

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT <i>ENGINEERING DIVISION</i> APPLICATION PROCESSING AND CALCULATIONS	PAGES 12	PAGE 1
	APPL. NO. 534825	DATE 04/12/2012
	PROCESSED BY LI CHEN	CHECKED BY

PERMIT TO OPERATE

COMPANY NAME AND ADDRESS

LA DWP Scattergood Generation Station
12700 Vista Del Mar
Playa Del Rey, CA 92093
SCAQMD ID #800075

Contact: Bruce Moore (213) 367-3772

EQUIPMENT LOCATION

LA DWP Scattergood Generation Station
12700 Vista Del Mar
Playa Del Rey, CA 92093

EQUIPMENT DESCRIPTION

Section D of the Facility Permit, ID# 800075, Facility Description and Equipment Conditions

Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
PROCESS 1: POWER GENERATION					
BOILER, UNIT NO. 1, DIGESTER GAS, FUEL OIL NO. 6, NATURAL GAS, COMBUSTION ENGINEERING, 1,200,000 POUNDS OF STEAM PER HOUR, WITH OXYGEN CONTENT CONTROL, 1750 MMBTU/HR WITH:	D24		NOx: MAJOR SOURCE	NOx: 5.0 PPM (3) [RULE 2009]; CO: 500 PPMV(5) [RULE 1303]; 2000 PPMV (5A) [RULE 407]; PM10: 0.1 GRAINS/SCF (5) [RULE 409] SO2: 500 PPMV FUEL OIL (5) [RULE 407]; (9) [40CFR 72- Acid Rain Provisions]	A99.1, A195.3, B61.2, C1.5, C1.7, D28.2, D371.1, E193.1
A/N: 430935 534825					
GENERATOR, 179 185 MW GROSS					

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Equipment	ID No.	Connected To	Source Type/ Monitoring Unit	Emissions	Conditions
BOILER, UNIT NO. 2, DIGESTER GAS, FUEL OIL NO. 6, NATURAL GAS, COMBUSTION ENGINEERING, 1,200,000 POUNDS OF STEAM PER HOUR, WITH OXYGEN CONTENT CONTROL, 1,750 MMBTU/HR WITH: A/N: 430937, 534826	D20		NOx: MAJOR SOURCE	NOx: 5.0 PPMV (3) [RULE 2009]; CO: 500 PPMV(5) [RULE 1303]; CO: 2,000 PPMV (5A) [RULE 407] PM10: 0.1 GRAINS/SCF (5) [RULE 409] SOx: 500 PPMV FUEL OIL (5) [RULE 407]; (9) [40CFR 72 – Acid Rain Provisions]	A99.1, A195.3, B61.2, C1.5, C1.6, D28.2, D371.1, E193.1
GENERATOR, 479 <u>185</u> MW <u>GROSS</u>					

BACKGROUND

The Los Angeles Department of Water and Power (LADWP) owns and operates the Scattergood Generation Station (SGS) in the city of Playa Del Rey. The SGS has three steam generating plants, i.e., utility boilers, that generate electricity for the city of Los Angeles. The first two units, Units 1 and 2, were installed in the late 1950s. They are identical Combustion Engineering units. On the Title V facility permit each boiler is shown as connected to a 179 MW generator. LADWP now contends that the 179 MW is the net output of the generator. The gross output of each unit is actually 185 MW, and that should be the correct rating to be on the permit.

The following is a list of the applications submitted by LADWP.

Applications	Equipment	Fee
534825	Boiler Generator #1 change of conditions	\$14,363.30
534826	Boiler Generator #2 change of conditions	\$7,181.65
534827	Title V/RECLAIM minor permit revision	\$1,747.19
Expedited Permit Processing Fee		\$10,772.48
Total Fee		\$34,064.62

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The applications were submitted to the District on April 5, 2012. They were deemed complete on April 11, 2012. LADWP is a federal Title V facility. It participates in the RECLAIM NOx program.

DISCUSSIONS

The following is a chronology of the permit history available from the District's database.

Year	Application #	Megawatts shown on Permit	Permit Activities
1957-1958	G372, G373, G374, G375	N/A	Permit to construct two steam generators and two dust collectors
1958	G439, G440	N/A	Unit 1 and dust collector revision
1959	G534, G535	N/A	Unit 2 and dust collector revision
1960	G597	N/A	Install an electric precipitator
1968	G1609, G1610	N/A	Use of low sulfur oil
1969	G1720, G1721	N/A	Two new dust collectors
1971	G01954, G01955	N/A	Allow off-stoichiometric combustion for NOx reduction
1989	Adoption of AQMD Rule 1135		
1991	255443, 255444	179	Construct the urea injection system for NOx control
1994	Adoption of RECLAIM and facility permit		
1994	298913, 298914	179	Specify the option of digester gas on the RECLAIM permit
1996	314873, 314872	179	Allow flexible operation of the urea injection system and remove two dust collection cyclones
1996	320323, 320326	179	Increase the digester gas throughput from 200,000 scfh to 687,500 scfh
2000	375578, 375579	179	Add the BRACt NOx limit of 7 ppmv averaged over an hour
2001	385743, 385742	179	Remove the urea injection option and the urea storage tank
2003	410719, 410717	179	Add the Rule 2009 limit of 5 ppmv NOx averaged over 720 hours
2004	430935, 430937	179	Remove the BRACt 7 ppmv NOx limit

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The two steam plants were constructed in the late 1950s. The original equipment included two steam generating plants (boilers) and two Aerodyne Type C dust collectors. The applications numbers are G372-G375. The first steam plant started operation in December 1958 and the second one in July 1959. The steam plants were manufactured by Combustion Engineering. Each plant had sixteen Peabody oil burners and sixteen natural gas burners. They were permitted to operate either with natural gas or with fuel oil. The design specification calls for production of 1,200,000 pounds of steam per hour. The steam quality is 1,800 psig pressure at 1,000 °F temperature. The steam is sent to a General Electric Model F2 steam turbine generator which is connected to a 192,000 KVA electric generator. The electric generator has a power factor of 0.85. Thus, the nameplate megawatt rating of the generator is 163.2 MW.

The steam plants have the following design specifications:

- natural gas capacity of 1,700,000 scf/hour
- natural gas Btu rating of 1,050 Btu/scf
- fuel oil capacity of 95,000 lbs/hour, 16 Peabody nozzles
- fuel oil Btu rating of 18,200 Btu/lbs

Therefore, the Btu ratings of the boilers are:

- 1,785 MMBtu/hr, natural gas
- 1,729 MMBtu/hr, fuel oil

Initial operation of the two steam generators had considerable issues with plume opacity when operating with fuel oil. The units had to operate under a variance that allowed the facility to correct the excess PM emissions. The facility made several attempts to revise the dust collectors. The steam plants were not issued a permit to operate (P/O) until several years later. The original permits, however, contain no description of generator capacity. A LADWP brochure about the Scattergood Steam Power Plant published in 1958 states that the steam generators have a capacity of 160,000 kilowatts each. The capacity seems to be consistent with the generator nameplate capacity of 163.2 MW.

The GE F2 steam turbine has eight (8) main steam control valves. The control valves regulate the amount of steam entering into the high pressure turbine section. The steam exiting the high pressure section is routed to the boiler reheater and goes back to the mid pressure section of the steam turbine. The amount of steam the turbine uses is directly proportional to the power generation. The operator controls the power generating by opening the control valves selectively. A chart containing the power curve provided by GE shows the correlation between the power generation and the number of valves opening. For example, the power produced is 124 MW with

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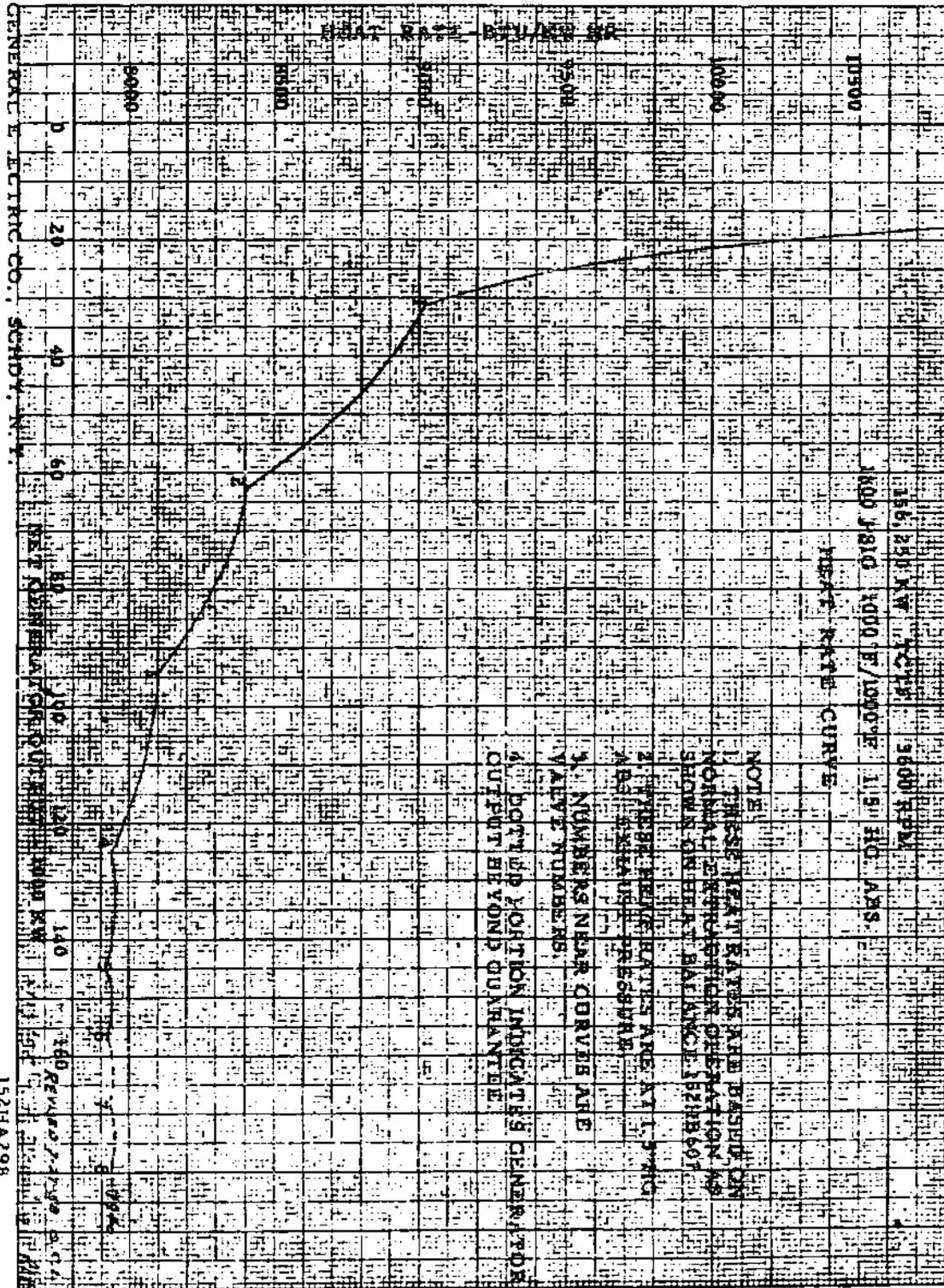
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802VH251

SCATTERGOOD UNIT 1

152HA298

GENERAL ELECTRIC CO. SCHUYLER, N.Y. U.S.A. GENERAL ELECTRIC CO. SCHUYLER, N.Y. U.S.A. 100X298 R 152HA298

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four valves opening, 145 MW with five valve opening, and 157 MW with six valves opening. The chart also states that operating with more than 6 valves opening is beyond the manufacturer guarantee. The chart does show that the generator will produce about 169 MW with seven valves opening, and about 179 MW with all eight valves opening. The megawatts shown in the chart are net generator output.

Therefore, the 160,000 kilowatts capacity indicated by LADWP in 1958 likely refers to the nominal capacity, with six steam control valves open. The maximum capacity is actually 179 MW net output, even though this is beyond the manufacturer guarantee.

The LADWP and the AQMD were apparently fully aware of the true generating capacity. In the application folder of A/N G534 there is a field report in March 1960 by the Air Pollution Control District (APCD) engineer that states:

“Capacity of the unit was stated to be 182 megawatts. ...Mr. Myers said about 300 lbs of fly ash are collected when the unit is operating on oil firing at approximately 180 MW.”

In May 1968 LADWP submitted two applications G1609 and G1610. The two applications were for the purpose of switching to low sulfur low ash fuel oil. Some reference regarding the generator capacity can be found in the application folders. A field report of 01/30/1969 provided a table of source tests of both units operating on fuel oil. For Unit 1 the load was 169 megawatts with the fuel oil usage of 78,000 lbs/hr, 170 megawatts with the fuel oil usage of 79,000 lbs/hr. For Unit 2 the unit load was 172 megawatts when fuel oil usage was at 86,000 lbs/hr. Since the fuel oil usage is less than the design limit of 95,000 lbs/hr it can be extrapolated that the capacity should be higher than 172 megawatts.

In January 1971 LADWP submitted two application G1954 and G1955. The applications were submitted to adopt the off-stoichiometric operation for the purpose of NOx reduction. At the time AQMD had adopted Rule 68 that mandated the following requirements.

	NOx limit by 12/31/1971	NOx limit by 12/31/1974
Operation with fuel oil	325 ppm	225 ppm
Operating with natural gas	225 ppm	125 ppm

Reference to the generator capacity can also be found in the source test conducted for these two applications, C-1726. The following are the load parameters of the source test.

Unit 1, 180 MW with fuel oil
 180 MW with natural gas

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Unit 2, 184 MW with fuel oil
 185 MW with natural gas

The source test report specifically crossed out "maximum" label in front of the load parameters. The load parameters of the source test might not be the maximum capacity. A detailed test parameters are given in the next table.

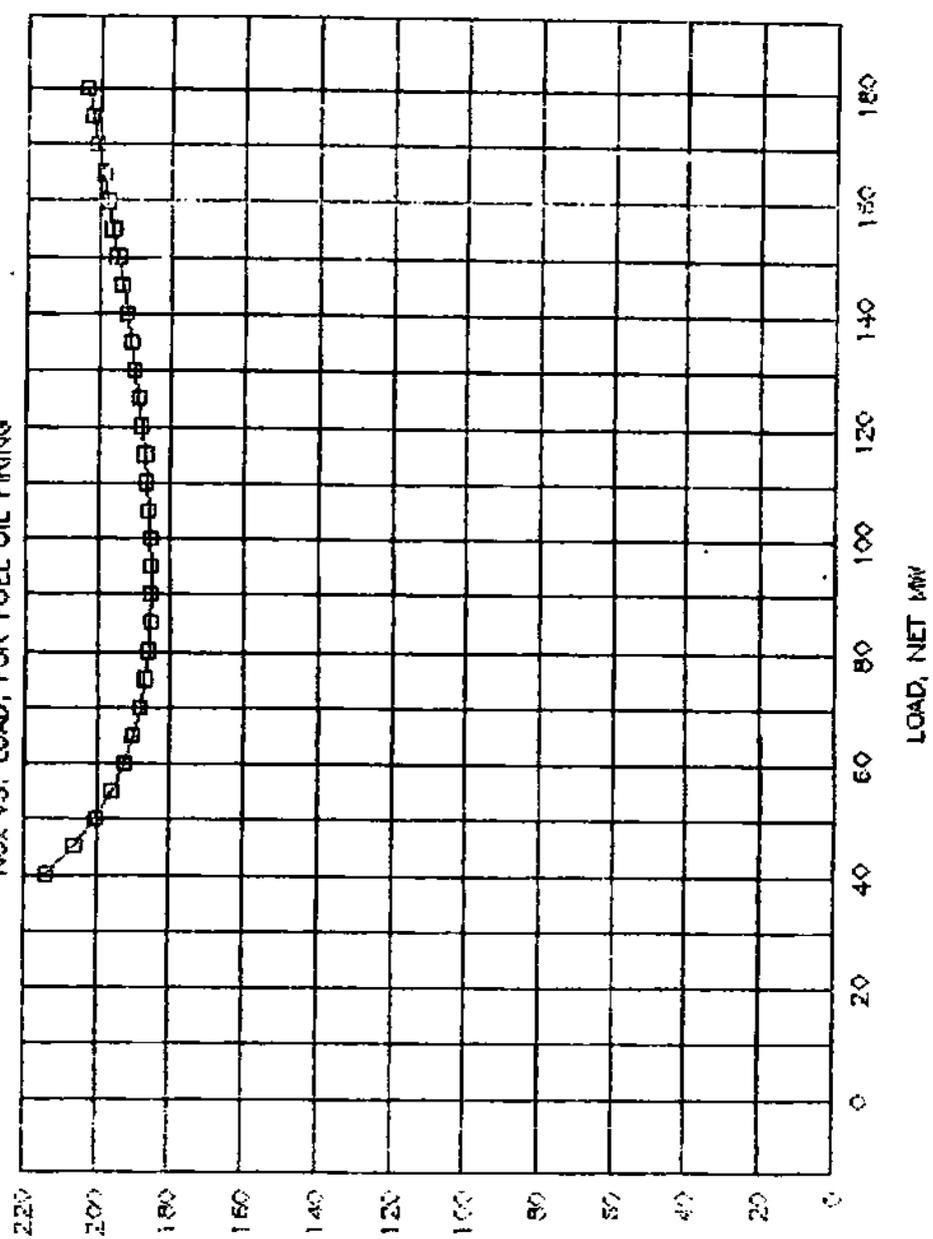
	Unit 1		Unit 2	
Maximum Load (MW)	180	180	184	185
Fuel	Oil	Gas	Oil	Gas
Steam flow rate, 10 ³ lb/hr	1,220	1,230	1,250	1,260
Fuel oil flow rate, 10 ³ lb/hr	85	-	80	-
Natural gas flow rate, 10 ³ scfh	-	1,630	-	1,680

It is noteworthy that when operating with fuel oil Unit 1 consumes 85,000 lbs/hr fuel oil, produces 1,220,000 lbs/hr of steam, and yields 180 MW of power. Meanwhile, Unit 2 consumes 80,000 lbs/hr fuel oil, produces 1,250,000 lbs/hr of steam, and yields 184 MW of power. The comparison suggests that when operating with fuel oil, even though the two units have identical specifications, Unit 2 is likely more efficient than Unit 1. Next, we will compare the two units operating with natural gas. When operating with natural gas Unit 1 consumes 1,630,000 scf/hr natural gas, produces 1,230,00 lbs/hr of steam and yields 180 MW of power. Similarly, Unit 2 consumes 1,680,000 scf/hr natural gas, produces 1,260,000 lbs/hr of steam and yields 185 MW of power. The two sets of data are quite consistent of the identical units, suggesting that the two units are very much the same when operating with natural gas. Furthermore, it suggests that Unit 1 may be able to generate 185 MW of power if the fuel input is raised to 1,680,000 scf/hr from 1,630,000 scf/hr.

In 1990 the District adopted Rule 1135 to control NOx emissions from electric power generating systems. Rule 1135 was amended in July 1991. This rule specifies the NOx emission limits based on the source's net megawatts ratings. For the LADWP sources the initial rate was 1.60 lbs/MWH in 1990, 1.41 lbs/MWH in 1991, and 0.15 lbs/MWH in 1999 and afterwards. The net megawatts rating became an important permitting parameter because it is now tied to the NOx emission limit. In 1991 LADWP submitted two applications 255443 and 255443 to install an urea injection system for the purpose of NOx control and compliance with Rule 1135. The engineering evaluation for the permit to construct by the District engineer Darren Stroud in December 1991 clearly specified that the units are 179 net megawatts, 1.785 x 10⁹ Btu/hr. LADWP provided two charts showing the NOx emissions at given load points in net megawatts. One chart is for operating with fuel oil and the other is for natural gas. Both charts show the maximum net megawatts are around 179 megawatts.

SCATTERGOOD UNITS 1 & 2

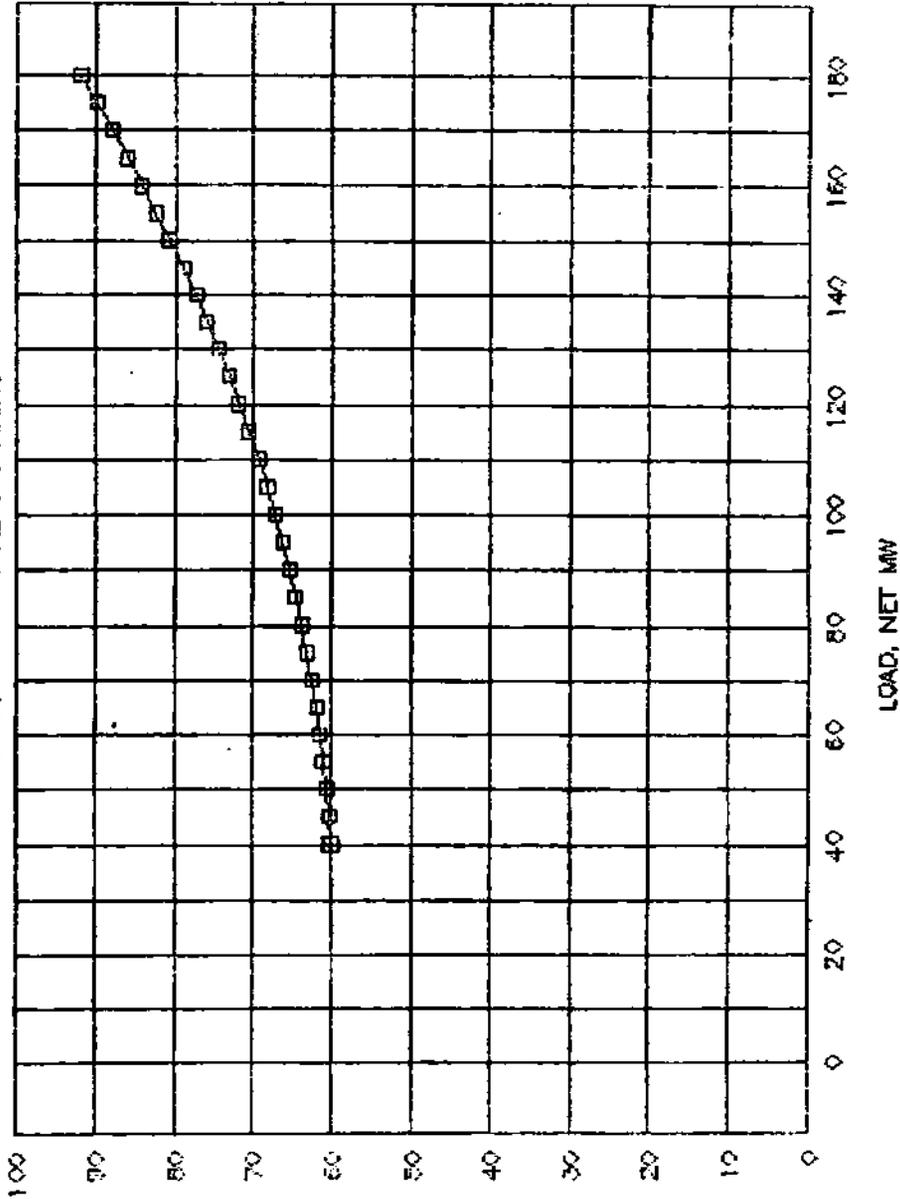
NOx VS. LOAD, FOR FUEL OIL FIRING



NOx EMISSIONS, PPM @ 3% O2

SCATTERGOOD UNITS 1 & 2

NOx VS. LOAD, FOR NATURAL GAS FIRING



NOx EMISSIONS, PPM @ 3% O2

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In 1994 the District adopted the RECLAIM program. LADWP Scattergood opted in the NOx RECLAIM program in 1994. According to the RECLAIM rules the two steam plants are NOx major sources. The major sources are required to list the BTU ratings on the permit. The original RECLAIM permit of 1994 shows that the two plants are listed at 1,750 MMBtu/hr.

The heat input rate of 1,750 MMBtu/hr is based on the RECLAIM standard natural gas heating value of 1,020 Btu/hr. In the previous applications the heat input rating of 1,785 MMBtu/hr was based on the heating value of 1,050 Btu/hr.

Based on the above research it is then established that:

1. The units were permitted before the District adopted the NSR rules.
2. The original permit did not list the megawatt rating. The generator capacity was originally indicated at 160,000 kW. However, the maximum capacity is greater than 160,000 kW.
3. The facility is using the original 192,000 KVA electrical generators. The generators are capable of matching up with the boilers at 180 MW.
4. The 179 MW rating on the current permit is the net megawatts rating. After the adoption of Rule 1135 and prior to the facility's entry into the NOx RECLAIM program the facility calculated NOx emissions using an emission factor and the 179 MW rating.
5. The 1,750 MMBtu/hr heat input rating on the current permit is consistent with the 179 MW rating. Subsequent to the facility's entry to the NOx RECLAIM program the units were put on a NOx concentration limit. As such, the NOx emissions are calculated based on the heat input of 1,750 MMBtu/hr instead of the 179 MW rating.

Given now that the net megawatt rating is 179 the gross megawatt rating is expected to be higher. LADWP provided the steam guide sheets of December 20, 1992. The specifications are:

Units 1 and 2	Gross (MW)	Net (MW)
Full Load (Oil)	185	179
Full Load (Gas)	185	179
Max Load (Oil)	187	179
Max Load (Gas)	187	179

In addition LADWP provided CEMS data of 1994-2005 that tabulated both the net and the gross megawatts of Units 1 and 2. The data confirms that, when the net megawatts is at 179 and the unit does not receive power from outside source, the gross megawatts is around 185-186. Thus, based on the steam guide sheet, and the previous operating history, it is reasonable to agree that the gross megawatts are 185 when the net megawatts are 179.

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RULE EVALUATION

RULE 212 – Standards for Approving Permits

The proposed change of megawatt rating on the permit does not have emission increases. Public notification is not required.

RULE 401 – Visible Emissions

Continued compliance with this rule is expected because there is no change in operation.

RULE 402 – Nuisance

Continued compliance with this rule is expected because there is no change in operation.

RULE 407 – Liquid and Gaseous Air Contaminants

This rule limits CO and SOx emissions. Continued compliance with this rule is expected because there is no change in operation.

RULE 409 – Combustion Contaminants

This rule limits PM emission from a combustion source. Continued compliance with this rule is expected because there is no change in operation.

RULE 431.1 – Sulfur Content of Gaseous Fuel

This rule limits sulfur content of gaseous fuel. Continued compliance with this rule is expected because there is no change in operation.

RULE 431.2 – Sulfur Content of Liquid Fuel

The facility will only use CARB certified diesel for this equipment. Continued compliance with this rule is expected because there is no change in operation.

RULE 475 – Electric Power Generating Equipment

This rule limits PM emission from a combustion source. Continued compliance with this rule is expected because there is no change in operation.

Regulation XIII – New Source Review for Non-RECLAIM Pollutants

This rule is not triggered because there is no increase of emissions.

RULE 1401 – New Source Review for Toxic Air Contaminants

This rule is not triggered because there is no increase of emissions.

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Regulation XVII – Prevention of Significant Deterioration

This rule is not triggered because there is no change or modification to the existing operation. There are no emission increases.

Regulation XX – NSR for RECLAIM Pollutants

This rule is not triggered because there is no increase of NO_x emissions.

Regulation XXX – Title V Operating Permit

The proposed change is a minor revision to the Title V permit. Therefore, it is subject to the EPA review for a 45-day period. The draft permit and the engineering evaluation will be sent to EPA for review.

RECOMMENDATION

Revise the megawatts rating from 179 to 185.

CONDITIONS

There are no changes in permit conditions.