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**PERMIT APPLICATION REVIEW
COVERED SOURCE PERMIT (CSP) NO. 0240-01-C
Permit Renewal Application No. 0240-04
Permit Application for Modification No. 0240-05**

Applicant: Hawaiian Electric Company, Inc. (HECO)
Facility: Kahe Generating Station
Location: 89-900 Farrington Highway, Waianae, Oahu
Address: Hawaiian Electric Company, Inc.
P.O. Box 2750
Honolulu, Hawaii 96840-0001

Responsible Official: Lawrence G. Ornellas	Contact: Karin Kimura
Title: Manager, Generation	Title: Senior Environmental Scientist
Company: HECO	Company: HECO
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Equipment:

<u>Unit</u>	<u>Description</u>
K-1	92 MW (nominal), 903 MMBtu/hr Babcock and Wilcox boiler, model no. RB-378, serial no. 20731, with propane fired igniter.
K-2	90 MW (nominal), 900 MMBtu/hr Babcock and Wilcox boiler, model no. RB-379, serial no. 20732, with propane fired igniter.
K-3	92 MW (nominal), 892 MMBtu/hr Combustion Engineering boiler, model no. 5067, serial no. 20859, with diesel fired igniter.
K-4	93 MW (nominal), 918 MMBtu/hr Combustion Engineering boiler, model no. 12867, serial no. 20881, with diesel fired igniter.
K-5	142 MW (nominal), 1,468 MMBtu/hr Babcock and Wilcox boiler, model no. RB-486, serial no. 23465, with diesel fired igniter.
K-6	142 MW (nominal), 1,516 MMBtu/hr Babcock and Wilcox boiler, model no. RB-487, serial no. 23466, with diesel fired igniter.
A	2.5 MW General Motors black start diesel engine generator.
B	2.5 MW General Motors black start diesel engine generator.

1. Background

- 1.1 HECO has applied for a permit renewal with modifications for operating boilers and black start diesel engine generators at Kahe Generating Station. The electric plant operates six boilers (Boilers K-1 through K-6) ranging in capacity from 90 MW to 1,516 MW. The facility also operates two 2.5 MW black start diesel engine generators (Units A and B) to start the boilers in emergencies when electricity cannot be obtained from the grid. Boiler K-5 and K-6 are fired on fuel oil No. 6 with as much as 0.5% sulfur content. Boilers K-1 through K-4 are fired on fuel oil No. 6 with 0.5% maximum sulfur content and

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specification used oil not to exceed the limits specified in Paragraph 2.16 of this review. Igniters for Boilers K-1 and K-2 burn propane. Igniters for boilers K-3 through K-6 burn fuel oil No. 2 with 0.5% maximum sulfur content. The black start diesel engine generators are fired on fuel oil No. 2 with a maximum sulfur content of 0.5% by weight. The total specification used oil consumption for the Boilers K- 1 through K- 4 is limited to 115,000 gallons per year. Boiler K-6 fuel oil No. 6 consumption is limited to 75,423,600 gallons per year based on a daily average fuel consumption that is not to exceed 8,610 gallons per hour. The facility is a major source for new source review (NSR) pollutants and hazardous air pollutants (HAPs). Boiler K-6 startups are limited to 36 hours per occurrence and 600 hours per year. The Standard Industrial Classification Code for this facility is 4911 (Electrical Power Generation Through Combustion of Fossil Fuels).

1.2 The following modifications/revisions were proposed for the permit:

Modification	Status
Change the 8,610 gallon per hour daily average fuel limit (75,423,600 gallon per year) for Boiler K-6 to a 76,401,000 gallon per year fuel limit.	Applicant withdrew the modification
Increase the total combined hour limit for the black start diesel engine generators from 300 hours per year to 700 hours per year.	Applicant withdrew the modification
Move special conditions for black start diesel engine generators into a separate attachment from the boilers.	Made the change as requested
Proposed alternate operating scenario for boiler start-up operations that may range from 1 to 72 hours and occur up to 10 times per year.	Not considered an alternate operating scenario
Proposed alternate operating scenario for maintenance activities that include boiler soot blowing on an average between 175 and 675 minutes per day per boiler	Not considered an alternate operating scenario
Proposed an allowance to switch fuels not already listed in the permit for equipment as an alternate operating scenario.	Incorporated into permit as an alternate operating scenario.
Proposed an allowance to operate Boilers K-1 through K-6 as high as 110% of peak load during emergencies as an alternate operating scenario.	Incorporated into permit as an alternate operating scenario
Proposed burning 115,000 gallons per year specification used oil as an alternate operating scenario	Not considered an alternate operating scenario
Proposed the use of fuel additives as an alternate operating scenario	Incorporated into permit as an alternate operating scenario
Proposed temporary equipment replacement as an alternate operating scenario	Incorporated into permit as an alternate operating scenario
Incorporate a diluent CAP value for O ₂ and CO ₂ as applicable for CEMS servicing Boiler K-6	Made change as applicable

1.3 A site investigation of the Kahe Generating Station was performed on May 23, 2012. Pictures from the investigation are shown in Enclosure (1).

2. Applicable Requirements

- 2.1 Hawaii Administrative Rules (HAR)
 - Title 11 Chapter 59, Ambient Air Quality Standards
 - Title 11 Chapter 60.1, Air Pollution Control
 - Subchapter 1 - General Requirements
 - Subchapter 2 - General Prohibitions
 - 11-60.1.31 Applicability
 - 11-60.1-32 Visible Emissions
 - 11-60.1-38 Sulfur Oxides from Fuel Combustion
 - 11,60.1-39 Storage of Volatile Organic Compounds
 - Subchapter 5 - Covered Sources
 - Subchapter 6 - Fees for Covered Sources, Noncovered Sources, and Agricultural Burning
 - 11-60.1-111 Definitions
 - 11-60.1-112 General Fee Provisions for Covered Sources
 - 11-60.1-113 Application Fees for Covered Sources
 - 11-60.1-114 Annual Fees for Covered Sources
- 2.2 40 Code of Federal Regulations (CFR) Part 52, §52.21, Prevention of Significant Deterioration (PSD) of Air Quality is applicable to Boiler K-6. Prevention of Significant Deterioration (PSD) review applies to new major stationary sources and major modifications to these types of sources. This facility is a major stationary source as defined in the PSD regulations because the plant belongs to one of the source categories specified in §52.21.a (Fossil fuel-fired steam electric plants of more than 250 MMBtu per hour heat input) and maximum potential emissions of any regulated new source review (NSR) pollutant are above 100 TPY. Boiler K-6 was permitted under PSD permit HI 78-02.
- 2.3 40 CFR Part 52, §52.21, PSD of Air Quality is not applicable to Boiler K-1 through K-5 (built in 1961, 1963, 1969, 1970, and 1970, respectively) because the units are grandfathered from PSD and no changes have been proposed for the units that trigger PSD review.
- 2.4 40 CFR Part 60, New Source Performance Standards (NSPS), Subpart D, Standards of Performance for Fossil-Fuel-Fired Steam Generators is applicable to Boiler K-6 because the unit's capacity is greater than 73 MW (250 MMBtu/hr) and the unit commenced construction after August 17, 1971. The application indicates a January 26, 1978 equipment date for Boiler K-6. The following limits are specified in 40 CFR Part 60, Subpart D for Boiler K-6.

Boiler K-6, 40 CFR Part 60, Subpart D Limits	
Pollutant/Parameter	Emission and Opacity Limits ^{a,b}
PM	0.10 lb/MMBtu (arithmetic average of three contiguous one hour periods)
SO ₂	0.80 lb/MMBtu (arithmetic average of three contiguous one hour periods)
NO _x	0.30 lb/MMBtu (arithmetic average of three contiguous one hour periods)
Opacity (see note a)	20%, except for one six-minute period per hour of not more than 27%

a: Not specifically stated in Subpart D, however, emission limits are not considered applicable during startup, shutdown, and malfunction based on determinations made for other facilities subject to the standard.
 b: In accordance with 40 CFR §60.11, the opacity standards shall apply at all times, except during periods of startup, shutdown, and malfunction.

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- 2.5 40 CFR Part 60, NSPS, Subpart D, Standards of Performance for Fossil-Fuel-Fired Steam Generators is not applicable to Boilers K-1 through K-5 because the units were constructed prior to August 17, 1971.
- 2.6 40 CFR Part 60, NSPS, Subpart Da, Standards of Performance for Fossil-Fuel-Fired Steam Generating Units for Which Construction is Commenced After September 18, 1978 is not applicable to Boilers K-1 through K-6 because the units were constructed prior to September 18, 1978.
- 2.7 40 CFR Part 60, NSPS, Subpart Db, Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units is not applicable to Boilers K-1 through K-6 because the units were constructed prior to June 19, 1984.
- 2.8 40 CFR Part 60, NSPS, Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units does not apply to Boilers K-1 through K-6 because the units were constructed prior to 1989 and are above 100 MMBtu/hr in capacity.
- 2.9 The two (2) 2.5 MW black start diesel engine generators are not subject to 40 CFR Part 60, Subpart IIII, NSPS, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines because the engines were ordered prior to July 11, 2005 and manufactured prior to April 1, 2006. The application indicates that the black start diesel engine generators were manufactured in 1986.
- 2.10 Although Kahe Generating Station is a major source for hazardous air pollutant (HAPs), 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants (NESHAP), Subpart DDDDD for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters is not applicable to Boilers K-1 through K-6 because the boilers are electric utility steam generating units. Pursuant to 40 CFR §63.7491, boilers that are electric steam generating units are not subject to Subpart DDDDD. An electric utility steam generating unit means a fossil fuel fired combustion unit of more than 25 MW that serves a generator that produces electricity for sale.
- 2.11 40 CFR Part 63, Subpart JJJJJJ, National Emissions Standards for Hazardous Air Pollutants (NESHAPs) for Industrial, Commercial, and Institutional Boilers Area Sources is not applicable to the boilers because the boilers are not located at an area source of HAP emissions. The boilers are located at a major source of HAP emissions. Pursuant to 40 CFR §63.2, an area source means a stationary source of HAPs that is not a major source of HAPs.
- 2.12 40 CFR Part 63, Subpart UUUUUU, NESHAPs: Coal- and Oil-Fired Electric Utility Steam Generating Units is applicable to Boilers K-1 through K-6 because the units meet the definition of an electric utility steam generating unit (EGU). An EGU means any fossil fuel-fired combustion unit of more than 25 megawatts electric (MW_e) that serves a generator that produces electricity for sale. Electricity generated from steam supplied by the boilers is used for sale and each boiler's capacity is greater than 25 MW. Kahe Generating Station must comply with 40 CFR Part 63, Subpart UUUUUU no later than April 16, 2015.
- 2.13 The two (2) 2.5 MW black start diesel engine generators are not subject to 40 CFR Part 63, Subpart ZZZZ, NESHAPs for Stationary Reciprocating Internal Combustion Engines (RICE), except that the units must operate in accordance with

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§63.6640 (f)(2) of Subpart ZZZZ. If the black start diesel engine generators are not operated in accordance with 40 CFR §63.6649 (f)(2), the engines will not be considered an emergency engine and will need to meet all requirements for non-emergency engines.

2.14.1 The following emission limits were established for Boiler K-6 for startup periods pursuant to PSD review:

Pollutant	Basis	Limit	Compliance Method
		Startup	
NO _x	PSD Permit HI 78-02 and March 15, 1989 EPA letter amending the permit to change emissions limit from 0.23 lb/MMBtu to 0.30 lb/MMBtu	0.30 lb/MMBtu	CEMS and Method 7

2.14.2 The following PSD emission limits were established for operating Boiler K-6, except for the NO_x emissions limit during boiler startup:

Pollutant	Basis	Limit	Compliance Method
		Other Than Startup	
NO _x	PSD Permit HI 78-02	0.23 lb/MMBtu	CEMS and Method 7
SO ₂	PSD Permit HI 78-02	0.53 lb/MMBtu	Method 6
PM	PSD Permit HI 78-02	0.10 lb/MMBtu	COMS and Method 5

2.14.3 The following table summarizes Subpart D emission limits, PSD emission limits, permit limits, and explanations for selecting permit emission limits for Boiler K-6:

Pollutant		Subpart D Limit ^a	PSD Limit	Permit Limit	Reason for Permit Limit
NO _x	3-hour Startup	0.30 lb/MMBtu	0.30 lb/MMBtu	0.30 lb/MMBtu	PSD Permit HI 78-02 and March 15, 1989 EPA letter revising
NO _x	3-hour Periods other than startup	0.30 lb/MMBtu	0.23 lb/MMBtu (see note b)	0.23 lb/MMBtu	PSD limit is more stringent than NSPS limit
SO ₂	3-hour	0.80 lb/MMBtu	0.53 lb/MMBtu (see note b)	0.53 lb/MMBtu	PSD limit is more stringent than NSPS limit
PM	3-hour	0.10 lb/MMBtu	0.10 lb/MMBtu (see note b)	0.10 lb/MMBtu	Limits required by NSPS and PSD

a: Not specifically stated in Subpart D, however, emission limits are not considered applicable during startup, shutdown, and malfunction based on determinations made for other facilities subject to the standard.

b: PSD permit conditions do not exclude start-up, shutdown, and malfunction from the emission limits.

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2.15 The following table summarizes Subpart D and HAR opacity limits, and explanations for selecting permit opacity limits for Boilers K-1 through K-6 and black start diesel engine generators A and B:

Boiler	Subpart D Opacity Limit	HAR Opacity Limit ²	Permit Opacity Limit	Reason for Permit Limit
K-1 through K-4 Other than startup, shutdown, and malfunction	-----	40%	40%	HAR §11-60.1-32(a) for sources operating before March 21, 1972
K-1 through K-4 Startup, shutdown, and malfunction	-----	not more than 60% for more than six minutes in any sixty minute period	not more than 60% for more than six minutes in any sixty minute period	HAR §11-60.1-32(a)
K-5 Other than startup, shutdown, and malfunction	-----	20%	20%	HAR §11-60.1-32(b) for sources operating after March 20, 1972
K-5 Startup, shutdown, and malfunction	-----	not more than 60% for more than six minutes in any sixty minute period	not more than 60% for more than six minutes in any sixty minute period	HAR §11-60.1-32(b)
K-6 Other than startup, shutdown, and malfunction	20%, except for one six minute period of not more than 27%	20%	20%	HAR §11-60.1-32(b) is more stringent than Subpart D
K-6 Startup, shutdown, and malfunction	-----	not more than 60% for more than six minutes in any sixty minute period	not more than 60% for more than six minutes in any sixty minute period	HAR §11-60.1-32(b)
A Other than startup, shutdown, and malfunction	-----	20%	20%	HAR §11-60.1-32(b)
B Startup, shutdown, and malfunction	-----	not more than 60% for more than six minutes in any sixty minute period	not more than 60% for more than six minutes in any sixty minute period	HAR §11-60.1-32(b)

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2.16 Specification used oil requirements for Boilers K-1 through K-4 are listed as follows:

Constituent/Property	Allowable Limit
Sulfur	≤ 0.5 % by weight
Arsenic	≤ 5 ppm
Cadmium	≤ 2 ppm
Chromium	≤ 10 ppm
Lead	≤ 100 ppm
Total Halogens	≤ 1,000 ppm
Flash Point	≥ 100 °F
PCBs	< 2 ppm

2.17 The purpose of Compliance Assurance Monitoring (CAM) is to provide reasonable assurance that compliance is being achieved with large emission units that rely on air pollution control device equipment to meet an emissions limit or standard. Pursuant to 40 CFR Part 64, for CAM to be applicable, the emissions unit must: (1) be located at a major source; (2) be subject to an emissions limit or standard; (3) use a control device to achieve compliance; (4) have potential pre-control emissions that are greater than the major source level; and (5) not otherwise be exempt from CAM. Although the Boiler K-6 relies on a Low NO_x burner to achieve compliance with the NO_x standards (40 CFR Part 60, Subpart D and the BACT emission limits for NO_x) and has potential pre-control emissions greater than the major source level for NO_x, CAM is not applicable because a continuous emission monitoring system (CEMS) is used to determine compliance with the NO_x emission limits. Also, low NO_x burners are not considered a control device as defined in §64.1 of the CAM regulation. There are no emission limits specified for the other boilers and black start diesel engine generators. Therefore, CAM is not applicable.

2.18 Annual emissions reporting is required because this facility is a covered source.

2.19 The consolidated emissions reporting rule (CERR) applies. The NO_x emissions from the facility exceed the following reporting levels in 40 CFR §51, Subpart A for type A sources:

CERR APPLICABILITY			
Pollutant	Facility Emissions	CERR Triggering Levels (TPY)	
		1 year cycle (type A sources)	3 year cycle (type B sources)
PM ₁₀	2,870.6	≥ 250	≥ 100
SO ₂	15,204.2	≥ 2,500	≥ 100
NO _x	21,711.9	≥ 2,500	≥ 100
VOC	164.6	≥ 250	≥ 100
CO	8,619.9	≥ 2,500	≥ 1,000

2.20 A best available control technology (BACT) analysis is not required because there are no modifications proposed for the facility that increase emissions.

2.21 The facility is not a synthetic minor source because it is already a major source.

2.22 The facility is subject to the greenhouse gas (GHG) reporting requirements specified in 40 CFR Part 98 because the total greenhouse gas emissions on a CO₂ equivalent (CO₂e) basis are greater than 25,000 metric tons per year. The GHG emissions for permitted equipment are shown in Paragraph 6.4. The CO₂e emissions determined in

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metric tons from the global warming potential (GWP) of each GHG are shown in the table below.

Biogenic and Non-Biogenic GHG Emissions			
GHG	GWP	GHG Mass-Based Emissions (metric tons/yr)	CO ₂ e Based Emissions
carbon dioxide (CO ₂)	1	4,213,109	4,213,109
Methane (CH ₄)	21	168	3,528
Nitrous Oxide (N ₂ O)	310	34	10,540
Total→			4,227,177

3. Insignificant Activities

3.1 Insignificant activities identified by the applicant that meet the exemption criteria specified in HAR§11-60.1-82(f) are listed as follows:

- a. Diesel storage tank servicing a 107.5 hp air compressor is exempt in accordance with HAR, §11-60.1-82(f)(1);
- b. Two (2) 4,700 gallon used lube oil tanks servicing Boilers K-1 through K-4 is exempt in accordance with HAR,§11-60.1-82(f)(1);
- c. 5,581 gallon used lube oil tank servicing Boilers K-5 and K-6 is exempt pursuant to HAR, §11-60.1-82(f)(1);
- d. 1,745 gallon diesel tank for boiler igniter fuel is exempt pursuant to HAR, §11-60.1-82(f)(1);
- e. 7,000 gallon diesel tank for boiler igniter fuel is exempt pursuant to HAR, §11-60.1-82(f)(1);
- f. 3,750 gallon diesel tank for boiler igniter fuel is exempt pursuant to HAR, §11-60.1-82(f)(1);
- g. 440 gallon diesel tank for fire pump pursuant to HAR, §11-60.1-82(f)(1);
- h. 12,000 gallon diesel tank for black start diesel engine generators in accordance with HAR, §11-60.1-82(f)(1);
- i. 1,150 gallon propane tank HAR, §11-60.1-82(f)(1);
- j. 2,000 gallon propane tank HAR, §11-60.1-82(f)(1);
- k. 1,000 gallon propane tank HAR, §11-60.1-82(f)(1);
- l. 100 kW Roline LPG fired emergency generator HAR, §11-60.1-82(f)(1) ;
- m. 170 kW Waukesha LPG fired emergency generator HAR, §11-60.1-82(f)(1) ;
- n. 100 kW Cummins emergency diesel engine generator HAR, §11-60.1-82(f)(1);
- o. 107 hp Isuzu air compressor diesel engine HAR, §11-60.1-82(f)(1);
- p. Paint spray booths; HAR, §11-60.1-82(f)(6);
- q. 96,421 barrel fuel oil No. 6 Tank No. 11 are considered exempt in accordance with HAR, §11-60.1-82(f)(7);
- r. 96,421 barrel fuel oil No. 6 Tank No. 12 is considered exempt in accordance with HAR, §11-60.1-82(f)(7);
- s. 151,318 barrel fuel oil No. 6 Tank No. 13 is considered exempt pursuant to HAR, §11-60.1-82(f)(7);
- t. 151,318 barrel fuel oil No. 6 Tank No. 14 is considered exempt pursuant to HAR, §11-60.1-82(f)(7);
- u. 91,140 gallon fuel oil No. 6 test tank is considered exempt in accordance with HAR, §11-60.1-82(f)(7); and
- v. Fugitive leaks from valves, flanges, pump seals, and VOC water separators are considered exempt in accordance with HAR, §11-60.1-82(f)(7); and

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- w. Gasoline dispensing operations are considered exempt pursuant to HAR, §11-60.1-82(f)(7).

4. Alternate Operating Scenarios

- 4.1 The following alternate operating scenarios were incorporated into the permit:
- a. Upon receiving written approval from the Department of Health, the permittee may replace the boilers and black start diesel engine generators with an equivalent temporary replacement unit with equal or lesser emissions in the event of a failure or major overhaul of the equipment. The installation and operation of the temporary replacement unit shall not exceed twelve (12) consecutive months.
 - c. Upon receiving written approval from the Department of Health, the permittee may fire Boilers K-1 through K-5 on an alternate fuel (e.g., but not limited to biofuel) if the boilers were capable of accommodation the fuel and burning the fuel does not cause a modification as defined in any applicable federal or state regulation (e.g., PSD, NSPS, NESHAP, and HAR).
 - d. The permittee may operate the boilers up to 110% of peak load for emergency load conditions, if equipment malfunction such as a sudden loss of a unit occurs. The time period of this operation shall not exceed 30 minutes in duration, and shall not exceed the maximum permitted emission limits. The reason for operating above peak load shall be clearly documented, with the event's date, time, duration, operating load, and resulting emission rates.
 - e. Upon receiving written approval from the Department of Health, the permittee may use specific fuel additives to control algae, lubricity, improve combustion, inhibit corrosion or other reasons.

5. Air Pollution Control

- 5.1 Boiler K-6 is equipped with low-NO_x burners that precisely control the mixing of fuel and air to control NO₂ emissions.

6. Project Emissions

- 6.1 Boiler emissions of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds VOCs, particulate matter (PM), particulate matter less than ten (10) microns in diameter (PM₁₀), particulate matter less than 2.5 microns in diameter (PM_{2.5}), sulfur dioxide (SO₂), sulfuric acid (H₂SO₄), and hazardous air pollutants (HAPs) were evaluated. The NO_x, CO, VOC, PM, PM₁₀, and PM_{2.5} emissions were based on AP-42 emissions factors from Section 1.3 (5/10), Fuel Oil Combustion. A heating value of 152,000 Btu/gal was assumed for fuel oil No. 6 to convert emission factors from lb/1,000 gal to lb/MMBtu. Emission estimates were based on emission factors or firing fuel oil No. 6 as worst-case scenario. A mass balance calculation was used to determine SO₂ emissions based on the maximum allowable fuel sulfur content of 0.5% by weight for fuel oil No. 6, a fuel oil No. 6 heating value 18,847 Btu/lb, and each boiler's maximum heat rate input. The AP-42 emission factors used to estimate emissions from the boilers were increased by a factor of safety, except for those to determine PM, NO_x, and SO₂ from Boiler K-6. For Boiler K-6, the PM, NO_x, and SO₂ emission rates were based on BACT emission limits specified in PSD permit HI 78-02. The H₂SO₄ emission rate was based on the information from source testing that indicated H₂SO₄ emissions are proportional to 13.12% of the SO₂ emission rate. It was assumed that 45% of the total particulate was PM_{2.5} and 79% of the total particulate was PM₁₀ based on AP-42, Appendix B.2, Table B.2-2 (Page B.2-12) for boilers

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firing a mixture of fuel including petroleum. For Boiler K-6, a 75,423,600 fuel limit was applied to determine the ton per year emissions. The HAP emissions were based on AP-42 emission factors from either 1994 Waiiau 7 test data or the EPRI PISCES Air Toxic Data Base. Emissions are estimated in Enclosures (2) and (3) and summarized in the tables below.

92 MW (903 MMBtu/hr) Boiler Emissions (Unit K-1)			
Pollutant	Boiler Emissions		Boiler Emissions (TPY)
	lb/hr	g/s	8,760 hr/yr operation
SO ₂	478.700	60.442	2,096.7
H ₂ SO ₄	62.805	7.930	275.1
NO _x	1,084.503	136.932	4,750.1
CO	278.124	35.117	1,218.2
VOC	-----	-----	27.7
PM	50.568	6.385	221.5
PM ₁₀	39.949	5.044	175.0
PM _{2.5}	22.756	2.873	99.7
HAPs	-----	-----	5.5
Cadmium	-----	-----	0.009
Chromium	-----	-----	0.002
Lead	-----	-----	0.021
Manganese	-----	-----	0.088
Mercury	-----	-----	0.020
Nickel	-----	-----	5.1

90 MW (900 MMBtu/hr) Boiler Emissions (Unit K-2)			
Pollutant	Boiler Emissions		Boiler Emissions (TPY)
	lb/hr	g/s	8,760 hr/yr operation
SO ₂	495.104	62.513	2,168.6
H ₂ SO ₄	64.958	8.202	284.5
NO _x	738.000	93.182	3,232.4
CO	277.200	35.000	1,214.1
VOC	-----	-----	27.6
PM	50.400	6.364	220.8
PM ₁₀	39.816	5.027	174.4
PM _{2.5}	22.680	2.864	99.3
HAPs	-----	-----	5.5
Cadmium	-----	-----	0.009
Chromium	-----	-----	0.002
Lead	-----	-----	0.021
Manganese	-----	-----	0.087
Mercury	-----	-----	0.020
Nickel	-----	-----	5.1

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92 MW (892 MMBtu/hr) Boiler Emissions (Unit K-3)			
Pollutant	Boiler Emissions		Boiler Emissions (TPY)
	lb/hr	g/s	8,760 hr/yr operation
SO ₂	490.703	61.957	2,149.3
H ₂ SO ₄	64.380	8.129	282.0
NO _x	602.992	76.135	2,641.1
CO	274.736	34.689	1,203.3
VOC	-----	-----	19.5
PM	139.152	17.570	609.5
PM ₁₀	109.930	13.880	481.5
PM _{2.5}	62.681	7.906	274.3
HAPs	-----	-----	5.4
Cadmium	-----	-----	0.009
Chromium	-----	-----	0.002
Lead	-----	-----	0.021
Manganese	-----	-----	0.086
Mercury	-----	-----	0.020
Nickel	-----	-----	5.1

93 MW (918 MMBtu/hr) Boiler Emissions (Unit K-4)			
Pollutant	Boiler Emissions		Boiler Emissions (TPY)
	lb/hr	g/s	8,760 hr/yr operation
SO ₂	505.006	63.763	2,211.9
H ₂ SO ₄	66.257	8.366	290.2
NO _x	582.012	73.486	2,549.2
CO	282.744	35.700	1,238.4
VOC	-----	-----	28.1
PM	51.408	6.491	908.7
PM ₁₀	40.612	5.128	717.9
PM _{2.5}	23.134	2.921	408.9
HAPs	-----	-----	5.4
Cadmium	-----	-----	0.009
Chromium	-----	-----	0.002
Lead	-----	-----	0.021
Manganese	-----	-----	0.091
Mercury	-----	-----	0.020
Nickel	-----	-----	5.1

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142 MW (1,468 MMBtu/hr) Boiler Emissions (Unit K-5)			
Pollutant	Boiler Emissions		Boiler Emissions (TPY)
	lb/hr	g/s	8,760 hr/yr operation
SO ₂	807.569	101.966	3,537.2
H ₂ SO ₄	105.953	13.378	464.1
NO _x	1,648.564	208.152	7,220.7
CO	452.144	57.089	1,980.4
VOC	-----	-----	32.6
PM	251.028	31.695	1,099.5
PM ₁₀	198.312	25.039	868.6
PM _{2.5}	112.963	14.263	494.8
HAPs	-----	-----	9.0
Cadmium	-----	-----	0.015
Chromium	-----	-----	0.002
Lead	-----	-----	0.034
Manganese	-----	-----	0.142
Mercury	-----	-----	0.032
Nickel	-----	-----	8.4

142 MW (1,516 MMBtu/hr) Boiler Emissions (Unit K-6)				
Pollutant	Boiler Emissions		Boiler Emissions (TPY)	
	lb/hr	g/s	75,423,600 gal/yr fuel limit	No Limits
SO ₂	803.480	101.449	3,038.1	3,519.3
H ₂ SO ₄	105.417	13.310	398.1	461.2
NO _x	348.680	44.025	1,318.4	1,527.2
CO	466.928	58.956	1,765.5	2,045.1
VOC	-----	-----	29.1	33.7
PM	151.600	19.141	573.2	664.0
PM ₁₀	119.764	15.122	452.8	524.5
PM _{2.5}	68.220	8.614	257.9	298.8
HAPs	-----	-----	9.0	10.4
Cadmium	-----	-----	0.015	0.017
Chromium	-----	-----	0.002	0.002
Lead	-----	-----	0.034	0.039
Manganese	-----	-----	0.142	0.164
Mercury	-----	-----	0.032	0.037
Nickel	-----	-----	9.0	10.4

6.2 Black start diesel engine generator emissions of nitrogen oxides (NO_x), carbon monoxide (CO), volatile organic compounds VOCs, particulate matter (PM), particulate matter less than ten (10) microns in diameter (PM₁₀), particulate matter less than 2.5 microns in diameter (PM_{2.5}), sulfur dioxide (SO₂), sulfuric acid (H₂SO₄), and hazardous air pollutants (HAPs) were evaluated. The NO_x, CO, VOC, PM, PM₁₀, and PM_{2.5} emissions were based on AP-42 emissions factors from Section 3.4 (10/96), Fuel Oil Combustion. The emission factors were increased by a factor of safety. A mass balance calculation was used to

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determine SO₂ emissions based on the maximum allowable fuel sulfur content of 0.5% by weight for fuel oil No. 2, a fuel oil No. 2 heating value 19,372 Btu/lb, and each diesel engine generator's maximum heat rate input of 30.5 MMBtu/hr. The H₂SO₄ emission rate was based on the information from source testing that indicated H₂SO₄ emissions are proportional to 13.12% of the SO₂ emission rate. It was assumed that 90% of the total particulate was PM_{2.5} and 96% of the total particulate was PM₁₀ based on AP-42, Appendix B.2, Table B.2-2 for gasoline and diesel fired internal combustion engines. A total combined operating limit of 300 hours per year was assumed for the black start diesel engine generators. The HAP emissions were estimated with AP-42 emission factors from Section 3.4 (Table 3.4-3) and Section 3.1 (Table 3.1-5). Emissions are shown in Enclosure (4) and summarized below.

2.5 MW (30.5 MMBtu/hr) Black Start Diesel Engine Generator Emissions (Units A & B)				
Pollutant	Engine Emissions (two units)		Boiler Emissions (TPY)	
	lb/hr	g/s	300 hr/yr limit (both units)	No Limits
SO ₂	31.489	0.004	2.4	140.2
H ₂ SO ₄	4.355	0.001	0.3	17.5
NO _x	245.830	0.031	18.4	1,074.6
CO	98.820	0.012	7.4	432.2
VOC	-----	-----	1.1	64.2
PM	5.551	0.001	0.4	23.4
PM ₁₀	5.307	0.001	0.4	23.4
PM _{2.5}	5.002	0.001	0.4	23.4
HAPs	-----	-----	0.024	1.4
Cadmium	-----	-----	2.20E-05	0.001
Chromium	-----	-----	5.03E-05	0.003
Lead	-----	-----	6.41E-05	0.004
Manganese	-----	-----	3.61E-03	0.211
Mercury	-----	-----	5.49E-06	0.0003
Nickel	-----	-----	2.10E-05	0.001

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6.3 Total yearly emissions from operating the plant are listed below as follows:

TOTAL EMISSIONS				
Pollutant	Potential Emissions (TPY)			
	Diesel Engines	Boilers	All Units	All Units
	Limited	Limited Boiler K-6 No Limits - Boilers K-1 to K-5	Limited – Boiler K-6 No Limits - Boilers K-1 to K-5 Limited - Diesel Engines	No Limits
SO ₂	2.4	15,201.8	15,204.2	15,823.2
H ₂ SO ₄	0.3	1,994.0	1,994.3	2,074.6
NO _x	18.4	21,711.9	21,730.3	22,995.3
CO	7.4	8,619.9	8,627.3	9,331.7
VOC	1.1	164.6	165.7	233.4
PM	0.4	3,724.0	3,633.6	3,747.4
PM ₁₀	0.4	2,870.2	2,870.6	2,965.3
PM _{2.5}	0.4	1,675.8	1,676.2	1,699.2
HAPs	0.020	39.8	39.8	42.6
Cadmium	2.20E-05	0.068	0.068	0.069
Chromium	5.03E-05	0.012	0.012	0.015
Lead	6.41E-05	0.152	0.152	0.161
Manganese	3.61E-03	0.636	0.640	0.869
Mercury	5.49E-06	0.144	0.144	0.149
Nickel	2.10E-05	37.8	37.8	39.2

6.4 Total GHG emissions from Boilers K-1 through K-6 and Black Start Diesel Engine Generators A and B were determined by the applicant with emission factors from 40 CFR Part 98, Subpart C, Tables C-1 and C-2. The GHG emissions are summarized in the table below.

SIX BOILERS AND TWO BLACK START DIESEL ENGINE GENERATORS			
	Emission TPY ^a		
	Carbon Dioxide (CO ₂)	Methane (CH ₄)	Nitrous Oxide (N ₂ O)
Boiler K-1	654,971	26.1	5.2
Boiler K-2	652,795	26.1	5.2
Boiler K-3	646,993	25.8	5.2
Boiler K-4	665,851	26.6	5.3
Boiler K-5	1,064,782	42.5	8.5
Boiler K-6	957,972	38.3	7.6
Diesel Engine Generator A	373	----	----
Diesel Engine Generator B	373	----	----
Total GHG Emissions	4,644,110	185	37

a: Emissions are in short tons per year.

7. Air Quality Assessment

7.1 There are no changes proposed for the facility that increase emissions. Therefore, an air modeling assessment was not performed.

8. Significant Permit Conditions

8.1 Except as specified in the permit for fuel fired by the igniters, Boilers K-1 through K-4 shall be fired only on one or a combination of the following fuels:

- a. Fuel oil No. 6 with a maximum sulfur content not to exceed 0.5% by weight; and
- b. Specification used oil meeting requirements specified in the permit that will be verified by laboratory analysis.

8.2 Except as specified in the permit for fuel fired by the igniters, Boilers K-5 and K-6 shall be fired only on fuel oil No. 6 with a maximum sulfur content not to exceed 0.5% by weight.

Reason for 8.1 and 8.2: These are fuels that were proposed by the applicant for operating the boilers. The fuel sulfur content limits were used in the modeling assessments that showed compliance with the ambient air quality standards for SO₂.

8.3 The total combined fuel oil No. 6 and fuel oil No. 2 fired by Boiler K-6 shall not 8,610 gallons per hour based on the unit's daily maximum average fuel consumption.

Reason for 8.3: The 8,610 gallon per hour firing rate limit for Boiler K-6 was specified for complying with the ambient air quality standards for SO₂. According to the previous permit application review, the firing rate limit in conjunction with stack height increases for Boilers K-1 through K-4 and a 0.5% maximum fuel oil No. 6 fuel sulfur content limit, results in compliance with the SO₂ ambient air quality standards.

8.4 The total combined specification used oil fired by Boilers K-1 through K-4 shall not exceed 115,000 gallons in any rolling twelve-month (12-month) period.

Reason for 8.4: This limit was proposed by the applicant for firing specification used oil in Boilers K-1 through K-4 only.

8.5 Boiler K-6 start-ups shall not exceed thirty-six (36) hours per occurrence and shall exclude the time when the boiler is not combusting fuel.

8.6 The total combined start-up duration for Boiler K-6 shall not exceed six hundred (600) hours in any rolling twelve-month (12-month) period.

8.7 A start-up period is when the first boiler igniter is lighted until the boiler's subsystems are brought online and stability is attained for normal operation; or when the boiler is initially brought up to thirty-two percent (32%) load (45 MW) whichever occurs first.

8.8 The maximum heat input rate shall not exceed 433.5 MMBtu/hr over any rolling three (3) hour average during Boiler K-6 start-ups.

Reason for 8.5 through 8.8: These limits were proposed for Boiler K-6 startups. The heat input rate limit of 433.5 MMBtu/hr, together with the 600 hr/yr operating limit, restricts NO_x to below the 40 ton per year PSD emissions threshold that would require a BACT review. A data acquisition system will be used to measure operating parameters during Boiler K-6 startup periods to determine compliance with the permit conditions.

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8.9 Incorporate PSD emission limits for Boiler K-6 for NO_x, SO₂, and PM.

Reason for 8.9: Incorporate pursuant to Paragraphs 2.14.1 and 2.14.2 of this permit application review. A CEMS will be operated to measure and record the NO_x emission rates. The sulfur content of the fuel burned by the boilers will be monitored to ensure compliance with the SO₂ limits. Annual source testing is specified for Boiler K-6 to determine compliance with the emission limits for NO_x, SO₂, and PM.

8.10 Specify 40 CFR Part 60, Subpart D, requirements for Boiler K-6 that includes:

- a. Emission limits for NO_x, SO₂, and PM that do not apply during startup, shutdown, and malfunction;
- b. Opacity limits that don't apply during startup shutdown and malfunction;
- c. CEMS monitoring for NO_x;
- d. SO₂ emissions monitoring by fuel sampling and analysis in place of CEMS;
- e. COMS monitoring for opacity; and
- f. Source testing requirements for NO_x, SO₂, PM, and opacity.

Reason for 8.10: Incorporate pursuant to Paragraph 2.4 of the permit application review.

8.11 Incorporate alternate operating scenario that would allow the permittee to switch fuels for Boilers K-1 through K-5.

Reason for 8.11: Boilers K-1 through K-5 were installed prior to 1975 and may burn an alternate fuel without triggering a permit modification in accordance with state and federal regulations. Pursuant to 40 CFR §52.21(b)(1)(iii), use of an alternative fuel does not cause a modification if the source was capable of accommodating the fuel before January 6, 1975. Additionally, if a boiler was in existence prior to the date of other federal regulations, such as NSPS, and was always capable burning the fuel, a modification may not be triggered. Also, Pursuant to HAR §11-60.1-81, an increase in the emissions of any air pollutant above permitted emission limits would be a significant modification.

8.12 Specify 40 CFR Part 63, Subpart UUUUUU requirements for Boilers K-1 through K-6 that must be met by April 16, 2015.

Reason for 8.12: Incorporate pursuant to Paragraph 2.12 of the permit application review.

8.13 Incorporate requirements from §63.6649 of 40 CFR Part 63, Subpart ZZZZ for the black start diesel engine generators.

Reason for 8.13: Incorporate pursuant to Paragraph 2.13 of the permit application review.

8.14 Specify opacity limits for Boilers K-1 through K-6 and Black Start Diesel Engine Generators A and B.

Reason for 8.14: Incorporate pursuant to Paragraph 2.15 of the permit application review.

8.15 The black start diesel engine generators shall be fired only on fuel oil No. 2 with a maximum sulfur content not to exceed 0.5% by weight.

8.16 The total combined operating hours of the black start diesel engine generators shall not exceed three hundred (300) hours in any rolling twelve-month (12-month) period.

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Reason for 8.15 and 8.16: These limits were proposed by the applicant. The 300 hour per year operating limit results in NO_x emissions that are below the BACT emissions threshold of forty (40) tons per year. Exceeding the threshold would require a BACT review.

9. Conclusion and Recommendation:

Maximum potential emissions were based on boilers and black start diesel engine generators operating at maximum nominal capacity. Actual capacity of the units will vary depending on operating load. Boiler K-6 is equipped with low-NO_x burners to reduce NO_x emissions. A CEMS is operated for Boiler K-6 to determine whether or not compliance is being achieved with the PSD emission limits for NO_x. Performance testing is specified for Boiler K-6 to determine if compliance is being achieved with the NO_x, SO₂, and PM emission limits. Boilers K-5 and K-6 are equipped with COMSs to monitor opacity. Performance testing is also specified for Boiler K-6 to determine if opacity limits were met. Recommend issuance of the covered source permit subject to the significant permit conditions, thirty-day (30-day) public comment period, and forty-five-day (45-day) review by EPA.

Mike Madsen, July 16, 2012