; it is not, however, echoed by the

percentage of individuals living below the poverty level, which is higher in Seattle than at either the county or state level. This would seem to indicate a higher disparity between the wealthy and the poor in Seattle than at the other levels.

3.3.2 ENVIRONMENTAL CONSEQUENCES

3.3.2.1 Proposed Project

Seattle Steam estimated the economic effects of the proposed project by assuming each \$95,000 allotted to construction and each \$150,000 allotted for equipment purchase would result in the equivalent of a full time job for a year (Gent 2010). Total construction and equipment costs for the proposed project are estimated at \$21.4 million and \$34.8 million, respectively. Realizing that portions of the equipment purchased for the CHP system might be manufactured in other countries, Seattle Steam estimates that resulting U.S. jobs should be based on 70 percent of the total equipment costs. Finally, Seattle Steam estimates that for every direct job generated from the project, two indirect jobs would also be created.

Using the Seattle Steam estimates and assumptions described above, which DOE judged reasonable for purposes of this evaluation, the number of jobs created by construction of the proposed project are generated as follows:

- Construction [$(\$21.4 \text{ million}) / (\$95,000 \text{ per job})$]: 225 jobs
- Equipment [$(\$34.8 \text{ million})(0.70) / (\$150,000 \text{ per job})$]: 163 jobs
- Indirect [$(2)(225 + 163)$]: 776 jobs
- Total direct and indirect jobs $(225 + 163 + 776)$: 1,164

A portion, if not a majority, of jobs associated with the purchase of equipment would be expected to be outside of the Seattle and King County areas because of the unique nature of the equipment and the limited locations where it is manufactured. However, assuming all jobs were in the immediate area, impacts to the economy would be beneficial, but minor. The 1,164 direct and indirect jobs represent only about 0.33 percent of the Seattle workforce and only about 0.11 percent of the King County workforce (Table 3-4). Similarly, if all construction costs and 70 percent of the equipment costs were added to the local economy, the resulting \$45.6 million would represent only about 0.041 percent of the total output for King County (Table 3-4). It is expected that new King County-area jobs associated with construction of the proposed project primarily would be filled by the existing workforce in the area, and there would be no influx of workers or workers' families to the area and no impacts to housing or community infrastructure.

Once the CHP plant was constructed and operational, Seattle Steam anticipates that there would be five new, long-term jobs required to support operation and maintenance of the facility (Gent 2010). If it is assumed that these direct jobs would support the same number of indirect jobs described above, then there would be a total of 15 jobs (5 direct and 10 indirect) resulting from operation of the new CHP plant. These new jobs would represent a beneficial, though minor, impact to the area economy. Unemployment levels are high enough in the area that the new jobs

likely would be filled by existing residents of the area. However, even if a portion of the new jobs required expertise or skills from outside the area, any influx of new workers and workers families would be very minor.

The Department anticipates the proposed project would have no significant impacts on the socioeconomics of the Seattle or King County areas, but the added jobs and influx of money would provide some beneficial, though minor, impacts.

3.3.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to Seattle Steam for the proposed CHP system, and DOE assumes the project would not proceed without this assistance. Further, there would be no change to the socioeconomic resources of the Seattle and King County area, including minor beneficial impacts associated with the additional jobs and influx of project funds to the area's economy.

3.4 Occupational Health and Safety

3.4.1 AFFECTED ENVIRONMENT

Occupational health and safety is concerned with occupational and worker hazards during routine operations. The U.S. Department of Labor, Bureau of Statistics maintains statistics on workplace injuries, illnesses, and fatalities. These statistics consider the potential for total recordable cases; days away from work, days of restricted work activity or job transfer; and worker fatalities in the work environment. The incidence rates (cases per 100 full-time workers for non-fatality statistics and cases per 100,000 full-time workers for fatality statistics) the Bureau of Labor Statistics maintains are calculated separately for different industries based on the reported health and safety cases for that particular industry. A full-time worker is assumed to work 2,000 hours per year. The health and safety incident categories are defined as follows:

Total recordable cases – The total number of work-related deaths, illnesses, or injuries that result in the loss of consciousness, days away from work, restricted work activity or job transfer, or required medical treatment beyond first aid.

Days away from work, or days of restricted work activity or job transfer – Cases that involve days away from work, or days of restricted activity or job transfer, or both.

Worker fatality – Cases that involve the death of a worker.

Seattle Steam maintains a comprehensive health and safety management program for its operations at both of its steam plants. The Occupational Safety and Health Administration recordable incident rate for Seattle Steam operations during 2009 was 0 per 11,709 hours worked (Gent 2010), which can be compared with the national average of 1.9 per 200,000 hours worked for the steam and air-conditioning supply industry (BLS 2009a). As identified in Section 2.2, it

is Seattle Steam's expectation to lease the Post Avenue plant to a project developer that would operate the CHP plant with a contract to provide steam to Seattle Steam and electricity to PSE. Terms of any agreement to operate the CHP plant would include requirements for the operator to have a comprehensive health and safety management program; to maintain engineering controls to prevent injuries and to control employee exposure to electrical hazards, steam, and chemicals in the workplace; and to provide comprehensive safety training to new employees and additional periodic training for current workers.

3.4.2 ENVIRONMENTAL CONSEQUENCES

3.4.2.1 Proposed Project

3.4.2.1.1 Construction and Manufacturing

The U.S. Department of Energy estimated health and safety impacts to workers from industrial hazards by using 2008 incidence rates for both nonfatal occupational injuries and occupational fatalities from the U.S. Department of Labor, Bureau of Labor Statistics data. During the initial phase of the proposed project, activities would involve (1) the manufacturing of CHP components, and (2) the construction-type activities to prepare the facility for the new equipment and then install it.

For equipment-manufacturing activities, DOE used the Bureau of Labor Statistics incident rates from the category "turbine and turbine generator set units manufacturing" for 2008. The total recordable cases incidence rate for the year was 4.4 injuries per 100 full-time employees (each working 2,000 hours during the year), and the days away from work, days of restricted work activity, or job transfer incidence rate was 2.4 injuries per 100 full-time employees (BLS 2009a). Seattle Steam estimates (Section 3.3.2.1) that there would be the equivalent of 163 U.S. manufacturing jobs for a year involved in the project (for example, there could also be twice this number of individuals working a half year). Assuming these would be full-time, 2,000-hour per year jobs, DOE estimates there would likely be about 7 total recordable cases (calculated at 7.2 cases) and about 4 days away from work (calculated at 3.9 days) during equipment manufacturing. The fatality incidence rate for machinery manufacturing activities in 2008 (preliminary data) was 1.9 fatalities per 100,000 full-time employees (BLS 2009b). Assuming the 163 jobs, DOE believes a fatality during equipment manufacturing would be unlikely because the calculated number of fatalities is about 0.0031 (or conversely, 1 chance in 320).

For construction and equipment installation activities, DOE used the Bureau of Labor Statistics incident rates from the category "nonresidential building construction" for 2008. The total recordable cases incidence rate for the year was 4.4 injuries per 100 full-time employees (each working 2,000 hours during the year), and the days away from work, days of restricted work activity, or job transfer incidence rate was 2.2 injuries per 100 full-time employees (BLS 2009a). Seattle Steam estimates (Section 3.3.2.1) that there would be the equivalent of 225 construction jobs for a year involved in the project (for example, there could also be half this number of individuals working two years). Assuming these would be full-time, 2,000-hour per year jobs,

DOE estimates there would likely be about 10 total recordable cases (calculated at 9.9 cases) and about 5 days away from work (calculated at 4.95 days) during construction and equipment installation. The fatality incidence rate for general construction activities in 2008 (preliminary data) was 9.9 fatalities per 100,000 full-time employees (BLS 2009b). Assuming the 225 jobs, DOE believes a fatality during equipment manufacturing would be unlikely because the calculated number of fatalities is about 0.022 (or conversely, 1 chance in 45).

3.4.2.1.2 Operations

During operations, Seattle Steam estimates there would be 5 full-time workers assigned to the CHP plant (Gent 2010). For these activities, DOE used the Bureau of Labor Statistics incidence rates from the category “fossil fuel electric power generation” for 2008. The total recordable cases incidence rate was 3.0 injuries per 100 full-time employees, and the days away from work or days of restricted work activity or job transfer incidence rate was 1.8 injuries per 100 full-time employees (BLS 2009a). This means that over a 20-year period, there likely would be 3 total recordable cases and about 2 days away from work (calculated at 1.8) during CHP plant operations. The fatality incidence rate for general activities in the “utilities” industry in 2008 (preliminary data) was 3.8 fatalities per 100,000 full-time employees (BLS 2009b). The “utilities” industry in this case is the overall group in which the “fossil fuel electric power generation” category is found, but the fatality rate is only identified for the larger group. Evaluating the same 5 jobs over 20 years, DOE believes a fatality during operation and maintenance of the CHP plant would be unlikely because the calculated number of fatalities is about 0.0038 (or conversely, 1 chance in 260).

3.4.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to Seattle Steam for the proposed CHP system, and DOE assumes the project would not proceed without this assistance. Further, risks to workers and the public from operation of the Seattle Steam plant would be unchanged.

3.5 Noise

3.5.1 AFFECTED ENVIRONMENT

The Seattle Steam facility is in a heavily built-up commercial area. As can be seen in Figure 2-2, the existing facility is surrounded by roads and buildings. Within the same block (that is, between Columbia Street and Yesler Way on the north and south and between Western Avenue and Post Avenue on the west and east), there are two other buildings that either share the same walls with the steam plant or are separated by only a few feet. Other commercial buildings are separated from the steam plant only by sidewalks and the roads, which are relatively narrow in the case of Post and Western avenues.

The City of Seattle has established allowable noise levels for commercial districts of the city as well as for residential and industrial districts. Specifically, Seattle Municipal Code Chapter 25.08, Noise Control, defines unlawful sounds as those that would exceed levels in the code. The maximum sound levels presented in the code are based on the district of the receiving property (that is, the property being exposed to the sound), the district of the source, and the time of day and week the sound is emitted. Table 3-5 provides a summary of the maximum acceptable sound levels set by City code.

Considering the values in Table 3-5, no residential areas in Seattle may be exposed to a daytime noise source originating from an industrial district of greater than 60 dB(A). Since these are maximum allowable sound levels at the receiving property, actual sound levels at the industrial site in this example may be greater than 60 dB(A) as long as the sound levels diminished sufficiently by the time they reached the residential area. It can also be noted that residential areas are further protected during night time and early mornings of weekends and holidays by lowering the daytime maximum acceptable levels by 10 dB(A), but this is only applicable to the residential receiving area. The maximum acceptable sound levels stay the same for the commercial and industrial receiving districts for all times of the day, including weekends and holidays.

Table 3-5. Summary of maximum acceptable sound levels as set by Seattle code.

District of Sound Source	Exterior sound level limits as Leq values in dB(A) ^a		
	District of receiving property		
	Residential	Commercial	Industrial
Daytime (7 a.m. to 10 p.m.)			
Residential	55	57	60
Commercial	57	60	65
Industrial	60	65	70
Weeknights (10 p.m. to 7 a.m.), Weekends & holidays (10 p.m. to 9 a.m.)			
Residential	45	57	60
Commercial	47	60	65
Industrial	50	65	70

Source: Seattle Municipal Code (SMC) Chapter 25.08 Noise Control.

a. Leq is equivalent sound level, which is the constant sound level in a given period that conveys the same sound energy as the actual time-varying A-weighted sound. dB(A) is A-weighted decibels, which are decibels based on the A-weighted scale, a modified scale that better approximates the range of human hearing by filtering out low-frequency sounds that are not as damaging as higher frequencies.

3.5.2 ENVIRONMENTAL CONSEQUENCES

3.5.2.1 Proposed Project

Noise emissions during facility construction actions and installation of the CHP system would be periodic and temporary. The highest noise levels generally associated with construction, such as site preparation and pile driving, would not be applicable to the proposed project because the facility already exists. Noise from construction-type work (that is, facility modifications) would be inside the existing building, and noise from installation of the CHP system would be primarily from operation of cranes and other large equipment and would be short-term.

Once installed, operation of the proposed CHP system would be expected to increase sound levels produced within the facility. That is, the gas turbine, steam generator, and steam turbine would be expected to produce greater sound levels than the single steam boiler currently in operation. Because the existing Seattle Steam facility is in a commercial area surrounded by commercial facilities, the nearest sound receptors are also commercial facilities, and the applicable maximum acceptable sound level is 60 dB(A) (Table 3-5). According to Seattle code, it would be unlawful for the Seattle Steam facility to generate sound levels exceeding 57 dB(A) during the day and 47 dB(A) during the night as received at any residential area. However, there are no residential areas in close proximity to the plant. Studies show that sound from a point source decreases by 6 dB(A) when the distance from the source is doubled (MPCA 1999). Therefore, if the Seattle Steam facility produced 60 dB(A) sound levels at a distance of 30 feet from the building (that is, at a location across the street), the sound would decrease to about 42 dB(A) at a distance of 240 feet away. Further, there is likely no unobstructed path of 240 feet in any direction from the existing plant, so intervening structures would tend to block the sound waves that would be produced.

According to vendor information submitted to Seattle Steam, the gas turbine that would be used in the CHP system is currently specified as a GE LM6000 unit and the steam turbine is currently specified as an Elliott (Ebara Group) YR Turbine. Seattle Steam indicates the gas turbine would be purchased with an integral unit enclosure with sound attenuation that would result in an average sound level of 85 dB(A) at 1 meter from the face of the equipment during full load operation. The manufacturer of the steam turbine also offers several different insulation packages that reduce the sound levels that would be produced by the equipment. The different insulation packages include a thermal blanket, steel insulation and jacketing, and an acoustic blanket. The acoustic blanket provides the most sound attenuation, reducing sound levels of an MYR turbine from an untreated range of 91 to 94 dB(A) to a treated range of 84 to 86 dB(A). For purposes of this evaluation, DOE assumes that Seattle Steam would require the steam turbine to be equipped with the acoustic blanket in order for its sound levels to be reduced to a level similar to the gas turbine with its enclosure.

The third primary component of the proposed CHP system is a once-through steam generator. Evaluations have shown that this type of steam generator has acoustical characteristics that act to reduce gas turbine exhaust noise (Gambino and Ashtiani 2007). DOE found no published or

manufacturer sound levels for this component of the system, but the preliminary equipment specifications developed by Seattle Steam indicated the steam generator would be purchased with: (1) a duct silencer if required, (2) a by-pass stack including steel structures and a silencer, and (3) an inlet silencer on the forced draft fan. For purposes of this evaluation, DOE assumes the steam generator would not add significantly to the sound levels identified for the gas turbine and the steam turbine. DOE also assumes the identified equipment and any other that might be necessary in the CHP system's exhaust would enable the exhaust discharge to meet identified City noise control standards.

There would be two sound sources within the Seattle Steam facility, each producing about 85 dB(A) outside of their first level of attenuation. Since a doubling of sound energy results in an increase of 3 decibels (MPCA 1999), the resulting noise level would be about 88 dB(A). This is the noise level that would be inside the existing facility and that might be characterized as noisier than heavy truck traffic, but not as noisy as a chainsaw. In order for this sound level to meet City codes, it would have to be reduced to no more than 60 dB(A) at or near the exterior of the building. This reduction is close to what would be expected just by the building itself. Studies have shown that, as a national average, outdoor noises are reduced by 25 dB(A) inside a house when the windows are closed. The reduction is slightly higher in cold climates, where there is more insulation in the house, and slightly lower in warm climates (EPA 1974). In this case, the primary sound source of concern is reversed (that is, it is on the inside of the building), but the reductions should be similar.

Seattle Steam has not yet performed detailed noise evaluations and possibly would have to add insulation or other types of sound attenuation such as additional walls or baffles inside the building as part of the project design. However, Seattle Steam recognizes the need to achieve the 60 dB(A) requirement and the above evaluation shows that it should be reasonably attainable. At 60 dB(A), sound levels are comparable to conversational speech and quieter than in a typical business office (MPCA 1999). With the proposed project meeting sound levels set by Seattle's Noise Control ordinance, no significant noise impacts would be expected to the surrounding areas. Inside the building, workers would be subject to appropriate health and safety standards, including wearing appropriate hearing protection as required.

3.5.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to Seattle Steam for the proposed CHP system, and DOE assumes the project would not proceed without this assistance. Further, sound levels generated from operation of the Seattle Steam plant at would be unchanged.

3.6 Utilities, Energy, and Materials

Discussions in this section are limited to the electrical energy that would be generated by the proposed CHP plant and the natural gas that would be used to fuel the plant. The project would have no notable impact on other utilities or utility services of the community. Water use and

wastewater production essentially would be the same as under current operations. Fabrication of the CHP system components would involve the unavoidable commitment of various materials, however, none of these materials has been identified as unique, in limited availability in the marketplace, or an otherwise limited resource.

3.6.1 AFFECTED ENVIRONMENT

3.6.1.1 Electricity

The proposed CHP facility would provide electricity to the PSE distribution system (with transmission services provided by Seattle City Light). PSE provides electricity to much of the Washington area around Puget Sound, serving more than one million customers (Puget Energy 2010). It operates about 2,600 miles of transmission lines, more than 20,000 miles of distribution lines, and 366 transmission and distribution substations (PSE 2009a). PSE also owns 14 power plants with a combined generating capacity of just over 2,900 megawatts (PSE 2009a). PSE's average annual electricity sales during the last three years (2007 to 2009) were approximately 23.9 million megawatt-hours (Puget Sound 2010).

PSE is connected to the regional grid and is a member of the Western Electricity Coordinating Council region under the North American Electric Reliability Corporation (formerly the North American Electric Reliability Council). The Western Electricity Coordinating Council region covers the western third of the continental United States including most of Montana, Wyoming, Colorado, and New Mexico, and all of the states to the west, as well as western Canada.

In its report, *Electric Power Annual 2008* (DOE 2010), DOE compiled information on electric usage by North American Electric Reliability Corporation regions within the United States. During summer, 2004 through 2008, the Western Electricity Coordinating Council region had net internal electrical demands that averaged 131,000 megawatts and, during the same period, had capacity margins that ranged from 14.1 to 27.1 percent (DOE 2010). Capacity margin is defined as the amount of unused available capacity of an electric power system at peak load as a percentage of capacity resources. In projecting future effects of actual and planned capacity resources, DOE estimates that summer net demands in the Western Electricity Coordinating Council region from 2008 through 2013 will average 138,000 megawatts, and the capacity margin will range from 22 to 29.8 percent (DOE 2010). During the corresponding winters (extending into 2014), DOE estimates that the average net demand will be 111,000 megawatts with the capacity margin ranging from 37.4 to 41 percent (DOE 2010). The significantly lower demand in the winter is consistent with heavy use of electricity for cooling in the summer and heavy use of natural gas in the winter for heating.

3.6.1.2 Natural Gas

The proposed CHP facility would obtain its natural gas fuel from the PSE distribution system. Similar to its electrical distribution system, PSE provides natural gas to much of the Puget Sound area. The areal extent of its natural gas distribution system is not as large as its electrical system,

but includes the populous area on the east side of Puget Sound from Olympia up through Tacoma, Seattle, and Everett, Washington. PSE's system includes almost 12,000 miles of natural gas mains, almost 13,000 miles of service lines, 40 gate stations, and two storage facilities (PSE 2009a). PSE purchases its natural gas from a variety of major and independent gas producers in the United States and Canada. All of PSE natural gas supply is transported through facilities of Northwest Pipeline GP, which is the sole interstate pipeline delivering natural gas into the PSE service area (Puget Energy 2010), making PSE's ability to supply natural gas is dependent upon the reliability of Northwest Pipeline GP operations. PSE's average annual natural gas deliveries during the last three years (2007 to 2009) were approximately 111,000 million cubic feet (Puget Sound 2010).

The U.S. Energy Information Administration does not identify natural gas production in the state of Washington, but rather describes the state as relying heavily on natural gas produced in Canada (EIA 2010). In 2008, the state used a total of 298,000 million cubic feet of natural gas, with the residential sector being the largest consumer. Roughly one-third of the state's households use natural gas as their primary energy source for home heating (EIA 2010).

3.6.2 ENVIRONMENTAL CONSEQUENCES

3.6.2.1 Proposed Project

3.6.2.1.1 Electricity

During construction activities, it is anticipated that demand for electricity would be greater than under current operations. There would be additional use of power tools, and during some activities (such as asbestos removal) additional air controls and filtering would be required. However, these additional demands would be relatively minor and short-term in nature, and would not be expected to adversely impact existing electrical distribution systems in the facility or the city.

Once the CHP system was operational, the facility would have an electricity generating capacity of about 50 megawatts and would become a net supplier of electricity to the electrical grid distributed by PSE. Seattle Steam has developed an estimate for a typical year of operation of the CHP plant that shows the gas turbine producing a total of 158,700 megawatt-hours of electricity and the steam turbine producing 15,000 megawatt-hours. The estimate also indicates there would be internal plant usage of electricity amounting to 6,600 megawatt-hours over the course of the year, which would reduce the amount of electricity going to the transmission lines. The net amount of electricity that would be generated and transferred to the grid under a typical year, therefore, would be about 167,000 megawatt-hours (Gent 2010).

The 167,000 megawatt-hours of electrical power that would be produced annually by the CHP plant under the proposed project is relatively small, representing only 0.7 percent of the 23.9 million megawatt-hours supplied annually by PSE. The proposed plant's generating capacity of 50 megawatts also represents 1.7 percent of the 2,900 megawatts of generating capacity owned

by PSE and only about 0.04 percent of the average annual demand of 131,000 megawatts within the Western Electricity Coordinating Council region. The proposed project would have only minor effects on the local and regional electrical distribution system, but the effects would be beneficial because of the additional generating capacity and the associated increase in system reliability. More important, however, electricity would be produced through a more efficient use of fuel when compared with the existing electricity and steam generation that it would be offsetting.

3.6.2.1.2 Natural Gas

During construction of the CHP plant, there would be no change in natural gas usage. Once the plant began producing electricity and steam, there would be an increase in natural gas usage compared to the facility's current operations. Seattle Steam's estimate of fuel needs for a typical year of operation is 1,520 billion British thermal units (Btu) (Gent 2010). Assuming this annual demand was met entirely by using natural gas with an average heat content of 1.031 million Btu per thousand cubic feet, the energy need in Btu equates to 1,470 million cubic feet of natural gas. The plant's demand thus would equate to 1.3 percent of the 111,000 million cubic feet of natural gas distributed annually by PSE and 0.49 percent of the 298,000 million cubic feet used in the entire state in 2008. These percentages of natural gas demand might seem fairly high for a single facility, especially in a state that does not produce natural gas. However, this quantity of fuel would be offset by reductions in the amount of fuel that would otherwise be used in the existing steam boiler at the 633 Post Avenue facility and that would otherwise be used to produce electricity at other locations on the electrical grid. The premise for CHP systems and the driving reason for the proposed project is that the CHP system would use less fuel than the applicable steam and electricity production from existing power generation plants.

It should also be noted that the proposed CHP plant's fuel demand would likely not be met entirely with natural gas. As described previously, the plant would use natural gas as its primary fuel, but would also be capable of using diesel fuel as a secondary fuel as necessary during times of natural gas curtailment. The total fuel energy or heat content needed by the system for a year of operation would remain as described above, but under normal operations some of the energy would be supplied by combustion of diesel fuel rather than natural gas. Again, the efficiency of the CHP system would allow it to use less diesel fuel than would otherwise be used to produce comparable amounts of electricity and steam.

It is possible that the proposed project could, at times, use more natural gas than under current conditions. This is because the electric grid receives power from many different generating sources involving many different fuels. If the offset provided by the operating CHP plant, for example, was in the form of less coal burned to generate electricity, there could be a net increase in natural gas usage. Overall, the amount of fuel used would be less. Seattle Steam estimates that the CHP plant would operate with a fuel-chargeable-to-power heat rate of about 6,000 Btu per kilowatt-hour compared with a U.S. average of about 10,000 Btu per kilowatt-hour for electricity generating facilities tied to the grid that use coal, petroleum, or natural gas for fuel

(Gent 2010). That is, Seattle Steam estimates the CHP plant would use about 60 percent as much fuel as the current steam and electricity generating capacity it would be replacing.

3.6.2.2 No-Action Alternative

Under the No-Action Alternative, DOE would not provide funding to Seattle Steam for the proposed CHP system, and DOE assumes the project would not proceed without this assistance. Further, there would be no additional source of electricity to the electrical grid and fuel use to generate steam and electricity would be unchanged.

3.7 The Relationship between Local Short-Term Uses of the Environment and the Maintenance and Enhancement of Long-Term Productivity

Council on Environmental Quality regulations that implement the procedural requirements of NEPA requires consideration of the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity (40 CFR 1502.16). Installation and operation of the proposed CHP system would require short-term use of land and other resources. Short-term use of the environment, for purposes of this EA, is that used during the life of the CHP system, whereas long-term productivity refers to the period of time after the equipment has been decommissioned and removed. The short-term use of the project site and other resources for the Seattle Steam proposed project would not impact the long-term productivity of the area. When it is time to decommission and remove the CHP system, the land and facilities occupied by that system could be used for other industrial purposes, or the land could be reclaimed and re-vegetated to resemble pre-disturbance conditions.

3.8 Irreversible and Irretrievable Commitments of Resources

There would be an irretrievable commitment of land and facilities where the Seattle Steam proposed CHP system would be located. This area is currently dedicated to the production of thermal energy for the existing steam distribution system, and the proposed project would support this mission. There would also be an irreversible commitment of energy and materials used to fabricate the CHP system components, as well as to modify the existing building, install the equipment, and operate the system. There would be an irreversible commitment of fuel energy to operate the system, but it would be less than the existing steam and electricity generating facilities would use for comparable energy production. The Department would also expend the finances associated with funding the proposed project.

3.9 Unavoidable Adverse Impacts

Construction and operation of the proposed CHP system would involve several minor, though potentially adverse, impacts, which are summarized as follows:

Air Quality – Operation of the CHP system would be expected to increase emissions of air pollutants from Seattle Steam’s facility at 633 Post Avenue. These emissions would be offset by a reduction in emissions currently generated from the existing steam boiler in the facility and at electrical generating plants in the region.

Cultural Resources – The proposed project would require actions on the interior and exterior of a building of historic significance. The building’s exterior would be restored to the extent practicable to maintain the characteristics that made it eligible for the National Register of Historic Properties, but it is expected that the roof would require changes in order to incorporate necessary air handling devices. The interior actions would include structural improvements that should help extend the life of the building.

Noise – The proposed project would cause unavoidable increases in noise within the existing Seattle Steam facility, which is located in the middle of a commercial area of downtown Seattle, Washington. The City’s noise control ordinance would require the Seattle Steam facility to cause no more than a sound level of 60 dB(A) to adjacent receptors. Detailed design has not yet been completed on how the necessary sound attenuation would be achieved and it may require additional walls or baffles within the facility. However, achieving the City’s required noise reduction level would ensure there would be no significant noise impacts to people or property use in the area.

4. CUMULATIVE IMPACTS

Council on Environmental Quality regulations stipulate that the cumulative impacts analysis in an EA consider the potential environmental impacts resulting from the incremental impacts of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such actions (40 CFR 1508.7). Impacts of the proposed project generally would be minor and tend to be either very local or regional in nature (see Chapter 3). As a result, DOE focused this evaluation of cumulative impacts on activities very close to the Seattle Steam plant at 633 Post Avenue or on regional trends that would have a relationship with the proposed project.

Conditions resulting from past and ongoing activities are included in the descriptions of the affected environment in Chapter 3 of this EA. The following sections describe reasonably foreseeable future actions (Section 4.1) and the incremental cumulative impacts of installation and operation of the proposed CHP system (Section 4.2).

4.1 Reasonably Foreseeable Actions

Seattle Steam has identified no actions for the facility on Post Avenue other than those described for the proposed CHP plant. To identify foreseeable actions around the facility, DOE primarily considered information made available by the Seattle Department of Planning and Development at its web site (<http://www.seattle.gov/dpd/>). Energy resources are a primary concern for Seattle Steam's proposed project and represent a more regional concern with respect to foreseeable future actions, so DOE considered forecasts made by PSE for this evaluation.

4.1.1 FORECASTS BY THE SEATTLE DEPARTMENT OF PLANNING AND DEVELOPMENT

The Seattle Department of Planning and Development has posted summaries of building actions currently under construction or being planned. This information can be found in the form of a "Building in Downtown Seattle" (Seattle DPD 2008) graphic and also in a "DPD Activity Locator" (Seattle DPD 2010), which allows interactive viewing of building permit records with locations plotted on a map of the city.

Building in Downtown Seattle – This graphic shows proposed locations for commercial projects and for residential and mixed-use project in the categories: (1) Completed Since 2004, (2) Under Construction, and (3) In Permit/Design Review (planned). The only buildings under construction or planned shown in the graphic within 0.2 mile of the Seattle Steam facility are an office building in the next block to the north and a combined office and 180-residential unit complex about 0.15 mile to the east.

DPD Activity Locator – DOE reviewed this database for building permit activity during the 3-month period from January 16 to April 16, 2010. All three of the available building categories (single family/duplex, multiple family, and commercial/mixed/other) were considered along with

all four of the available action categories (construction, addition/alteration, temporary, and no construction). Within each of these groupings, the data were then queried for permit applications, permits issued, and permits finalized. The only grouping showing any activity in proximity of about 1 mile of the Post Avenue facility was the addition/alteration grouping, which indicated multiple permit applications and permits issued. All were for the commercial building category and none were within a block of the Seattle Steam facility.

The Department also reviewed the Department of Planning and Development information for long-term planning strategies involving the area that includes the 633 Post Avenue facility. Seattle has implemented several planning actions to enhance the Pioneer Square area. The latest is the “Livable South Downtown” plan, which includes Pioneer Square as well as the adjacent Chinatown/International District, Little Saigon, and the Stadium District. A primary objective of this effort is to develop a means to encourage investment, which would allow new residents and workers to enliven south downtown, while retaining the area’s history and unique character (Seattle DPD 2009). The effort included an environmental impact statement that evaluated alternatives for future growth. Project strategic measures include pursuing zoning changes to increase development heights and allowable densities for residential use tailored to each neighborhood and providing incentives for residential uses in renovated historic buildings and development between and around historic buildings.

4.1.2 FORECASTS BY PUGET SOUND ENERGY

Future actions that could affect electricity and natural gas demands and availability are more regional in nature than other environmental resource areas with respect to the proposed project. PSE is the primary entity involved in the distribution of both electricity and natural gas; therefore, DOE considered forecasts PSE made to evaluate future actions in these energy resource areas. PSE developed an *Integrated Resource Plan* (PSE 2009b) and a subsequent addendum to the Plan (PSE 2010) that provides its estimates of the future electrical and natural gas needs of its customers.

PSE estimates a modest, but steady, growth in the area’s electric demands for the next 20 years, consistent with forecasts of modest growths in population and the economy. However, over the same time, contracts for purchasing power will be expiring, and aging generation units potentially will be retiring. As a result, the gap between electrical demand and PSE’s current ability to supply electricity will be increasing faster than would be attributed simply to increased demand. With current contracts and generating capacities (with retirements), PSE estimates there would be a shortfall of about 4,700 MW by 2030 (PSE 2010). This planning, of course, provides PSE with its goals for developing new contracts for purchasing power and for developing new generation units. It also provides a good indication that electricity from the proposed Seattle Steam CHP plant would remain in demand in the foreseeable future and that there will undoubtedly be new power generating units added to the region and adding to the demand for fuel energy resources.

With respect natural gas, PSE also forecasts a modest and continued growth in demand from its retail consumers, but assumes a faster growth in natural gas demand for electric generation. Natural gas is currently used in fueling about 30 percent of electric generation, and this is projected to increase to about 66 percent by 2029 (PSE 2009). In order to keep pace with the demand, PSE sees a need to increase pipeline capacity for transporting natural gas between production areas of northern British Columbia and the area of northwest Washington, and to investigate improving access to production areas in the Rocky Mountain basin. Additional capacity for storage will also be pursued. Foreseeable actions by PSE will help assure the proposed CHP plant would have continued access to natural gas. The extent of the actions PSE plans highlights the need for more efficient use of the natural gas brought into the area, which should maintain the benefits of the CHP plant.

4.1.3 OTHER FORESEEABLE ACTIONS

There is one other reasonably foreseeable future action that should be mentioned because it involves DOE and Seattle Steam, though it does not directly involve the Post Avenue facility. DOE is involved in providing financial assistance for utility-based energy efficiency projects. Under one of the qualifying projects, McDonald-Miller Facility Solutions partnered with Seattle Steam to provide turnkey development, implementation, and financing of energy efficiency projects for customers of Seattle Steam. These would be projects on the customer side of the steam meter to address steam distribution and use as well as electricity, gas, and all energy-using mechanical and electrical systems. DOE funding for this energy efficiency project would be through the State Energy Program and thus represents a project selected by the State of Washington with concurrence from DOE. In this case, proposed Department of Commerce and State Energy Program funding would support implementation of the first set of approximately 15 energy efficiency projects with Seattle Steam customers, with a total capital cost of \$12 million. These projects are now under development. The project business model is scalable and will launch a delivery mechanism that will implement further energy efficiency projects with Seattle Steam's large client base. Total energy efficiency project investments to be achieved with Seattle Steam customers through this mechanism are estimated at greater than \$50 million over the next two to three years (Fuller 2010). This project would not be expected to have any cumulative effects with the Seattle Steam CHP plant project other than possibly resulting in changes to steam demands from Seattle Steam customers as energy efficiency measures were implemented.

4.2 Summary of Cumulative Impacts

In this analysis of cumulative impacts, DOE evaluated potential impacts to the resources and subject areas analyzed in detail in Chapter 3 of this EA. Impacts to other resources would be negligible or would not occur (Section 1.4). Therefore, it is unlikely that installation and operation of the CHP, in combination with other past, present, or reasonably foreseeable actions, would have more than a negligible incremental impact on those aspects of the environment, and they are not further discussed here.

4.2.1 AIR QUALITY

Modifications to the existing Seattle Steam facility and installation of the CHP system would have a very small incremental adverse impact for the few weeks or months that cranes and other heavy equipment would be required.

Operation of the CHP system would cause emissions of carbon monoxide, nitrogen oxides, particulate matter, and other pollutants (Table 3-2), which would contribute to the cumulative adverse impacts on air quality from construction and other activities in the area around the Seattle Steam facility. Seattle Steam (or the eventual operator of the plant) would be required to obtain an operating permit from PSCAA before the plant could be constructed and operated. The permit would establish air emissions limitations that would ensure that the CHP system's emissions in combination with others in the area did not cause applicable ambient air quality standards to be exceeded. In addition, emissions from the CHP system would be offset by a reduction in emissions from the facility's existing steam plant and electricity generating plants in the region. DOE therefore concludes that operation of the CHP system would not cause significant cumulative adverse impacts on air quality in the Seattle and King County area.

4.2.2 CULTURAL RESOURCES

The only cultural resource that potentially would be affected by the proposed CHP system is the existing Seattle Steam facility at 633 Post Avenue that would house the system (Section 3.2). Seattle Steam is not planning any other action at the facility that would be cumulative with the proposed project and no other identified action in the area would have cumulative impacts on the facility.

4.2.3 SOCIOECONOMICS

The planned actions at the Seattle Steam facility and elsewhere in the area would expand employment opportunities, increase the tax base for Seattle and King County, and have other beneficial impacts on the economy of the Seattle area. Installation and operation of the Seattle Steam proposed CHP system would have a minor contribution to these cumulative economic benefits.

4.2.4 OCCUPATIONAL HEALTH AND SAFETY

Modification of the existing Seattle Steam facility and installation of the CHP system would cause temporary traffic in the area that would be cumulative with existing traffic and possibly increase the rate of traffic accidents. The number of construction workers required for facility modification and installation of the CHP system would be negligible relative to the total number of commuters in the downtown Seattle area. Operation of the CHP system would not impact traffic congestion, traffic accident rates, or other health and safety risks, as all operations would be confined to the existing Seattle Steam facility.

4.2.5 NOISE

Actions to modify the existing Seattle Steam building and install the CHP system would add to other noises in the area, as would the subsequent operation of the CHP system. One of the projects being tracked by the Seattle Department of Planning and Development is the planned construction of an office building in the block just north of the Seattle Steam facility location, but no start date was identified. Construction-type activities would be short-term, or at least of a finite term, but they would still be subject to Seattle's Noise Control ordinance. Operation of the proposed CHP system would add to the ambient noise levels of the neighborhood, but meeting the 60 dB(A) requirement at the location of any receptors would ensure that plant's incremental addition would be minor.

One possible noise issue was identified that could have an adverse impact on the proposed CHP system. Seattle's plans for the south downtown area include strategies for increasing the presence of residential areas such as in renovated historic buildings and in development between and around historic buildings. Were such residential development to occur in close proximity to the Post Avenue facility, the question might be raised as to whether the noise level criteria applicable to the CHP system could change. As described in Section 3.5.1, during daytime, it would be unlawful for the CHP system to cause noise levels in excess of 57 dB(A) to be received by any residential area. If residences were to get close to the Seattle Steam facility, this noise level would not be greatly different from the 60 dB(A) now identified as the applicable target for a maximum noise level. However, the nighttime and off-hour requirements for residential receptors drops to 47 dB(A), and that could become problematic for the Seattle Steam facility if residences get close enough. As a worse-case scenario, time restrictions on operation of the CHP system could be imposed, which would not be desirable for a generating unit. If the Seattle Steam project receives the appropriate building permits with the identified noise characteristics of the CHP system, DOE can only assume this would not become a future problem.

4.2.6 UTILITIES, ENERGY, AND MATERIALS

As forecast by PSE, future actions dealing with the generation and distribution of electricity and the procurement and distribution of natural gas would tend to enhance the need and value of the proposed CHP plant. The increasing need for electricity in the area will increase the importance of the electricity produced from the plant and the increasing competition for fuel will increase the impetus for more efficient use of that fuel, such as would be inherent in the proposed CHP system.

5. CONCLUSIONS

The Department's Proposed Action would provide Seattle Steam with \$18.8 million in financial assistance in a cost-sharing arrangement to facilitate the purchase and installation of a new CHP system in the existing Seattle Steam facility at 633 Post Avenue in downtown Seattle, Washington. This system would have the capacity to produce about 50 megawatts of onsite electricity generation and steam (in combination with Seattle Steam's other energy plant) as required to support Seattle Steam's existing steam distribution system. DOE concludes the following about the potential environmental impacts of its Proposed Action and Seattle Steam's proposed project.

- Modification of the existing Seattle Steam facility and installation and operation of the CHP system would not have any meaningful or detectable impacts on land use; geology and soils; water, biological, and visual resources; waste and hazardous materials; environmental justice; and transportation and traffic.
- Prior to construction and operation of the CHP system, Seattle Steam would obtain the necessary permits and air emission limitations that would ensure compliance with federal and Washington state air quality regulations.
- The proposed CHP system would result in a net decrease in emissions of air pollutants considering emissions from the current steam plant and regional electricity generating plants that it would offset. Thus, the project would have a net beneficial impact on air quality in the region.
- The proposed project would require actions on the interior and exterior of a building of historic significance. Temporary changes would likely be required to the building's façade, and permanent changes might be made to the building's roof. However, the building's exterior would be restored to the extent practicable to maintain the characteristics that made it eligible for the National Register of Historic Properties. The interior actions would include structural improvements that should help extend the life of the building. Any such changes first would need to meet the approval of the Pioneer Square Preservation Board.
- There would be a minor to moderate and temporary beneficial impact to the economy in the areas where equipment would be manufactured, as well as in the Seattle area during installation and operations.
- There would be no new or significant hazards to workers or the public.
- Operation of the CHP system would cause a small adverse increase in sound levels outside of the existing facility, but the sound levels would be required to meet Seattle's

Noise Control ordinance, which would ensure the sound levels were of minor significance to any nearby receptors.

- Operation of the CHP system would require more natural gas (or diesel fuel in times of natural gas curtailment) than is currently used at the existing facility. However, this would be offset by the production of electricity that would go to the region's electric grid. Overall, the system would use less fuel energy than that currently being used to produce the corresponding amounts of steam in the Seattle Steam boiler plant and electricity in regional generating units.
- Relative to the cumulative changes in the environment as a result of ongoing and planned activities in south downtown Seattle, installation and operation of the CHP system would cause small, adverse incremental changes in air quality and noise in that area, and increasing demand in the future for electricity and natural gas will enhance the need for efficient uses of fuel such as is inherent in CHP systems.

Under the No-Action Alternative, DOE would not provide funding to Seattle Steam and assumes that the CHP system would not be installed and operated. No impacts to the existing environment would occur, and beneficial impacts of the proposed project would not be realized.

On the basis of the evaluations in this Draft EA, DOE concludes that its Proposed Action, to provide financial assistance to Seattle Steam to facilitate installation of a CHP system, would have no significant impact on the human environment.

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Appendix A

Distribution List

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1063 South Capitol Way, Suite 106
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Ms. Cory Plantenberg
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510 Desmond Drive, S.E., Suite 102
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Mr. Kevin Haggerty
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Freedom of Information Act Reading Room
1000 Independence Avenue, SW, 1G-033
Washington, DC 20585

The Seattle Public Library
Central Library
1000 Fourth Avenue
Seattle, WA 98104-1109

Mayors Office
Seattle City Hall 7th Floor
600 Fourth Avenue
P.O. Box 94749
Seattle, WA 98124-4749

Mr. Stan Gent, President/CEO
Seattle Steam Company
1325 Fourth Avenue, Suite 1440
Seattle, WA 98101

Appendix B
Consultations



NATIONAL ENERGY TECHNOLOGY LABORATORY
Albany, OR • Morgantown, WV • Pittsburgh, PA



March 18, 2010

Ms. Allyson Brooks, Ph.D.
State Historic Preservation Officer
Washington State Department of Archaeology
and Historic Preservation
1063 South Capitol Way, Suite 106
Olympia, WA 98501

Dear Ms. Brooks:

SUBJECT: U.S. Department of Energy Request for Consultation for the Seattle Steam Company Combined Heat and Power Project, Seattle, King County, Washington

The U.S. Department of Energy (DOE) proposes to provide a financial grant to the Seattle Steam Company through the Department's Industrial Energy Efficiency Initiative of the *American Reinvestment and Recovery Act of 2009* (Recovery Act). Funding would be provided in a cost-shared arrangement to facilitate deployment of a combined heat and power plant in Seattle Steam's existing facility in downtown Seattle at 633 Post Avenue.

Deployment of the combined heat and power plant would involve removal of the existing, less efficient peaking boilers. This would be followed by installation of a new gas turbine, a heat recovery steam generator, and two steam turbines. In addition to producing steam for the existing Seattle Steam thermal energy distribution system, the new plant equipment would produce up to 50 megawatts of electrical power for transmission to the area's electrical grid. Seattle Steam's grant application indicated that this work would be performed without changes to the exterior of the existing plant, which was constructed between 1900 and 1902 and is located in the historic Pioneer Square area of Seattle. Attachment 1 provides additional project information, including photographs of the facility and maps of its location.

The DOE's National Energy Technology Laboratory is preparing an environmental assessment for this proposed project to meet the requirements of the National Environmental Policy Act. DOE intends to use the NEPA process to satisfy its Section 106 involvement obligations and, at this time, we anticipate implementing a 15-day public comment period for this proposed project. A copy of the draft environmental assessment will be sent to your office when released for public comment.

Based on internal scoping, DOE recognizes that the existing Seattle Steam building at 633 Post Avenue is within the Pioneer Square – Skid Road National Historic District and that this specific building has been identified by the State of Washington as contributing to the District's placement on the National Register. Based on a preliminary analysis, DOE has determined that the project would not cause any effects to other historic or archeological resources at the project site in Seattle, Washington and effects to the existing energy generation plant at 633 Post Avenue would be

3610 Collins Ferry Road, P.O. Box 880, Morgantown, WV 26507

primarily limited to the interior. Seattle Steam has indicated that temporary openings may be required for equipment installation and the roof penthouse may be modified to accommodate the turbine unit inlet air requirements. DOE does not believe changes to the building's interior and the minor or temporary changes to the exterior would adversely affect the characteristics that contributed to the District's listing on the National Register, but is seeking your review in this matter.

Please forward the results of your review and any requests for additional information to Mark Lusk of the Department's National Energy Technology Laboratory using the contact information provided below. Since this is a Recovery Act project, we would appreciate a quick response to our request for consultation. Our goal is to release the draft environmental assessment in May, so if we could receive your input within 30 days that would be greatly appreciated. Thank you for your assistance in this matter.

Contact Information: Mr. Mark Lusk
U.S. Department of Energy
National Energy Technology Laboratory
3610 Collins Ferry Road
P. O. Box 880, MS B07
Morgantown, WV 26507-0880
Telephone: (304) 285-4145
Email: Mark.Lusk@netl.doe.gov

Sincerely,



Mark Lusk
NEPA Document Manager

Attachments

Seattle Steam Company Combined Heat and Power Project

Additional Project Information

The Seattle Steam Company (Seattle Steam) is a privately-owned utility, founded in 1893, that currently operates a district energy system in Seattle, Washington. Seattle Steam produces thermal energy (steam) from five boilers in two plants located in downtown Seattle. The energy is distributed through approximately 18 miles of underground pipe to about 200 buildings in about one square mile of Seattle’s Central Business District and First Hill neighborhoods. Buildings served by the district energy system include office buildings, hospitals, hotels, and college campuses. Locations of the two energy plants and the approximate extent of the district energy system are shown in Figure 1.

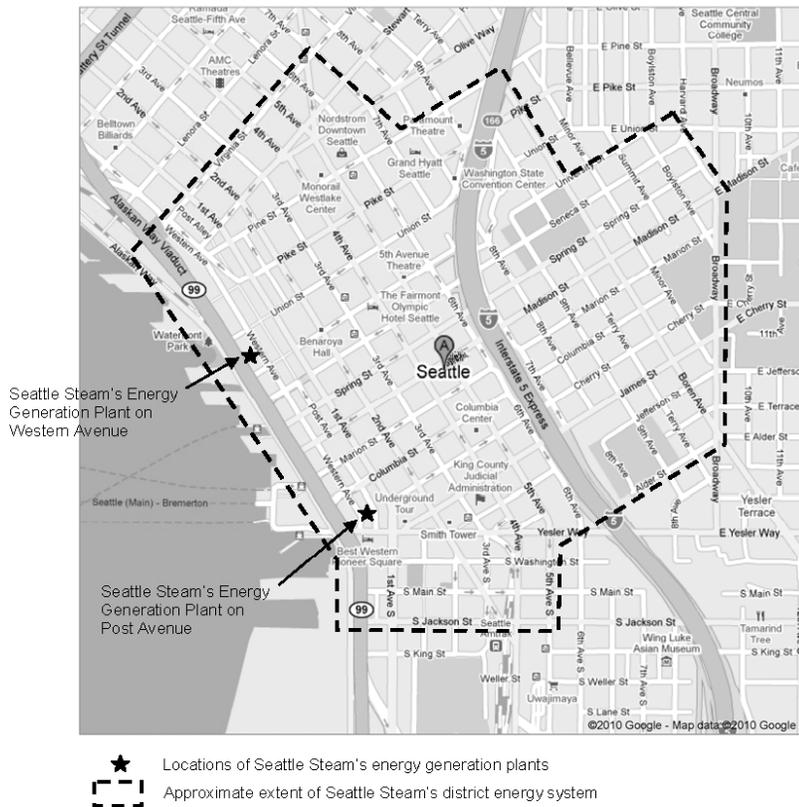
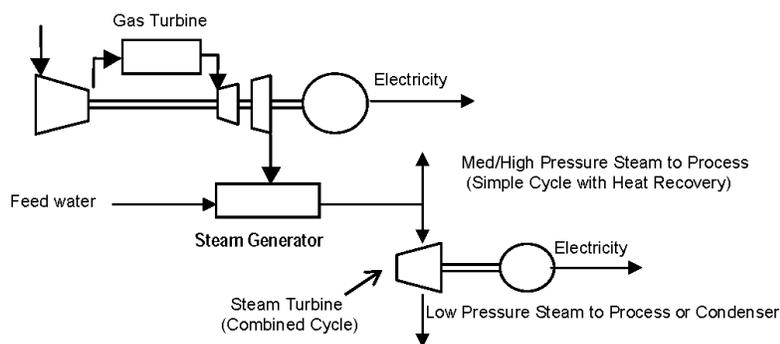


Figure 1. Locations of Seattle Steam’s energy generation plants and district energy system

Seattle Steam now proposes to transition one of their existing energy plants, specifically the plant at 633 Post Avenue (Figure 1), into a combined heat and power (CHP) plant. Under this action, the existing

boiler equipment in the Post Avenue plant would be removed and new equipment would be installed with the capacity to produce both electricity and steam. With the new equipment configuration, a gas turbine would be used to produce electricity. Heat from that process would be recovered by sending it through a steam generator for the production of steam. As another energy recovery step, the CHP plant would include a steam generator that would provide a secondary source of electricity. Figure 2 provides a generic representation of the equipment configuration that would be used in the CHP plant. As depicted in the figure, steam would be diverted to the Seattle Steam distribution system either as it left the steam generator or the steam turbine, and electricity could be transmitted to the electrical grid from both the gas turbine and the steam turbine.



Source: EPA 2008

Figure 2. Generic representation of a CHP plant as would be deployed by Seattle Steam.

The CHP plant has been proposed with key roles being held by the Seattle Steam Company and Puget Sound Energy. Seattle Steam's proposed function in the project is to lease the Post Avenue plant to a project developer with a contract to purchase steam from the owner/operator. Puget Sound Energy, an electricity and natural gas utility in the area, would similarly be under contract with the CHP plant owner/operator to sell natural gas and purchase electrical energy. Puget Sound Energy has also expressed a possible interest in being the owner of the CHP plant and supplier of steam energy to Seattle Steam. A third identified player, Seattle City Light, has agreed that it would provide electric connections to the Post Avenue plant facility and sell transmission services through its electrical system. Although Puget Sound Energy provides natural gas utility services in the City of Seattle, Seattle City Light, a publically-owned utility, is the sole provider of electricity in the city and Puget Sound Energy provides electricity to areas bordering the city. Therefore, there would be transmission agreements and fees involved in moving the electrical energy from the CHP plant to the Puget Sound Energy distribution system where it would ultimately be sold and used.

Seattle Steam Plant at 633 Post Avenue

As noted above, the new CHP plant would be installed in the existing Seattle Steam facility at 633 Post Avenue. This building (Figure 3) is over 100 years old and located in the Pioneer Square-Skid Road Historic District of Seattle (National Park Service Reference Number 70000086). The building currently houses one operating boiler and several old boilers that are not operational. Under the Seattle Steam project, the old equipment would be removed to the extent necessary to accommodate the new equipment; the structure of the building interior would be upgraded with additional bracing and supports as needed to

meet current building codes and to support the new equipment; and the new equipment would be installed.



Figure 3. Photographs of the Seattle Steam plant at 633 Post Avenue.

The Seattle Steam Company has informed DOE that all work on the building at 633 Post Avenue would be in accordance with City of Seattle standards and would involve significant changes only to the interior of the building. However, temporary openings may be required for equipment installation and the roof penthouse may be modified to accommodate the turbine inlet air requirements. The historic nature of the building's exterior would be unaffected with the possible exception of work such as replacing windows with like windows, cleaning brickwork, etc.

Figure 4 provides an aerial view of the Post Avenue building. Figure 5 identifies the building location on a map segment copied from the U.S. Geological Survey's *Seattle South Washington 7.5 x 15 Minute Quadrangle* map.



 Seattle Steam Company's plant at 633 Post Avenue

Figure 4. Aerial view of the Seattle Steam Company boiler plant at 633 Post Avenue

