

### **3.10 Power Plant at Technical Area 3 (TA-3-22)**

#### **3.10.1 General Description of Source Category**

The Technical Area 3 (TA-3) Power Plant provides space heating to most of the buildings in TA-3. Steam produced is also used for process needs and to produce electricity in one 10-megawatt and two 5-megawatt steam turbine/generator sets. The plant consists of three dual fuel boilers with natural gas being the primary fuel and No. 2 fuel oil available for use as a standby fuel. Each boiler has a nameplate maximum heat input capacity of 210 MMBtu/hr. Because LANL is located at a high elevation, the boilers do not operate at nameplate capacity. The maximum heat input capacity, derated for altitude, is calculated to be 178.5 MMBtu/hr. This reflects a 15% decrease in input rating consistent with the LANL Facility Engineering Manual (Chapter 6, Section 204) specification for forced draft boilers at this altitude. Two of the boilers were manufactured by Edgemoor Iron Works and installed in 1950. The third boiler was manufactured by Union Iron Works and installed in 1951.

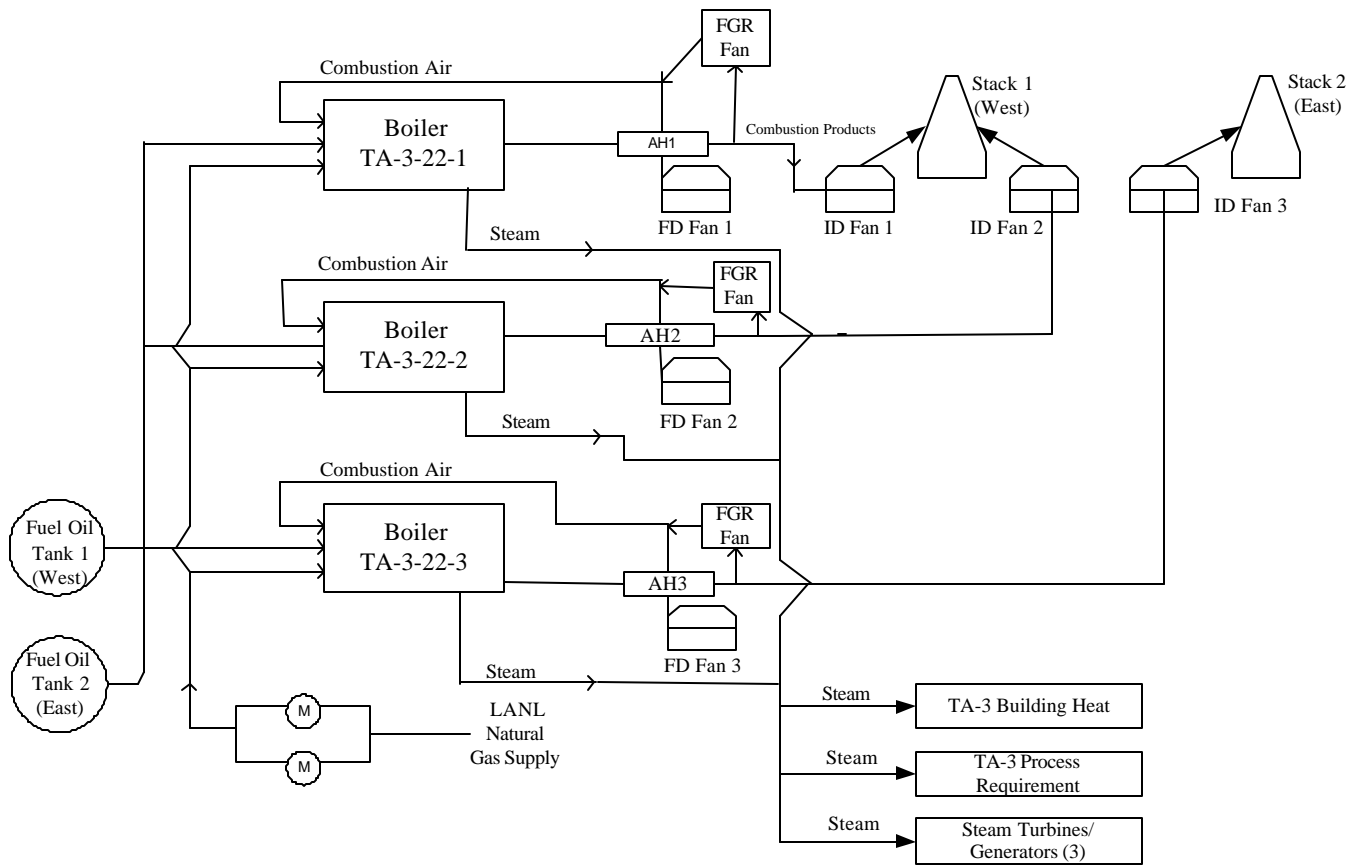
#### **3.10.2 Operating Schedule**

The plant operates 24 hours per day and 7 days per week. Normally, only two boilers are operated simultaneously, one of which is on hot standby and the other is running at partial capacity. Under maximum operating conditions, such as during peak generation of electricity, the third boiler can be brought on-line and the plant can operate at maximum capacity.

#### **3.10.3 Process Flow Diagram**

A process flow diagram for the TA-3-22 Power Plant is presented in Figure 3.10-1.

**Figure 3.10-1. Process Flow Diagram for Technical Area 3 (TA-3-22) Power Plant**



### 3.10.4 Emissions

Combustion of natural gas and fuel oil at the plant results in emissions of criteria pollutants ( $\text{NO}_x$ , CO,  $\text{SO}_2$ , PM, VOCs) and small quantities of HAPs. In May 2000, LANL submitted an air quality construction permit application to NMED to install a flue gas recirculation (FGR) air pollution control system to reduce emissions of  $\text{NO}_x$ . NMED issued construction permit No. 2195B for this project on September 27, 2000. The permit establishes pound per hour emission limits for each criteria pollutant for both gas and fuel oil combustion. The pound per hour limits apply to the operations of each boiler separately. The FGR permit also established ton per year emission limits for each criteria pollutant that apply on a plant-wide basis. These maximum allowable rates are based on projected emissions from the quantities of fuel allowed by restrictions on natural gas and

fuel oil use in the FGR permit. The permit specifies maximum fuel quantities of 4,000 MMscf natural gas and 500,000 gallons of fuel oil for the plant on an annual basis.

The emission estimates for criteria pollutants shown in Table 3.10-1 are the allowable emission rates in the FGR construction permit.

**Table 3.10-1. Criteria Pollutant Emission Estimates for the TA-3 Power Plant**

Unit No.	TSP <sup>(a)</sup> (lb/hr)		PM <sub>10</sub> <sup>(a)</sup> (lb/hr)		NO <sub>x</sub> <sup>(a)</sup> (lb/hr)		CO <sup>(a)</sup> (lb/hr)		VOC <sup>(a)</sup> (lb/hr)		SO <sub>2</sub> <sup>(a)</sup> (lb/hr)	
	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil	Gas	Oil
B-1	1.4	2.7	1.4	2.7	9.0	9.9	7.4	6.8	1.0	0.3	2.6	68.7
B-2	1.4	2.7	1.4	2.7	9.0	9.9	7.4	6.8	1.0	0.3	2.6	68.7
B-3	1.4	2.7	1.4	2.7	9.9 <sup>(b)</sup>	9.9	7.4	6.8	1.0	0.3	2.6	68.7
<b>Total (ton/yr)</b>	<b>15.7</b>		<b>15.7</b>		<b>99.6</b>		<b>81.3</b>		<b>11.1</b>		<b>36.9</b>	

(a) The allowable emissions estimates for the FGR construction permit were calculated using a heat value of 138,500 Btu/gallon of diesel, a derated capacity of 189.5 Btu/hr, and a sulfur content of 0.34% for diesel.

(b) Revised limit from technical permit revision, November 2002.

The emission factors that were used in the FGR permit application are shown in Table 3.10-2. Natural gas emission factors are from AP-42, 7/98, Section 1.4, Natural Gas Combustion, Table 1.3-1 except for NO<sub>x</sub> and CO. The NO<sub>x</sub> emission factor was based on the result of a 1995 source test at the TA-3 plant. The CO emission factor was based on the 1995 version of Section 1.4 of AP-42 because this value was closer to source test results at TA-3 than the 1998 revised value in Section 1.4. Fuel oil emission factors are from AP-42, 9/98, Section 1.3, Fuel Oil Combustion, Tables 1.3-1 and 1.3-3. The SO<sub>2</sub> emission factor is the sum of the AP-42 SO<sub>2</sub> and SO<sub>3</sub> emission factors using a sulfur content of 0.34%. LANL estimated total SO<sub>2</sub> emissions to be 13.8 tons per year but the NMED established an allowable limit of 36.9 tons per year in the final permit.

**Table 3.10-2. Criteria Pollutant Emission Factors Used in the FGR Permit**

Fuel	TSP/PM <sub>10</sub>	NO <sub>x</sub>	CO	VOC	SO <sub>2</sub>	HAP
Natural gas <sup>(a)</sup> (lb/10 <sup>6</sup> ft <sup>3</sup> )	7.6	163 <sup>(b)</sup>	40 <sup>(c)</sup>	5.5	0.6	1.89
Distillate oil <sup>(d)</sup> (lb/10 <sup>3</sup> gal)	2.0	24	5	0.2	50.2 <sup>(e)</sup>	6.11E-02 <sup>(f)</sup>

(a) Emission factors, unless otherwise indicated are from AP-42, 7/98, Section 1.4, Natural Gas Combustion, Tables 1.4-2, 1.4-3 and 1.4-4.

(b) Based on source test data in Appendix D from 1995.

- (c) AP-42, 1/95, Section 1.4, Natural Gas Combustion, Table 1.4-2.
- (d) AP-42, 9/98, Section 1.3, Fuel Oil Combustion, Tables 1.3-1, 1.3-2, and 1.3-3.
- (e) The SO<sub>2</sub> emission factor is the sum of the AP-42 SO<sub>2</sub> and SO<sub>3</sub> emission factors using a sulfur content of 0.34%. LANL estimated total SO<sub>2</sub> emissions to be 13.8 tons per year but NMED established an allowable limit of 36.9 tons per year in the final permit.
- (f) Heating value of 137,000 Btu/gal used in emission factor conversions.

HAP emission estimates were calculated using emission factors also shown in Table 3.10-2. Natural gas emission factors were taken from AP-42, 7/98, Section 1.4, Natural Gas Combustion, Table 1.4-2. Fuel oil emission factors for formaldehyde and polycyclic organic matter (POM) are from AP-42, 9/98, Section 1.3, Fuel Oil Combustion, Table 1.3-8 and from Table 1.3-10 for trace metals. AP-42 does not contain additional organic HAP emission factors for distillate fuel oil combustion. The remaining HAP emission factors for distillate fuel oil use are from the external combustion boiler section of EPA's Factor Information Retrieval (FIRE) emission factor database (10/2000 version).

HAP emission estimates are shown in Table 3.10-3. Estimated emissions were calculated based on the maximum fuel usage allowed under Permit No. 2195B and the emission factors in Table 3.10-2.

**Table 3.10-3. HAP Emission Estimates for the TA-3 Power Plant**

<b>Fuel Type</b>	<b>Total HAP (tons per year)</b>
Natural Gas	3.78
Fuel Oil	0.02
<b>Total</b>	<b>3.8</b>

A sample emission calculation is shown below. The NO<sub>x</sub> emissions were estimated with an anticipated FGR control efficiency of 70%.

$$Emission\ Rate\left(\frac{ton}{year}\right) = \left[ EF\left(\frac{lb}{10^6\ ft^3}\right) * Nat.\ Gas\ Usage\left(\frac{4,000\ MMscf}{year}\right) + EF\left(\frac{lb}{10^3\ gal}\right) * Fuel\ Oil\ Usage\left(\frac{500,000\ gal}{year}\right) \right] \left(\frac{ton}{2000\ lb}\right)$$

The TA-3 power plant currently is operated under a series of Operating Instructions to ensure the protection of employee safety and health, integrity of the equipment, and protection of the environment. Specific procedures for operating the boilers during startup, shutdown, and malfunction are currently in place. These procedures serve to minimize and mitigate emissions during startup, shutdown, or malfunction.

### 3.10.5 Emissions Control Equipment

The primary air pollutant emitted from the TA-3 boilers, NO<sub>x</sub>, is controlled by a flue gas recirculation (FGR) system. Approximately 70% of NO<sub>x</sub> emissions are removed by the FGR control system. In the FGR system, a portion of exhaust flue gas is recycled and mixed with combustion air before being fed to a burner. Combustion products in the recycled flue gas act as inerts or diluents during combustion of the fuel/air mixture and suppress NO<sub>x</sub> formation primarily by reducing combustion temperatures.

### 3.10.6 Applicable Requirements

Unit-specific applicable requirements that apply to the TA-3 boilers are listed below in Table 3.10-4.

**Table 3.10-4. Applicable Requirements**

<b>Source Category</b>	<b>Applicable Requirement</b>
Power Plant TA-3-22	<ul style="list-style-type: none"> <li>• Natural gas used shall contain no more than 5 grains of total sulfur per 100 scf. No. 2 fuel oil used shall contain less than 0.34% sulfur by weight and is not a blend containing waste oils or solvents. (Condition 1.g of Permit 2195B)</li> <li>• The plant shall not use more than 4,000 MMscf of natural gas per 365 day rolling total or more than 500,000 gallons of No. 2 fuel oil per 12 month rolling total. (Condition 1.h of Permit 2195B)</li> </ul> <p><b><i>Emission Limits</i></b></p> <ul style="list-style-type: none"> <li>• Emissions from each individual unit shall not exceed the hourly limits listed in Table 3.10-1 nor shall their combined totals exceed the annual limits (12-month rolling average) in Table 3.10-1. (Condition 2.a of Permit 2195B)</li> <li>• Nitrogen dioxide emissions shall not exceed 0.3 lb/MMBtu of heat input from any unit when burning natural gas or oil. (Conditions 2.b and 2.c of Permit 2195B, 20.2.33 NMAC, and 20.2.34 NMAC)</li> <li>• Visible emissions shall not equal or exceed an opacity of 20%. (Condition 2.d of Permit 2195B and 20.2.61 NMAC)</li> </ul>

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### **3.10.7 Proposed Monitoring, Recordkeeping, and Reporting**

Proposed monitoring, recordkeeping, and reporting is described below in Table 3.10-5. Currently required monitoring, recordkeeping, or reporting is followed with a citation to the basis for the requirement.

**Table 3.10-5. Proposed Monitoring, Recordkeeping, and Reporting for the Power Plant**

Source Category	Monitoring, Recordkeeping, and Reporting
Power Plant TA-3-22	<p><b>Monitoring:</b></p> <ul style="list-style-type: none"> <li>• A volumetric flow meter shall be installed and utilized to measure the total amount of natural gas being used on a daily basis. (Conditions 1.i and 3.b of Permit 2195B)</li> <li>• Total fuel oil consumption shall be monitored on a monthly basis. (Condition 3.a of Permit 2195B)</li> <li>• If total natural gas used exceeds 3,400 MMscf per 365 day rolling total, semiannual compliance stack tests shall be conducted for NO<sub>x</sub> and CO from each unit until natural gas usage is calculated to be less than 3,400 MMscf per 365 day rolling total for a total of 730 consecutive days. (Conditions 1.h and 6 of Permit 2195B)</li> </ul> <p><b>Recordkeeping:</b></p> <ul style="list-style-type: none"> <li>• Total fuel oil usage shall be recorded monthly and on a rolling twelve month total. (Condition 4.a of Permit 2195B)</li> <li>• A record of the total sulfur content of the No. 2 fuel oil used shall be obtained and kept from the supplier whenever oil is delivered to the facility. (Conditions 3.c and 4.b of Permit 2195B)</li> <li>• Records of total natural gas usage shall be kept daily and on a 365 day rolling total. (Condition 4.c of Permit 2195B)</li> <li>• A record shall be kept to verify natural gas consumed is pipeline quality natural gas (less than 5 grains of total sulfur per 100 standard cubic foot). (Condition 4.d of Permit 2195B)</li> </ul> <p><b>Reporting:</b></p> <ul style="list-style-type: none"> <li>• Report criteria pollutant and HAP emissions on a semiannual basis. (20.2.73.300 NMAC for criteria pollutants and LANL proposed condition for HAPs and semiannual basis)</li> <li>• Submit semiannual report of any required monitoring within 45 days from the end of each reporting period. The reporting periods are January to June and July to December. (20.2.70.302.E.(1) NMAC)</li> </ul>