

COVERED SOURCE RENEWAL APPLICATION REVIEW

File No: 0424-03 / CSP No. 0424-01-C

Applicant: U.S. Navy Public Works Center (PWC) Pearl Harbor

Facility: U.S. Navy Public Works Center Red Hill Water Pumping Station
Red Hill Water Pumping Station
Pearl Harbor, HI 96818
Zone 4, 613,010 m East, 2,363,775 m North (Old Hwn)

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SICC 4941 (Water Supply)

Equipment Description:

One (1) 2.0 MW (2,682 HP) Allison Gas Turbine Generator, Model No. 501-KA, Unit No. TG897. Fired on JP-5 with maximum firing rate of 235 gal/hr, maximum sulfur content not to exceed 0.2% by weight.

Exact manufacture date is not known, however per a blueprint (copy) in file A-1044 (and similar files for other navy turbine(s)), the date of the original blueprint was 1974 and the final as built date was listed as 1978 (on the same blueprint), so we can conservatively use 1978 as the constructed date. The Navy received the combustion turbines from California in the early 1990's.

Standard Identification Classification Code (SICC) 4941, Water Supply - Est. primarily engaged in distributing water for sale for domestic, commercial, and industrial use.

Air Pollution Controls:

The JP-5's sulfur content will not to exceed 0.2% by weight to minimize sulfur dioxide emissions. There are no add-on air pollution controls

Proposed Project:

This permit renewal will allow the continued use of an electrical combustion gas turbine generator. The generator is used strictly for emergency/standby purposes in the event of electrical power outage(s) at the Red Hill Water Pumping Station. The generator also operates during periods of equipment testing and maintenance.

The turbine generator is limited to an annual fuel consumption limit of 329,000 gallons per year (based on 1,400 hr/yr operation and max. fuel consumption rate of 235 gal/hr = 329,000 gal/yr). Compliance is verified by non-resettable fuel meters on the supply and return fuel lines.

Applicable Requirements:

Hawaii Administrative Rules (HAR)

Chapter 11-59, Ambient Air Quality Standards

Chapter 11-60.1, 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

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

Subchapter 8, Standards of Performance for Stationary Sources

11-60.1-161 New Source Performance Standards

New Source Performance Standards (NSPS)

40 Code of Federal Regulations (CFR) Part 60 - Standards of Performance for New Stationary Sources

- Subpart A - General Provisions; and
- Subpart GG, Standards of Performance for Stationary Gas Turbines.

The 2.0 MW gas combustion turbine generator is a “new source” (manufactured after trigger date of October 3, 1977) and is thus subject to NSPS.

Non-Applicable Requirements:

Consolidated Emissions Reporting Rule (CERR) as defined by 40 CFR Part 51, Subpart A - Emissions Inventory Reporting Requirements, determines CER based on the emissions of each air pollutant from any point source (facility, as defined in Part 51) that emits at the CER triggering levels as shown in the following table:

Pollutant	2 MW Comb. Turbine (tpy)	CER Trig. Levels Type B (tpy)	In-house Total Facility Trig. Levels (tpy)
NOx	14.95	100	25
SOx	4.05	100	25
CO	10.78	1000	250
PM10	2.10	100	25
VOC	0.50	100	25
Pb	N/A	5	25

PROPOSED

This facility does not emit pollutants that exceed either CER or in-house triggering levels. Therefore, no emissions reporting is required for the facility.

National Emissions Standards for Hazardous Air Pollutants (NESHAP) is not applicable since this facility is not a major source of hazardous air pollutants and there are no standards for combustion turbines or their emissions of HAPs as specified in 40 CFR Part 61 & 63.

Maximum Achievable Control Technology (MACT) is not applicable since this source is not a major source of Hazardous Air Pollutants (HAPs).

Prevention of Significant Deterioration (PSD) is not applicable because this source is not a major stationary source.

Best Available Control Technology (BACT) review is not required since the facility is an existing source and is not proposing any permit changes that would increase emissions.

Synthetic Minor Applicability: A synthetic minor source is a facility that is potentially major (as defined in HAR 11-60.1-1), but is made non-major through federally enforceable permit conditions. This facility is not a synthetic minor because emissions would not exceed major source thresholds even when operating at 8,760 hr/yr.

Compliance Assurance Monitoring (CAM): The purpose of Compliance Assurance Monitoring (CAM) is to provide a reasonable assurance that compliance is being achieved with large emissions units that rely on air pollution control device equipment to meet an emissions limit or standard. Pursuant to 40 Code of Federal Regulations, 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 precontrol emissions that are 100% of the major source level; and (5) not otherwise be exempt from CAM. CAM is not applicable to the emissions unit because the facility is not a major source and the unit does not have potential pre-control emissions that are 100% of the major source level.

Insignificant Activities:

The following were listed as insignificant activities by the applicant:

- One (1) 250 kW emergency diesel engine generator, per HAR §11-60.1-82(f)(5);
- One (1) 100 gallon diesel no. 2 storage tank, per HAR §11-60.1-82(f)(1); and
- One (1) 5,000 gallon JP-5 fuel storage tank, per HAR §11-60.1-82(f)(1).

Alternative Operating Scenarios:

Applicant requests the alternate scenario of replacing the combustion turbine generator with a temporary replacement unit of same or smaller size with emissions rates as low or lower than the existing unit, if any repair work reasonably warrants removal.

Project Emissions:

The combustion turbine generator will produce criteria pollutants with the major pollutant being Nitrogen Oxides (NO_x) emissions. The projected emissions are based on a maximum fuel firing rate of 235 gal/hr and an annual fuel limitation of 329,000 gal/yr (operational limitation of 1,400 hr/yr).

Since there are no AP-42 emission factors for JP-5 fuel combustion in combustion turbines, emission rates/factors were derived from the following:

PROPOSED

1. CO (15.4 lb/hr) is based on actual stack performance testing of identical units at the Pearl Harbor Naval Complex (ref. 1992 stack test in file A-956).
2. NO_x, VOC, and PM₁₀ (21.36 lb/hr, 0.72 lb/hr, and 3.0 lb/hr) are based on manufacturer's estimates. All PM emissions are assumed to be PM₁₀ emissions.
3. SO₂ (5.79 lb/hr) is based on the mass balance calculation assuming that all sulfur in the fuel will convert to SO₂. The maximum sulfur content of the JP-5 will be 0.2% by weight. Per AP-42 Appendix A, gasoline density is 6.17 lb/gal. Therefore, from the mass balance equation:

SO₂ mass balance based on JP-5 with maximum sulfur content of 0.2% by weight:
 235 gal/hr x 6.17 lb/gal x 0.002 = 2.8999 lb S / hour
 S + O₂ → SO₂ (1:1 molar ratio for S:SO₂)
 SO₂ (lb/hr) = MW SO₂/MW S x S (lb/hr) = 64.06/32.06 x 2.8999 = 5.79 lb SO₂/hr.

HAP emission factors were not included in manufacturer's data, so conservative AP-42 emission factors for Stationary Gas Turbines For Electricity Generation (Table 3.1-4) firing distillate oil, was used for estimating HAPs emissions, as follows (assumes heat input rate of 8,000 BTU/hp-hr), thus
 8,000 BTU/hp-hr x 2,682 hp x 1,400 hr/yr = 30,038 MMBTU/yr:

Hazardous Air Pollutant Emission Calculations

HAP	EF (lb/MMBTU)	Heat Input (MMBTU/yr)	Emissions (lb/yr)	Emissions (tpy)
Antimony	2.2E-05	30,038	0.66	0.00033
Arsenic	4.9E-06	30,038	0.15	0.00008
Beryllium	3.3E-07	30,038	0.01	0.00001
Cadmium	4.2E-06	30,038	0.13	0.00007
Chromium	4.7E-05	30,038	1.41	0.00071
Cobalt	9.1E-06	30,038	0.27	0.00014
Lead	5.8E-05	30,038	1.74	0.00087
Manganese	3.4E-04	30,038	10.21	0.00511
Mercury	9.1E-07	30,038	0.03	0.00002
Nickel	0.0012	30,038	36.05	0.01803
Phosphorus	0.0003	30,038	9.01	0.00451
Selenium	5.3E-06	30,038	0.16	0.00008
Total HAPs				0.02996

Emissions from the Gas Combustion Turbine at Red Hill Water Pumping Station

Pollutant	Emission Factor(lb/hr)	Emissions @ 1,400 hr/yr (TPY)	Emissions @ 8,760 hr/yr (TPY)
SO ₂	5.79	4.05	25.36
NO _x	21.36	14.95	93.56
CO	15.40	10.78	67.45
PM ₁₀	3.00	2.1	13.14
VOC	0.72	0.50	3.15

Air Quality Assessment:

An ambient air quality assessment is not required for this permit renewal because no significant changes/modifications were proposed with the renewal application. The modeling analysis last performed on the facility is provided in the following table for your information.

Ambient Air Concentrations

Model Conc. =		736.5	µg/m ³ per gram/sec					
Pollutant	Avg. Period	Emission Rate (g/s)	Time Factor	CONCENTRATION (µg/m ³)				% of std.
				Concen.	Background ¹	Total	Standard ²	
SO ₂	3-HR	0.73	0.9	483.9	73.0	556.9	1,300	42.8
	24-HR	0.73	0.4	215.1	18.0	233.1	365	63.9
	Annual ³	0.73	0.2	17.2	3.0	20.2	80	25.2
NO _x	Annual	2.69	0.2	63.3	2.0	65.3	70	93.3
CO	1-HR	1.94	1.0	1428.8	4589.0	6017.8	10,000	60.2
	8-HR	1.94	0.7	1000.2	2127.0	3127.2	5,000	62.5
PM ₁₀	24-HR	0.38	0.4	111.9	28.0	139.9	150	93.3
	Annual ³	0.38	0.2	8.9	14.0	22.9	50	45.9

¹ Background data obtained from Honolulu monitoring sta. concentrations 1996 for SO_x, CO, and PM-10. B, while Kapolei monitoring station data was used for NO_x.

² Most stringent State or Federal standard.

³ Annual concentration reduced to incorporate the 1,400 hour/8,760 hour fraction.

(Model conc) x (Potential emissions) x (Time factor) = Potential Ambient Air Impact
 EPA time factors of 0.9, 0.7, and 0.4 for the 3 hour, 8 hour, and 24 hour concentrations respectively, and State of Hawaii time factor of 0.2 for the annual concentrations were applied.

Based on these assumptions, the emissions impact from the combustion turbine generator will comply with State and Federal ambient air quality standards

Significant Permit Conditions:

The facility is subject to NSPS, 40 CFR 60 Subpart GG (meets trigger date of 1977).

The annual fuel limit is 329,000 gal/yr of JP-5 aviation fuel in any rolling twelve month period (maximum limit to meet NO_x annual and PM₁₀ 24-Hr SAAQS and NAAQS).

The 2.0 MW combustion turbine shall be fired only on JP-5 fuel with a maximum sulfur content not to exceed 0.2% by weight (to meet the SO₂ limit of 0.8% by weight, pursuant to 40 CFR 60.333).

The permittee shall monitor sulfur content of the fuel being fired in the turbine in accordance with 40 CFR 60, Subpart GG (per federal standard).

The turbine shall not discharge emissions exhibiting opacity of twenty percent opacity or more for any single period or multiple periods aggregating more than six minutes in any sixty minutes (opacity limit), except in times of start-up, shutdown or equipment breakdown (60% opacity limit).

PROPOSED

The permittee shall install, operate, and maintain a non-resettable fuel meters on the supply and return fuel lines to record the amount of fuel burned in the 2.0 MW combustion turbine (for monitoring purposes).

The permittee shall maintain the following records associated with operation of the 2.0 MW turbine (for monitoring purposes):

- Total fuel consumed on a monthly and twelve month rolling basis;
- Fuel analysis of JP-5 fuel burned. Analysis to be performed in accordance with 40 CFR 60 Subpart GG; and
- Equipment maintenance.

Alternate scenario to install a temporary (equal or lesser) unit in the event that the original unit is inoperable (to allow constant standby power when turbine unit is out of service).

The permittee shall keep and maintain records for a minimum of five (5) years (monitoring requirement).

Other Issues/Conditions:

This facility is exempt from NO_x standards per 40 CFR 60 Subpart GG, 60.332(g), since the unit is an emergency gas turbine.

This facility's SO₂ maximum sulfur content of 0.2% by weight will be verified by fuel supplier specification sheets as long as the sulfur content is derived by the appropriate ASTM standard per 40 CFR 60 Subpart GG, 60.335(d).

No performance test is required since there is no CEMs and NO_x limits and the SO₂ is limited by the sulfur content of the fuel.

Conclusion and Recommendations:

Based on the information supplied by the Navy, it is the preliminary determination of the Hawaii Department of Health (DOH) that the proposed project will not cause or contribute to a violation of any State or National ambient air quality standard.

The combustion turbine generator's emission calculations are conservative because the 1,400 hr/yr (329,000 gal/yr) annual limitation is much greater than anticipated. The unit will only be used in emergencies when there are commercial power outages and during testing and maintenance periods which will be substantially less than 1,400 hr/yr.

The Hawaii DOH therefore intends to issue a renewal of the Covered Source Permit to the U.S. Navy, subject to permit conditions, and public and EPA review and comment.