PROPOSED

INITIAL COVERED SOURCE PERMIT REVIEW - NO. 0353-02-C

Initial Permit - 4 each 3,286 bhp Diesel Engine Generators
Application No. 0353-04

Applicant: Queen's Medical Center
Facility: 4 each 3,286 bhp Diesel Engine Generators
Equipment Location: 1301 Punchbowl Street, Honolulu, Oahu

Responsible Official: Leslie Chinen
Title: Vice President - Corporate Development

Consultant: Jim Morrow
942-9096

Applicant's Mailing Address: 1301 Punchbowl St., Honolulu, 96813

SICC: 8062

Proposed Project:

Queens Medical Center (QMC) is proposing to install four 3,286 bhp diesel engine generators. The diesel engine generators are standby units and will operate when HECO requests QMC to disconnect from the power grid and during power outages. During standby operation, all four diesel engine generators will start up. After ten minutes, one of the diesel engine generators will shutdown and the remaining three diesel engine generators will power the facility. Fuel consumption of the four diesel engines will be limited to a combined total 1,000,000 gallons per rolling 12-months.

Existing Equipment:

QMC currently operates two 200 hp steam boilers. The steam boilers are a redundant system and do not operate simultaneously. One boiler is in stand-by while the other produces hot water. Under normal conditions, the boiler operates full fire for several hours per day and low fire for the balance of the day. The primary fuel is synthetic natural gas. Diesel fuel no. 2 is used as an emergency backup fuel. This hot water system operates 8,760 hours per year.

These boilers are currently operating under NSP No. 0353-01-N. The proposed diesel engine generators will make the QMC a major source. Since both of these permits are under the same

SICC, the boilers need to be permitted with the proposed diesel engine generators. As such, the conditions of NSP No. 0353-01-N will be incorporated into this permit and NSP No. 0353-01-N will be closed upon issuance of this permit.

Equipment Description:

The following equipment will be covered under this permit.

a. One 3,286 bhp Caterpillar Diesel Engine Generator set, model no. 3516B, serial no. PBR00266, manufactured in November 2006, unit no. U-1;

b. One 3,286 bhp Caterpillar Diesel Engine Generator set, model no. 3516B, serial no. PBR00267, manufactured in November 2006, unit no. U-2;

c. One 3,286 bhp Caterpillar Diesel Engine Generator set, model no. 3516B, serial no. PBR00268, manufactured in November 2006, unit no. U-3;

d. One 3,286 bhp Caterpillar Diesel Engine Generator set, model no. 3516B, serial no. PBR00269, manufactured in November 2006, unit no. U-4;

e. One 8.2 MMBtu/hr fire tube steam boilers, Cleaver Brooks model no. CB200-200-150, serial no. OL103324; and

f. One 8.2 MMBtu/hr fire tube steam boilers, Cleaver Brooks model no. CB200-200-150, serial no. OL103325.

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
11-60.1-115 Basis of Annual Fees for Covered Sources
Subchapter 8, Standards of Performance for Stationary Sources
11-60.1-161 New Source Performance Standards

BACT:

A Best Available Control Technology (BACT) analysis is required for each new or modified emissions unit located within a stationary source that has a net emissions increase equal to or greater than the significant levels defined in HAR §11-60.1-1. As shown in Table 1 below, the diesel engine generators are subject to a BACT analysis for NO_X. Since the diesel engine generators will be used for standby, add on air pollution control devices are not feasible. As such, BACT for these diesel engines will be good combustion practices and following the manufacturer's recommendations for proper inspection and maintenance.

Table 1. Potential Emissions from the Diesel Engine Generators

Pollutant	Emissions (TPY)	BACT Trigger (TPY)
NO_X	209	40
SO_X	3.5	40
CO	30	100
PM_{10}	4	15
VOC	1	40

Emissions are for one diesel engine burning 1,000,000 gallons of diesel no. 2

CERR (Consolidated Emission Reporting Rule):

40 CFR part 51, Subpart A – Emission Inventory Reporting Requirements, determines the annual emissions reporting frequency based on the actual emissions of each pollutant from any individual emission point within the facility that emits at or above the triggering levels. The diesel engine generators are intended to operate as a set of three, but there is the potential to operate one diesel engine generator alone. The emissions from the diesel engine generator exceed the trigger levels for a type B source as defined in 40 CFR 51, Subpart A and as such the facility is subject to CER.

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Table 2 Comparison of Emissions to CERR Trigger Levels (TPY)

Pollutant	3,286 bhp DEGs	8.2 MMBtu/hr Boiler firing SNG	8.2 MMBtu/hr Boiler firing DF No. 2	Emer. DEG 500 hrs/yr	Total	CERR
NO_X	209	3.4	5.2	8.2	229	100
SO_X	3.5	0.0	18.6	1.3	23	100
CO	30	2.9	1.3	2.2	35	1,000
PM_{10}	4	0.3	0.5	0.3	5	100
VOC	1	0.2	0.2	0.2	1	100

NSPS:

40 CFR Part 60, Standards of Performance for New Stationary Sources, Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. The diesel engines are subject to Subpart IIII because the diesel engines are stationary compression ignition internal combustion engines and were constructed after July 11, 2005.

Non-Applicable Requirements:

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 pre-control emissions that are 100% of the major source level; and (5) not otherwise be exempt from CAM. Although the facility is a major source and is subject to an emission limit, air pollution control devices are not used to meet the emission limit. As such, CAM does not apply.

NSPS:

40 CFR Part 60, Subpart K, Ka, or Kb - Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels). The existing diesel fuel storage tanks are less than 20,000 gallons and the vapor pressure of diesel is less than 15 kPa. As such, the storage tanks are not subject to Subparts K, Ka, or Kb.

NESHAP/MACT:

40 CFR 63, Subpart ZZZZ National Emission Standards for Hazardous Air Pollutants for Reciprocating Internal Combustion Engines is not applicable to the diesel engines because the facility is not a major source of HAPs.

PSD:

40 CFR 52.21 The PSD regulations and HAR define a major stationary source as any source type belonging to a list of 28 source categories which emits or has the potential to emit 100 tons per year or more of any criteria pollutant, or any other source type which emits or has the potential to emit pollutants in amounts equal to or greater than 250 tons per year. A major modification subject to PSD is defined as any physical change or change in method of operation of a stationary source that would result in a significant net increase of any pollutant subject to the Act. The QMC is not one of the 28 source categories and the highest emission rate among the criteria pollutants, NO_X at 209 tons per year, is less than 250 tons per year. As such, PSD does not apply to this facility.

Synthetic minor:

A synthetic minor is a facility that without limiting conditions, physical or operational, emits above the major triggering levels as defined by HAR 11-60.1-1 for either criteria pollutant(s) or hazardous air pollutant(s). QMC is a major source, thus it is not a synthetic minor.

Insignificant Activities:

The facility currently has two 1 MW emergency diesel engine generators. These generators are fired on diesel fuel no. 2 and provide electricity only during commercial power outages. Pursuant to HAR §11-60.1-82(f)(5), the two 1 MW emergency diesel engine generators are considered insignificant activities.

The applicant did not list any insignificant activities, however, it was determined that the following storage tanks are also insignificant activities pursuant to HAR §11-60.1-82(f)(1).

1. One 15,000 gallon diesel fuel storage tank; and
2. Two 20,000 gallon diesel fuel storage tanks.

Alternate Operating Scenarios:

There were not alternate operating scenarios proposed in the application.

Project Emissions:

The emissions from the two 8.2 MMBtu/hr steam boilers were estimated using AP-42 emission factors. Section 1.4-1, revised 7/98, was used to estimate emissions from firing on synthetic natural gas (primary fuel). The heating value was assumed to be 1,050 Btu/scf. Section 1.3-1, revised 9/98, was used to estimate emissions from burning diesel (emergency back-up fuel). Emissions from burning diesel fuel no. 2 were based on a heating value of 137,000 Btu/gal. Emissions estimates represent operating both 8.2 MMBtu/hr steam boilers for 8,760 hours per year.

The emergency generator emissions were calculated using AP-42 section 3.4, revised 10/96. Emission estimates represent both DEGs operating 500 hours per year.

Except for PM_{10} and SO_2, emissions from the diesel engine generator were estimated using the not to exceed emissions data from the manufacturer. PM_{10} and SO_2 emissions were estimated using the AP-42 emission factor from section 3.4, revised 10/96. Table 3 below summarizes the emissions from one diesel engine consuming the rolling 12-month fuel limit of 1,000,000 gallons of diesel fuel.

Table 3. 3,286 bhp Diesel Engine Generator Emissions

Pollutants	Emission Factor (lb/hr)	Emissions (TPY)
NO_X	65.88	209
CO	9.33	30
SO_2	1.11	3.5
PM_{10}	1.25	4
VOC	0.37	1

The table below provides an emissions summary for the facility. Calculations can be found in the appendix. A separate table for HAP emissions is not provided, as the emissions were insignificant from the boilers and very minor from the DEGs.

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Table 4. Emissions Summary (TPY)

Pollutant	3,286 bhp DEGs	8.2 MMBtu/hr Boiler firing SNG	8.2 MMBtu/hr Boiler firing DF No. 2	Emer. DEG 500 hrs/yr	Total	CERR
NO_X	209	3.4	5.2	8.2	229	100
SO_X	3.5	0.0	18.6	1.3	23	100
CO	30	2.9	1.3	2.2	35	1,000
PM_{10}	4	0.3	0.5	0.3	5	100
VOC	1	0.2	0.2	0.2	1	100

HAP emissions were estimated using AP-42 section 3.4, revised 10/96, and are listed in the appendix. Total HAP emissions were less than 0.3 tons per year.

Air Quality Assessment:

QMC conducted an ambient air quality impact analysis using U.S. U.S. EPA's ISCST3 model to determine source compliance with federal and state ambient air quality standards (AAQS). The maximum predicted concentrations were used to determine the maximum ambient air impacts. The model, methodology and assumptions used by QMC in the ambient air quality impact analysis were determined to be consistent with state and federal guidelines as discussed below.

ISCST3 was run with the regulatory default option selected. The default options include the use of rural dispersion coefficients, stack tip downwash, default wind speed profile exponents, upper bound concentrations for downwash, and the calm processing routine.

The meteorological data used by QMC for the analysis were collected from 1990 to 1995. Surface data was from the Honolulu International Airport and the upper air data was from Lihue Airport.

Wake effects from downwash were considered in the model. Wake effects are treated in the ISCST3 model by including direction specific building dimensions and locations for each emission source. The dimensions and locations were analyzed using the us U.S. EPA Building Profile Input Program (BPIP). The BPIP program determines the dominant structure for each 10-degree increment. The dominant structure could be a building or a combination of buildings.

The analysis used receptors spaced at 30-meter increments. Terrain features and ground level elevations were taken from the applicable U.S.G.S. DEM data and 7.5 minute topographic maps.

The table below shows the input values used for the parameters in the model.

Table 6. Source Parameters

Source	UTM Coordinate (m)		Stack Height (m)	Stack Diameter (m)	Exit Temp (°K)	Exit Vel. (m/s)
	East	North				
DEG, unit no. U- 1	618,896	2,356,764	30.48	0.3	764	113
DEG, unit no. U- 2	618,899	2,356,766	30.48	0.3	764	113
DEG, unit no. U- 3	618,906	2,356,769	30.48	0.3	764	113
DEG, unit no. U- 4	618,910	2,356,771	30.48	0.3	764	113

The maximum predicted concentrations are shown in the table below. Concentration levels are for the annual operations of four diesel engines with a fuel consumption limit of 1,000,000 gallons per year. Based on the assumptions used in the model, the facility should comply with state and federal ambient air quality standards for SO_2, NO_2, CO, and PM_{10}.

Table 7. Maximum Projected Impacts

Pollutant/ Averaging Time	Concentrations ($\mu g/m^3$)				Percent of Standard
	Facility	Background	Total	State Standard	
NO_2 / annual	47	9	56	70	80%
SO_2 / 3hr	90	56	146	1,300	11%
SO_2 / 24- hr	40	25	65	365	18%
SO_2 / annual	4	5	9	80	11%
CO / 1-hr	836	2,736	3,572	10,000	36%
CO / 8-hr	585	1,496	2,081	5,000	42%
PM_{10} / 24-hr	19	59	78	150	52%
PM_{10} / annual	2	16	18	50	36%

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Conclusion and Recommendation:

QMC is proposing to install four diesel engine generators for standby purposes. The diesel engine generators will only operate if HECO requests them to come off the grid and during power outages. The diesel engines are subject to emission standards and have a fuel consumption limit. Emissions were based on the diesel engines consuming all of the allowable fuel. QMC does not expect the diesel engines to consume all of the allowable fuel and the actual emissions from the facility should be much less than estimated. The ambient air quality impacts were reviewed and the model predicted that operating the diesel engines as proposed will not exceed the ambient air quality standards.

Issuance of a Covered Source Permit is recommended based on the information provided by the applicant.

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Appendix

Emissions Calculations