Environmental Protection & Compliance Division (EPC-DO)
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

Date:
Symbol: EPC-DO: 18-112
LA-UR: 18-22067
Locates Action No.: *N/A*

Ted Schooley
Permit Program Manager
New Mexico Environment Department
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505-1816

Subject: **IDEA ID 856 – Los Alamos National Laboratory NSR Permit No. 2195B-M2 Modification TA-3 Power Plant**

Dear Mr. Schooley:

Enclosed for your review is a permit application to modify the existing New Source Review permit for the Los Alamos National Laboratory's (LANL) TA-3 Power Plant (2915B-M2). Attached to the application is the required $500 filing fee check.

This modification supports LANL's power procurement strategy to diversify and modernize its steam and electrical power generation resources in order to reduce greenhouse gas emissions by 50% by FY 2025. The TA-3 Power Plant is currently permitted with three boilers (TA-3-22-1, TA-3-22-2, and TA-3-22-3) that produce steam for use as a heating source in approximately 40 buildings in TA-3 and a Combustion Gas Turbine Generator (CGTG) that produces a nominally rated 32 MW of electricity. This modification involves the permanent shut down of existing boilers TA-3-22-1 and TA-3-22-2 and the construction and installation of new energy efficient auxiliary boilers, TA-3-22-4 and TA-3-22-5. These auxiliary boilers will be used as hot standby in the event that the new combined cycle is not in operation. Existing boiler TA-3-22-3 will remain and function as a hot standby until the construction of the new auxiliary boilers and combined cycle is complete and fully operational. At which point, the combined cycle will be the primary source of steam and then TA-3-22-3 will be permanently shut down.

Another part of this modification will be the construction of duct firing and a Heat Recovery Steam Generator (HRSG) along with a Steam Turbine Generator (STG). The HSRG will be installed on the exhaust of the existing Combustion Gas Turbine Generator (CGTG) TA-3-22-CT-1. The steam generated by the HSRG can be sent to the STG to produce additional electricity and/or to supply the steam demand within TA-3. Installation of the HSRG changes the existing CGTG from a simple cycle operation to a combined cycle operation, capable of generating both electricity and steam. The electricity generated from the combined cycle will be used to support Los Alamos operations. No electricity will be sold off-site.

This modification will be constructed in a three-phased approach. Phase 1 will consist of the modification to the boilers as previously discussed. Phase 2 will consist of upgrading steam and condensate lines from various TA-3 buildings to the steam plant along with various building level efficiency improvements. It is anticipated that this phase of the project will not change any air emissions. Phase 3 will involve the conversion of the existing combustion turbine, TA-3-22-CT-1, to a combined cycle operation. The project will be completed in five years from the start of construction.

Currently under the existing NSR permit, the existing plant boilers (TA-3-22-1, TA-3-22-2, and TA-3-22-3) as a group and the existing CGTG have annual fuel limits to ensure minor source status. This application seeks to allow increased use of the new combined cycle operation and rely less on the new auxiliary boilers. This will be done by increasing the annual fuel limit for the new combined cycle operation. The new HSRG will have emissions control technology that will control NO_X, CO and VOC emissions from the combined cycle operation.

The attached application contains a comprehensive dispersion modeling analysis which considered LANL sources as part of this modification as well as surrounding source emission inputs and ambient background concentrations. Modeling was conducted for all criteria pollutants including $PM_{2.5}$. Model results demonstrate that all National and New Mexico Ambient Air Quality Standards are met during the full operation of all sources for each hour of the year.

To summarize and highlight the main benefits, this modification will increase the effective use of primary energy and support expected growth in electricity demand. Thank you in advance for the review of the application. Please contact Mr. Harvey Wiscovitch at (505) 667-9011 with any questions regarding the application contents.

Sincerely,

Taunia S. Van Valkenburg
Group Leader

AG/hw:am

Copy:

Adrienne L. Nash, NA-LA, (E-File)
Richard M. Kacich, DIR, (E-File)
Craig S. Leasure, PADOPS, (E-File)
William R. Mairson, ADESH, (E-File)
Raeanna R. Sharp-Geiger, ADESH, (E-File)
Andy Erickson, UI-DO, (E-File)
Stephen C. Fong, NA-LA, (E-File)
Karen G. Borovina, MPD-PO, (E-File)
Steven L. Story, EPC-CP, (E-File)
Margie B. Stockton, EPC-CP, (E-File)
Harvey J. Wiscovitch, EPC-CP, (E-File)
Timothy A. Dolan, LC-ESH, (E-File)
Patrick D. Woehrle, GAP, (E-File)
Rosemary Maestas, GAP, (E-File)
Richard A. Ulibarri, GAP, (E-File)
locatesteam@lanl.gov, (E-File)
adesh@lanl.gov, (E-File)
epc-correspondence@lanl.gov, (E-File)
ENV-ES Permit File

New Source Review Permit Application

LANL Technical Area 3 Power Plant Modification

For

Los Alamos National Laboratory

Operated by:

Los Alamos National Security, LLC

Los Alamos National Laboratory

Los Alamos, New Mexico 87544

Owned by:

U.S. Department of Energy

National Nuclear Security Administration

Office of Los Alamos Site Operations

Los Alamos, New Mexico 87544

March 2018

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1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is submitting this application to revise the existing New Source Review (NSR) Permit 2195B-M2 issued for the Technical Area (TA) 3 Power Plant. This application proposes changes to the TA-3 Power Plant that will:

- Add a Heat Recovery Steam Generator (HRSG) to the exhaust of the existing Combustion Gas Turbine Generator (CGTG) TA-3-22-CT-1 to create a combined cycle plant capable of producing both electricity and additional steam.
- Permanently shut down existing boilers TA-3-22-1 and TA-3-22-2 and add two new auxiliary boilers, TA-3-22-4 and TA-3-22-5. Both auxiliary boilers will be capable of firing natural gas and fuel oil similar to the existing boilers.
- Repair and upgrade existing steam and condensate return lines from TA-3 to the Human Research Laboratory (HRL) building.
- Add insignificant emission sources such as a fuel gas heater TA-3-22-FGHTR, three comfort space heaters TA-3-22-CHTR1, TA-3-22-CHTR2, TA-3-22-CHTR3 and two make-up air heaters, TA-3-22-AHTR1 and TA-3-22-AHTR3.
- During the period of time when the new boilers are being constructed, the existing boilers will operate as currently permitted. Once the two new auxiliary boilers commence operation, two of the existing boilers will be permanently be shut down and existing boiler TA-3-22-3 will be maintained in hot-standby until the Combined Heat and Power (CHP) plant is operational. Once The CHP plant is operational, TA-3-22-3 will be permanently shut down.

The net effect of this modification will result in a reduction of greenhouse gas emissions and provide a reliable and sustainable heat and electric supply to support the Laboratory.

This modification will take place over a five year period, therefore, LANL is requesting that the modification be written into the permit such that the construction will be broken out into three phases.

1.1 Facility Description

The TA-3 Power Plant or co-generation facility produces power and steam for nearby buildings and electricity when needed. The steam is used for comfort heat. Most electricity used at LANL is purchased from off-site electric utilities. However, during an emergency or in periods of peak demand, the power plant is an important asset to ensure power is available. As with many LANL buildings and infrastructure, the plant was constructed immediately after World War II. The facility boilers and associated steam turbines were installed in the 1950's and are now over sixty years old. In recognition of the aging system, a new Rolls-Royce RB211-6761 simple cycle combustion turbine generator set was purchased and became operational in 2007. This unit is referenced as the combustion gas turbine generator or CGTG.

The power plant is located on Diamond Drive in TA-3 which is the area containing the primary office buildings for LANL. Figure 1 shows the general location of the plant and TA-3. A plot plan in Figure 2 shows the location of the power plant buildings within TA-3.

1.2 Purpose of Application

NSR Permit 2195B was initially issued in September 2000 for the voluntary installation of a flue gas recirculation (FGR) system to control nitrogen oxide (NO_X) emissions from the three power plant boilers. The permit was modified in 2004 to allow installation of the CGTG, and has had minor revisions since that time. As part of the permit process, LANL has requested and been issued annual fuel restrictions to ensure potential air emissions remain below levels which define a major air source for new source review purposes. Actual emissions are well below the 100 ton per year threshold, but the major source determination is based on potential emissions. In addition, LANL also requested during the permit process for the CGTG to limit operation to a 100% load condition.

Figure 1

General Location of the Power Plant and TA-3

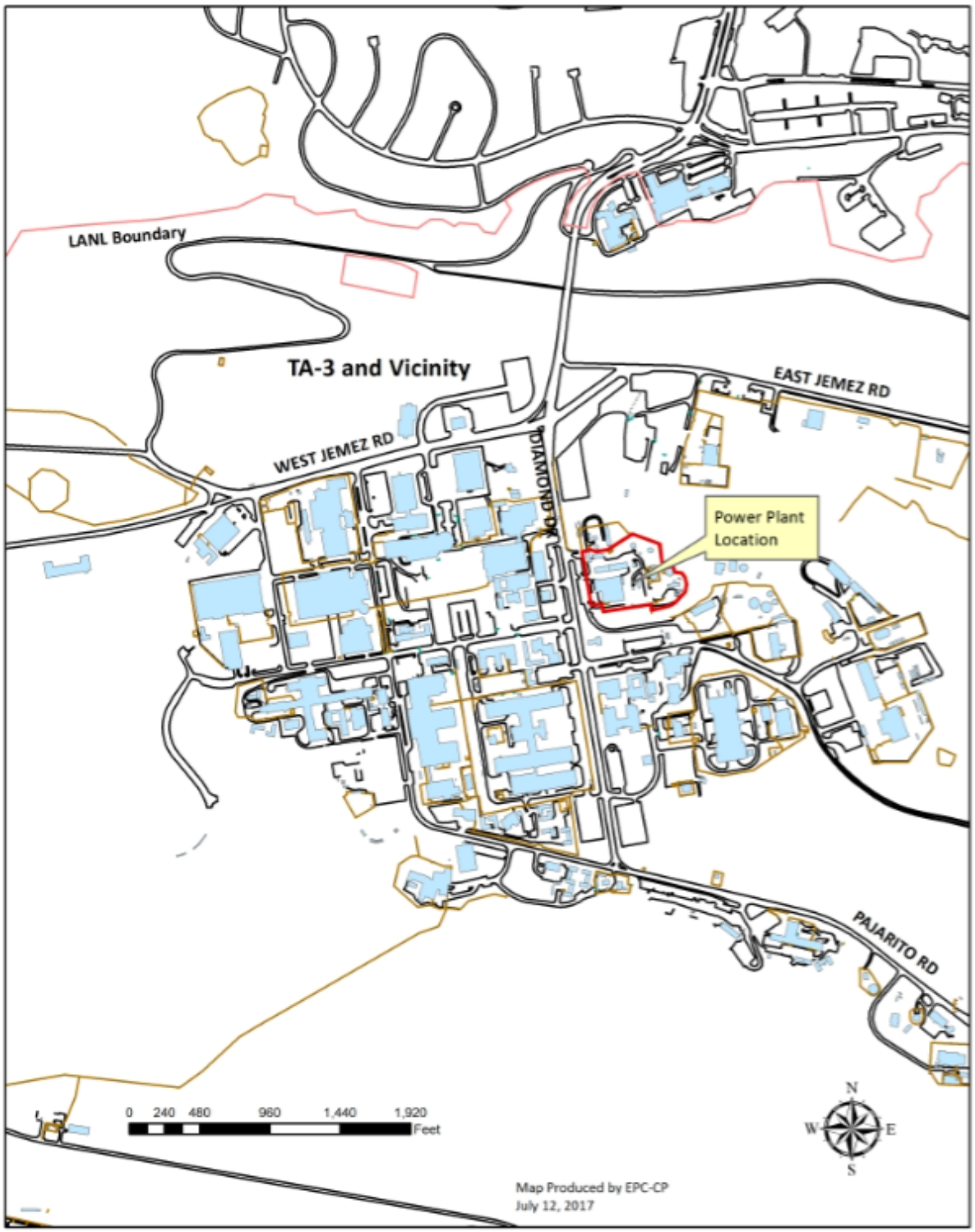

Figure 2

TA-3 Power Plant Plot Plan

The permit was modified further in 2011 to allow an increase in the allowable annual fuel (and operational hours) for the new and more efficient CGTG and decrease the allowable fuel and hours for the existing boilers. Also, part of this permit modification was to request a broader range of operation for the CGTG instead of the 100% load restriction. The request was to operate down to the 80% load level. The CGTG is operated as a standby unit for energy deficiencies and emergencies. For an electrical grid to function effectively, generation must closely equal demand. To alleviate an operational emergency, the CGTG needs to match output to a lost resource. By having the flexibility to operate the CGTG over a range of output (80-100% load) the plant can better meet generating needs.

This application is requesting the construction and installation of a HRSG on the exhaust of the existing CGTG and a new Steam Turbine Generator (STG). The HRSG will use the heat from the exhaust gas from the CGTG to create steam. A duct burner inside the HRSG can be fired in case the temperature of the exhaust gas needs to be increased. This steam can then be sent to the new STG to create electricity in the event of additional demand. This modification will change the existing CGTG from a simple cycle operation to a combined heat and power (CGTG + HRSG + STG) and gain more capacity to generate steam and electricity in order to meet growing demand.

The existing boilers TA-3-22-1 and TA-3-22-2 will be permanently shut down once the two new auxiliary boilers, TA-3-22-4 and TA-3-22-5, are constructed, installed and commence operation. Once the two new auxiliary boilers commence operation, two of the existing boilers will be permanently shut down and existing boiler TA-3-22-3 will be maintained in hot-standby until the CHP plant is operational. The primary purpose of the new auxiliary boilers is to supplement the steam supply in case of additional demand that the combined cycle cannot supply and to provide backup in the event the combined heat and power is unavailable. During the period when the new boilers are being constructed, the existing boilers will operate as currently permitted. Once the two new auxiliary boilers are declared fully operational, the existing boilers will be permanently shut down and a request to remove the existing boilers from this permit will be sent under a separate cover.

The existing steam and condensate lines from TA-3 feeding into the HRL building will be repaired and upgraded.

An exempt source that will be added as part of the project will be a fuel gas heater with a heat input of 0.7 MMBTU/hr. The fuel gas heater will be used in the event of a pressure increase in the fuel

gas line. Two makeup air preheaters for the auxiliary boilers each rated at 1.2 MMBtu/hr as well as three comfort heaters each rated at 0.1 MMBtu/hr will also be permitted as exempt sources.

In terms of fossil fuel management, gas-powered combined cycle plants are the most efficient technology for generating electricity from fossil fuels with the lowest levels of carbon dioxide (CO_2) emissions, which makes them one of the best solutions for reducing greenhouse gases. Combined cycles are more efficient than other traditional thermal technologies like coal and fuel oil as they produce energy in two phases. During the first phase, they generate electricity through the direct combustion of natural gas. During the second phase, they use the residual gases to make steam that can move a steam turbine and produce electricity. The combination of two systems increases the efficiency of the process by up to 55%-60%, compared to 30%-40% for other thermal technologies. This project will allow for using more natural gas to generate steam and electricity on-site as opposed to using electricity generated from higher CO_2 producing sources such as coal. Natural gas has much lower emissions of sulfur dioxide and nitrogen oxides as compared to coal. CO_2 emissions are approximately 50% lower from natural gas when compared to coal when burned to generate electricity.

1.3 Application Contents

A description of the proposed modification is provided in Section 2.0 of the application. Appendix A contains the completed New Mexico Environment Department (NMED) universal air permit, which includes a plot plan of the power plant, requested pounds per hour and tons per year emission limits, emission calculations and supporting information, and the notarized application certification. The universal application form is to be used for both NSR and Title V applications. Some sections of the form are specific to operations which do not exist at LANL. Sections applicable only to Title V applications or to operations not present are simply not included rather than printing and indicating “Not Applicable”.

Start-up, shut down and maintenance (SSM) emissions are provided in the emission calculations section of the application and in the permit application forms. SSM emissions are only shown for the combined cycle due to there being no shut down emissions associated with the new auxiliary boilers or the existing boiler. Start-up emissions for all boilers are accounted for in the normal operation emission rates already shown. Maintenance emissions for the boilers are also accounted for in the normal operation emission rates already shown.

2.0 PERMIT MODIFICATION DESCRIPTION

The proposed modification is intended to permanently shut down TA-3's existing three boilers (TA-3-22-1, TA-3-22-2 and TA-3-22-3) each with a rated capacity of 178.5 MMBTU/hr and replace them with two auxiliary boilers (TA-3-22-4 and TA-3-22-5) both with a rated capacity of 72.3 MMBTU/hr as well as install a HRSG on the exhaust of the existing CGTG (TA-3-22-CT-1). The project will use a phased approach to complete construction. The phases are as follows:

Phase 1 – Auxiliary Boiler Installation, Comfort Heater and Makeup Air Heater Installation

During the period of time when the new boilers are being constructed, the existing boilers will operate as currently permitted. Once the two new auxiliary boilers commence operation, boilers TA-3-22-1 and TA-3-22-2 will be permanently shut down. Boiler TA-3-22-3 will be kept temporarily as a hot standby to the auxiliary boilers until the CHP plant is fully operational. Once the CHP is fully operational, TA-3-22-3 will be permanently shut down. Comfort heaters and makeup air heaters will be installed in the building housing the auxiliary boilers. These heaters will be permitted as exempt sources.

Phase 2 – Steam/Condensate Line Refurbishment, Steam to Hot Water Conversion

The steam and condensate return lines from TA-3 to the HRL building will be repaired and upgraded. It is anticipated that this phase of the project will not generate air emissions.

Phase 3 – Combined Heat and Power Conversion, Fuel Gas Heater Installation

The HRSG will be installed with emission controls to ensure that the 100 ton per year emissions threshold will not be exceeded. The HRSG will employ two different catalysts to control NO_X, CO and VOC emissions. A selective catalytic reduction (SCR) catalyst will be used to control NO_X emissions from the CGTG exhaust gas and emissions from the duct burner. The SCR catalyst requires an ammonia feed in order for the catalytic reaction to take place. The ammonia is created by taking urea (in solid form), which is brought to TA-3 by truck, and hydrolyzed using a hydrolyzer skid associated with the HSRG that will create a 100% ammonia stream. The ammonia is fed directly into the SCR catalyst which will be diluted with air to 5-10% mixture of ammonia in air. The ammonia will only be generated when the combined cycle is in operation. There will be no ammonia storage tank to store excess ammonia generated from the hydrolyzer skid. There will be ammonia emissions associated with the ammonia slip through the HRSG. A CO fixed bed catalyst will control CO and VOC emissions from both the CGTG and

the duct burner inside the HRSG. The CO fixed bed catalyst will be located upstream of the SCR catalyst. A comparison of current emission limits for the power plant with the proposed limits in this application is shown in Table 2-1.

Ammonia emissions are associated with the SCR pollution control device installed in the HRSG. Sulfuric acid emissions are emitted from all combustion sources associated with this permitting action. Ammonia and sulfuric acid are defined as a toxic air pollutants or TAPs per New Mexico Administrative Code (NMAC) 20.2.72.502, Toxic Air Pollutants and Emissions. Both sulfuric acid and ammonia emissions are below their respective corrected threshold emission rates. Therefore, no further review is required. Please refer to the Air Dispersion Modeling report for more detailed information regarding the details of the TAP analysis.

As a result of this modification, LANL is proposing that the natural gas fuel restrictions be changed during Phase 1 in order to stay below the minor source permit source level. LANL is proposing that the new combined cycle will increase the fuel restriction of the existing CGTG due to the planned increased usage of the new combined cycle to generate steam and electricity during Phase 3. Plant emissions will not be increased above the minor source permit source level as a result of this modification. Note this is in reference to the primary fuel for the plant which is natural gas. The new fuel gas heater will only be fired using natural gas as well as the comfort heaters and makeup air heaters. The new auxiliary boilers emergency or standby fuel is distillate or No. 2 fuel oil. The boilers will only use No. 2 fuel oil during testing or during a natural gas outage. The existing No. 2 fuel oil storage tank (TA-3-779) will supply No. 2 fuel oil to both sets of new boilers. Tank TA-3-779 will not be modified and therefore is not addressed in this permitting action. It is proposed that the current annual restriction for fuel oil will remain unchanged. Table 2-2 provides a summary of these changes.

Table 2-1: Preliminary Project Emission Changes for TA-3 Power Plant - Phases 1 & 3

Phase 1

Current Allowable Totals

	NO_X	CO	VOC	SO_X	TSP	PM_{10}	$PM_{2.5}$
Hourly Maximum (lb/hr)	57.7	50.0	3.6	30.5	14.8	10.9	7.9
Annual (TPY)	90.9	93.8	4.3	9.1	9.5	9.2	9.0
TA-3-22-CT-1 (ppm)	25 ppmvd @ 15% O2	N/A	N/A	N/A	N/A	N/A	N/A

Proposed Allowable Totals

	NO_X	CO	VOC	SO_X	TSP	PM_{10}	$PM_{2.5}$
Hourly Maximum (lb/hr)	47.6	41.5	2.1	18.0	9.5	8.2	7.2
Annual (TPY)	66.1	85.4	2.7	6.9	7.9	7.7	7.6
TA-3-22-CT-1 (ppm)	25 ppmvd @ 15% O2	N/A	N/A	N/A	N/A	N/A	N/A

Change in Emissions

	NO_X	CO	VOC	SO_X	TSP	PM_{10}	$PM_{2.5}$
Hourly Maximum (lb/hr)	-10.1	-8.5	-1.5	-12.5	-5.3	-2.7	-0.7
Annual (TPY)	-24.8	-8.4	-1.6	-2.2	-1.6	-1.5	-1.4

Phase 3

Current Allowable Totals

	NO_X	CO	VOC	SO_X	TSP	PM_{10}	$PM_{2.5}$
Hourly Maximum (lb/hr)	57.7	50.0	3.6	30.5	14.8	10.9	7.9
Annual (TPY)	90.9	93.8	4.3	9.1	9.5	9.2	9.0
TA-3-22-CT-1 (ppm)	25 ppmvd @ 15% O2	N/A	N/A	N/A	N/A	N/A	N/A

Proposed Allowable Totals

	NO_X	CO	VOC	SO_X	TSP	PM_{10}	$PM_{2.5}$	NH_3
Hourly Maximum (lb/hr)	26.7	14.1	3.4	7.6	10.1	10.1	10.1	5.3
Annual (TPY)	69.2	62.0	15.0	5.7	34.6	34.6	34.6	-
TA-3-22-CHP-1 (ppm)	10 ppmvd @ 15% O2	10 ppmvd @ 15% O2	6 ppmvd @ 15% O2	N/A	N/A	N/A	N/A	10 ppmvd @ 15% O2

Change in Emissions

	NO_X	CO	VOC	SO_X	TSP	PM_{10}	$PM_{2.5}$	NH_3
Hourly Maximum (lb/hr)	-31.0	-35.9	-0.2	-22.9	-4.7	-0.8	2.2	5.3
Annual (TPY)	-21.7	-31.8	10.7	-3.4	25.1	25.4	25.6	-

Table 2-2

Comparison of Current and Proposed Annual Fuel Restrictions

Emission Unit	Current Fuel Restriction	Phase 1 Proposed Fuel Restriction	Phase 3 Proposed Fuel Restriction
Existing 3 Boilers	1,000 MMscf gas/ 500,000 gallons fuel oil	-	-
New Auxiliary Boilers + #3 Boiler	-	612 MMscf gas/ 500,000 gallons fuel oil	-
New Auxiliary Boilers	-	-	1,230 MMscf gas/ 500,000 gallons fuel oil
CGTG[1]	1,400 MMscf gas	1,400 MMscf gas	-
Combined Heat and Power (CGTG + HRSG + STG)	-	-	3,215 MMscf gas
totals	2,400 MMscf gas/ 500,000 gallons fuel oil	2,012 MMscf gas/ 500,000 gallons fuel oil	4,445 MMscf gas/ 500,000 gallons fuel oil

[1] The proposed fuel restriction for the CGTG was removed and added to the combined cycle.

The net effect of this modification will result in a reduction of greenhouse gas emissions. Although emissions related to on-site power generation will increase, overall greenhouse gas emissions associated with power produced off-site and on-site combined will be reduced.

3.0 AIR DISPERSION MODELING SUMMARY

The purpose of the accompanying air dispersion modeling report in Section UA-4 is to demonstrate that the proposed TA-3 Power Plant Steam Acquisition Project emissions will comply with the national and New Mexico Ambient Air Quality Standards during Phases 1 and 3 of the project. On January 4, 2018, LANL submitted a revised dispersion modeling protocol for this air permit modification to Mr. Eric Peters with the Air Quality Bureau Dispersion Modeling Group. The proposed project results in:

- Decreased hourly emission rates for nitrogen oxides (NOx), carbon monoxide (CO), sulfur dioxide (SO2), total suspended particulate (TSP), and particulate matter PM10.
- Increased hourly rates for particulate matter PM2.5 emissions.

Since the new equipment location and stack parameters are different from the currently permitted equipment, a dispersion modeling update is required to demonstrate compliance with the National Ambient Air Quality Standards (NAAQS) and the New Mexico Ambient Air Quality Standards (NMAAQS). The Power Plant air modeling analysis followed the dispersion modeling guidelines published by the New Mexico Environment Department (NMED) Air Quality Bureau (AQB) on August 8, 2017.

The dispersion modeling analysis used AERMOD, an EPA preferred and NMED recommended Gaussian plume model for use within 50 kilometers of emission sources. AERMOD is recommended for determining compliance with the ambient air quality standards in the complex topography around LANL. The model input included the 2013 LANL TA-6 meteorological tower data and mixing height data from the Albuquerque airport. The TA-6 tower is LANL's official weather station and is representative of the meteorological conditions at the facility. The building downwash input included a new building and all other buildings that influence the stack emissions. The EPA Building Profile Input Program (BPIP) was used to account for building downwash impacts in the analysis. The analysis used an extensive receptor grid extending outwards 10 kilometers from LANL property and also included property boundary receptors as well as receptors at public locations within the LANL boundary.

The dispersion modeling used three input scenarios for this project. LANL is seeking flexibility to operate the CHP Plant at 50-100% load range. Additionally, LANL modeled startup, shutdown and maintenance (SSM) emissions to demonstrate compliance during SSM. The four operating scenarios modeled are:

1. Operating under normal mode for 100% CHP load.
2. Operating under normal mode for 50% CHP load.
3. Operations during SSM period.
4. Operating during Phases 1 and 3 of the project.

The dispersion modeling analysis included the regulated air contaminants CO, NO2, SO2, particulate pollutants including total suspended particulates (TSP), and particulate matter PM10 and PM2.5.

The facility emissions of New Mexico toxic air pollutants, ammonia and sulfuric acid are quantities less than the screening levels for New Mexico for the proposed stack heights. Stack height correction determination for the proposed project demonstrated that air dispersion modeling analysis is not required for toxic air pollutants.

As specified by NMED AQB air dispersion modeling guidelines, radius of impact (ROI) model runs were conducted to determine if the project emissions result in significant impact to the ambient air quality. The ROI modeling resulted in insignificant impact for CO during normal and SSM operations. All other pollutants resulted in significant ambient impacts and required cumulative impact analysis.

The cumulative impact analysis included two methods:

1. For gaseous pollutants such as CO, NO2 and SO2, facility impact was added to the background concentrations from appropriate ambient monitors approved by the NMED AQB.
2. For particulate matter, facility, plus existing permitted surrounding sources were modeled and the background concentrations from appropriate ambient monitors were added as specified in the modeling guidelines.

Section UA-4 of the air permit application discusses the air dispersion modeling results for the Power Plant modification project. In summary, the AERMOD results demonstrate that the proposed permit emissions would comply with applicable NAAQS and NMAAQS for normal operations, during Phase 1 of the project, at 50-100% CHP load range after Phase 3 is completed, and during SSM operations.

Thus, the facility and cumulative impact analyses show that the Power Plant emissions together with other permitted sources and background ambient concentrations do not exceed NAAQS and NMAAQS for the air contaminants CO, NO2, TSP, PM10, PM2.5 and SO2.

In conclusion, the AERMOD analysis demonstrates that the facility will be in compliance with applicable NAAQS and NMAAQS for all three operating scenarios and during Phases 1 and 3 of the project requested in the air permit application.

Appendix A

Permit Application Forms

Mail Application To:		**For Department use only:**
New Mexico Environment Department Air Quality Bureau Permits Section 525 Camino de los Marquez, Suite 1 Santa Fe, New Mexico, 87505 Phone: (505) 476-4300 Fax: (505) 476-4375 www.env.nm.gov/aqb		AIRS No.:

Universal Air Quality Permit Application

Use this application for NOI, NSR, or Title V sources.

Use this application for: the initial application, modifications, technical revisions, and renewals. For technical revisions, complete Sections, 1-A, 1-B, 2-E, 3, 9 and any other sections that are relevant to the requested action; coordination with the Air Quality Bureau permit staff prior to submittal is encouraged to clarify submittal requirements and to determine if more or less than these sections of the application are needed. Use this application for streamline permits as well. For NOI applications, submit the entire UA1, UA2, and UA3 applications on a single CD (no copies are needed). For NOIs, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required.

This application is submitted as (check all that apply)**:** ☐ Request for a No Permit Required Determination (no fee)
☐ **Updating** an application currently under NMED review. Include this page and all pages that are being updated (no fee required).
Construction Status: ☐ Not Constructed √ Existing Permitted (or NOI) Facility ☐ Existing Non-permitted (or NOI) Facility
Minor Source: ☐ a NOI 20.2.73 NMAC √ 20.2.72 NMAC application or revision ☐ 20.2.72.300 NMAC Streamline application
Title V Source: ☐ Title V (new) ☐ Title V renewal ☐ TV minor mod. ☐ TV significant mod. TV Acid Rain: ☐ New ☐ Renewal
PSD Major Source: ☐ PSD major source (new) ☐ minor modification to a PSD source ☐ a PSD major modification

Acknowledgements:

√ I acknowledge that a pre-application meeting is available to me upon request. ☐ Title V Operating, Title IV Acid Rain, and NPR applications have no fees.

√ $500 NSR application Filing Fee enclosed OR ☐ The full permit fee associated with 10 fee points (required w/ streamline applications).

√ Check No.: **369947** in the amount of $500

√ I acknowledge the required submittal format for the hard copy application is printed double sided 'head-to-toe', 2-hole punched (except the Sect. 2 landscape tables is printed 'head-to-head'), numbered tab separators. Incl. a copy of the check on a separate page.

☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance program (SBEAP) and qualifies for 50% of the normal application and permit fees. Enclosed is a check for 50% of the normal application fee which will be verified with the Small Business Certification Form for your company.

☐ This facility qualifies to receive assistance from the Small Business Environmental Assistance Program (SBEAP) but does not qualify for 50% of the normal application and permit fees. To see if you qualify for SBEAP assistance and for the small business certification form go to https://www.env.nm.gov/aqb/sbap/small_business_criteria.html).

Citation: Please provide the **low level citation** under which this application is being submitted: **20.2.72.219.D NMAC**
(e.g. application for a new minor source would be 20.2.72.200.A NMAC, one example for a Technical Permit Revision is 20.2.72.219.B.1.b NMAC, a Title V acid rain application would be: 20.2.70.200.C NMAC)

Section 1 – Facility Information

Section 1-A: Company Information

		AI # if known (see 1st 3 to 5 #s of permit IDEA ID No.): 856	Updating Permit/NOI #: 2195B-M2
1	Facility Name: **U.S. Department of Energy(DOE)/Los Alamos National Laboratory**	Plant primary SIC Code (4 digits): **9711**	
		Plant NAIC code (6 digits): **928110**	
a	Facility Street Address (If no facility street address, provide directions from a prominent landmark): **Laboratory is bounded by towns of Los Alamos and White Rock, NM**		
2	Plant Operator Company Name: **Los Alamos National Security, LLC**	Phone/Fax: **(505) 667-2278/(505) 665-8858**	

a	Plant Operator Address: **P.O. Box 1663, Los Alamos, NM, 87545**	
b	Plant Operator's New Mexico Corporate ID or Tax ID: **2680007**	
3	Plant Owner(s) name(s): **U.S. Department of Energy, National Nuclear Security Administration**	Phone/Fax: **(505) 667-6691**
a	Plant Owner(s) Mailing Address(s): **3747 West Jemez Road, Los Alamos, NM 87544**	
4	Bill To (Company): **Los Alamos National Security, LLC**	Phone/Fax: **(505) 665-0451**
a	Mailing Address: **P.O. Box 1663, MS K490, Los Alamos, NM, 87545**	E-mail: **tauniav@lanl.gov**
5	√ Preparer: ☐ Consultant: **Harvey Wiscovitch**	Phone/Fax: **(505) 667-9011/(505) 665-8858**
a	Mailing Address: **P.O. Box 1663, MS J978, Los Alamos, NM, 87545**	E-mail: **hwiscovitch@lanl.gov**
6	Plant Operator Contact: **Taunia Van Valkenburg**	Phone/Fax: **(505) 665-0451**
a	Address: **P.O. Box 1663, MS K490, Los Alamos, NM, 87545**	E-mail: **tauniav@lanl.gov**
7	Air Permit Contact: **Steve Story**	Title: **AQC Team Leader, EPC-CP**
a	E-mail: **story@lanl.gov**	Phone/Fax: **(505) 665-2165**
b	Mailing Address: **P.O. Box 1663, MS J978, Los Alamos, NM, 87545**	

Section 1-B: Current Facility Status

1.a	Has this facility already been constructed? √ Yes ☐ No	1.b If yes to question 1.a, is it currently operating in New Mexico? √ Yes ☐ No
2	If yes to question 1.a, was the existing facility subject to a Notice of Intent (NOI) (20.2.73 NMAC) before submittal of this application? ☐ Yes √ No	If yes to question 1.a, was the existing facility subject to a construction permit (20.2.72 NMAC) before submittal of this application? √ Yes ☐ No
3	Is the facility currently shut down? ☐ Yes √ No	If yes, give month and year of shut down (MM/YY): **N/A**
4	Was this facility constructed before 8/31/1972 and continuously operated since 1972? √ Yes ☐ No	
5	If Yes to question 3, has this facility been modified (see 20.2.72.7.P NMAC) or the capacity increased since 8/31/1972? ☐Yes ☐No √ N/A	
6	Does this facility have a Title V operating permit (20.2.70 NMAC)? √ Yes ☐ No	If yes, the permit No. is: **P100-R2M1**
7	Has this facility been issued a No Permit Required (NPR)? √ Yes ☐ No	If yes, the NPR No. is: **2195A, 2195Q, 2195S, 2195T, 2195U, 2195V, 2195L, 2195X**
8	Has this facility been issued a Notice of Intent (NOI)? √ Yes ☐ No	If yes, the NOI No. is: **2597**
9	Does this facility have a construction permit (20.2.72/20.2.74 NMAC)? √ Yes ☐ No	If yes, the permit No. is: **632, 634-M2, 1081-M1-R6, 2195, 2195B-R2, 2195F-R4, 2195H, 2195N-R2, 2195P-R2**
10	Is this facility registered under a General permit (GCP-1, GCP-2, etc.)? √ Yes ☐ No	If yes, the register No. is: **GCP-3-2195G**

Section 1-C: Facility Input Capacity & Production Rate

1	What is the facility's maximum input capacity, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: **178.5 MMBtu/hr/boiler, 276.5 MMBtu/hr/combustion turbine**	Daily: **4284 MMBtu/24hr/boiler, 6636 MMBtu/24hr/combustion turbine**	Annually: **4.6 x 10^6 MMBtu/yr/all boilers, 1.4 x 10^6 MMBtu/yr/combustion turbine**
b	Proposed	Hourly: **72.3 MMBtu/hr/aux. boiler, 377.5 MMBtu/hr/combined heat & power**	Daily: **1735 MMBtu/24hr/aux. boiler, 9060 MMBtu/24hr/combined heat & power**	Annually: **1.3 x 10^6 MMBtu/yr/all aux. boilers, 3.3 x10^6 MMBtu/yr/combined heat & power**

2	What is the facility's maximum production rate, specify units (reference here and list capacities in Section 20, if more room is required)			
a	Current	Hourly: **10 MWh and 360,000 lbs mass steam/hr all boilers, 27 MWh combustion turbine**	Daily: **N/A**	Annually: **N/A**
b	Proposed	Hourly: **117,032 lbs mass steam/hr all aux. boilers, 47 MWh and 153,546 lbs mass steam combined heat & power**	Daily: **N/A**	Annually: **N/A**

Section 1-D: Facility Location Information

1	Section: **17**	Range: **6E**	Township: **19N**	County: **Los Alamos**	Elevation (ft): **7350**
2	UTM Zone: ☐ 12 or √ 13			Datum: ☐ NAD 27 √ NAD 83 ☐ WGS 84	
a	UTM E (in meters, to nearest 10 meters): **380790**			UTM N (in meters, to nearest 10 meters): **3970800**	
b	**AND** Latitude (deg., min., sec.): **35° 52' 27"**			Longitude (deg., min., sec.): **106° 19' 13"**	
3	Name and zip code of nearest New Mexico town: **Los Alamos 87545**				
4	Detailed Driving Instructions from nearest NM town (attach a road map if necessary): **Southern border of Los Alamos, NM**				
5	The facility is **1** (distance) miles **south** (direction) of **Los Alamos** (nearest town).				
6	Status of land at facility (check one): ☐ Private ☐ Indian/Pueblo ☐ Federal BLM ☐ Federal Forest Service √ Other (specify) **Federal Department of Energy**				
7	List all municipalities, Indian tribes, and counties within a ten (10) mile radius (20.2.72.203.B.2 NMAC) of the property on which the facility is proposed to be constructed or operated: **Los Alamos County, Sandoval County, Santa Fe County, Rio Arriba County, City of Espanola, San Ildefonso Pueblo, Santa Clara Pueblo, Jemez Pueblo, Pojoaque Pueblo, Cochiti Pueblo**				
8	**20.2.72** NMAC applications **only**: Will the property on which the facility is proposed to be constructed or operated be closer than 50 km (31 miles) to other states, Bernalillo County, or a Class I area (see www.env.nm.gov/aqb/modeling/class1areas.html)? √ Yes ☐ No (20.2.72.206.A.7 NMAC) If yes, list all with corresponding distances in kilometers: **Bandelier Wilderness Area (approximately 6 km from TA-3 Power Plant)**				
9	Name nearest Class I area: **Bandelier Wilderness Area (the wilderness portion of Bandelier National Monument)**				
10	Shortest distance (in km) from facility boundary to the boundary of the nearest Class I area (to the nearest 10 meters): **6 km (TA-3 Power Plant)**				
11	Distance (meters) from the perimeter of the Area of Operations (AO is defined as the plant site inclusive of all disturbed lands, including mining overburden removal areas) to nearest residence, school or occupied structure: **N/A**				
12	Method(s) used to delineate the Restricted Area: **N/A** "**Restricted Area**" is an area to which public entry is effectively precluded. Effective barriers include continuous fencing, continuous walls, or other continuous barriers approved by the Department, such as rugged physical terrain with steep grade that would require special equipment to traverse. If a large property is completely enclosed by fencing, a restricted area within the property may be identified with signage only. Public roads cannot be part of a Restricted Area.				
13	Does the owner/operator intend to operate this source as a portable stationary source as defined in 20.2.72.7.X NMAC? ☐ Yes √ No A portable stationary source is not a mobile source, such as an automobile, but a source that can be installed permanently at one location or that can be re-installed at various locations, such as a hot mix asphalt plant that is moved to different job sites.				
14	Will this facility operate in conjunction with other air regulated parties on the same property? ☒ No ☐ Yes If yes, what is the name and permit number (if known) of the other facility?				

Section 1-E: Proposed Operating Schedule (The 1-E.1 & 1-E.2 operating schedules may become conditions in the permit.)

1	Facility **maximum** operating ($\frac{\text{hours}}{\text{day}}$): **24**	($\frac{\text{days}}{\text{week}}$): **7**	($\frac{\text{weeks}}{\text{year}}$): **52**	($\frac{\text{hours}}{\text{year}}$): **8760**		
2	Facility's maximum daily operating schedule (if less than 24 $\frac{\text{hours}}{\text{day}}$)? Start: **N/A**		☐AM ☐PM	End: **N/A**	☐AM ☐PM	
3	Month and year of anticipated start of construction: **December 2019**					

4	Month and year of anticipated construction completion: **December 2024**
5	Month and year of anticipated startup of new or modified facility: **December 2024**
6	Will this facility operate at this site for more than one year? √ Yes ☐ No

Section 1-F: Other Facility Information

1	Are there any current Notice of Violations (NOV), compliance orders, or any other compliance or enforcement issues related to this facility? ☐ Yes √ No If yes, specify:		
a	If yes, NOV date or description of issue: **N/A**		NOV Tracking No: **N/A**
b	Is this application in response to any issue listed in 1-F, 1 or 1a above? ☐ Yes √ No If Yes, provide the 1c & 1d info below:		
c	Document Title: **N/A**	Date: **N/A**	Requirement # (or page # and paragraph #): **N/A**
d	Provide the required text to be inserted in this permit: **N/A**		
2	Is air quality dispersion modeling or modeling waiver being submitted with this application? √ Yes ☐ No		
3	Does this facility require an "Air Toxics" permit under 20.2.72.400 NMAC & 20.2.72.502, Tables A and/or B? ☐ Yes √ No		
4	Will this facility be a source of federal Hazardous Air Pollutants (HAP)? √ Yes ☐ No		
a	If Yes, what type of source? ☐ **Major** (☐ ≥10 tpy of any single HAP **OR** ☐ ≥25 tpy of any combination of HAPS) **OR** √ **Minor** (☐ <10 tpy of any single HAP **AND** √ <25 tpy of any combination of HAPS)		
5	Is any unit exempt under 20.2.72.202.B.3 NMAC? √ Yes ☐ No		
a	If yes, include the name of company providing commercial electric power to the facility: Los Alamos Power Pool Commercial power is purchased from a commercial utility company, which specifically does not include power generated on site for the sole purpose of the user.		

Section 1-G: Streamline Application (This section applies to 20.2.72.300 NMAC Streamline applications only)

1	☐ I have filled out Section 18, "Addendum for Streamline Applications." √ N/A (This is not a Streamline application.)

Section 1-H: Current Title V Information - Required for all applications from TV Sources

(Title V-source required information for all applications submitted pursuant to 20.2.72 NMAC (Minor Construction Permits), or 20.2.74/20.2.79 NMAC (Major PSD/NNSR applications), and/or 20.2.70 NMAC (Title V))

1	Responsible Official (R.O.) (20.2.70.300.D.2 NMAC): **William R. Mairson**	Phone: **505-606-2222**
a	R.O. Title: **Associate Director, ADESH**	R.O. e-mail: **wrmairson@lanl.gov**
b	R. O. Address: **P.O. Box 1663, MS K491, Los Alamos, NM 87545**	
2	Alternate Responsible Official (20.2.70.300.D.2 NMAC): **John C. Bretzke**	Phone: **505-665-3867**
a	A. R.O. Title: **Deputy Associate Director, ADESH**	A. R.O. e-mail: **jbretzke@lanl.gov**
b	A. R. O. Address: **P.O. Box 1663, MS K491, Los Alamos, NM 87545**	
3	Company's Corporate or Partnership Relationship to any other Air Quality Permittee (List the names of any companies that have operating (20.2.70 NMAC) permits and with whom the applicant for this permit has a corporate or partnership relationship): **N/A**	
4	Name of Parent Company ("Parent Company" means the primary name of the organization that owns the company to be permitted wholly or in part.): **Los Alamos National Security, LLC**	
a	Address of Parent Company: **P.O. Box 1663, Los Alamos, NM, 87545**	

5	Names of Subsidiary Companies ("Subsidiary Companies" means organizations, branches, divisions or subsidiaries, which are owned, wholly or in part, by the company to be permitted.): **N/A**
6	Telephone numbers & names of the owners' agents and site contacts familiar with plant operations: **N/A**
7	Affected Programs to include Other States, local air pollution control programs (i.e. Bernalillo) and Indian tribes: Will the property on which the facility is proposed to be constructed or operated be closer than 80 km (50 miles) from other states, local pollution control programs, and Indian tribes and pueblos (20.2.70.402.A.2 and 20.2.70.7.B)? If yes, state which ones and provide the distances in kilometers: **Taos Pueblo (69), Picuris Pueblo (56), Jicarilla Apache (67), Ohkay Owingeh Pueblo (19), Santa Clara Pueblo (10), San IIdefonso Pueblo (5), Pojoaque Pueblo (13), Nambe Pueblo (24), Tesuque Pueblo (19), Cochiti Pueblo (13), Santa Domingo Pueblo (27), Zia Pueblo (30), San Felipe Pueblo (38), Santa Ana Pueblo (40), Jemez Pueblo (19), Sandia Pueblo (61), Laguna Pueblo (77), Bernalillo County (56).**

Section 1-I – Submittal Requirements

Each 20.2.73 NMAC (**NOI**), a 20.2.70 NMAC (**Title V**), a 20.2.72 NMAC (**NSR** minor source), or 20.2.74 NMAC (**PSD**) application package shall consist of the following:

Hard Copy Submittal Requirements:

1) One hard copy **original signed and notarized application package** **printed double sided** **'head-to-toe'** **2-hole punched** as we bind the document on top, not on the side; except Section 2 (landscape tables), which should be head-to-head. Please use **numbered tab separators** in the hard copy submittal(s) as this facilitates the review process. For NOI submittals only, hard copies of UA1, Tables 2A, 2D & 2F, Section 3 and the signed Certification Page are required. Please include a copy of the check on a separate page.

2) If the application is for a minor NSR, PSD, NNSR, or Title V application, include one working hard **copy** for Department use. This copy does not need to be 2-hole punched, but **must be double sided**. Minor NSR Technical Permit revisions (20.2.72.219.B NMAC) only need to fill out Sections 1-A, 1-B, 3, and should fill out those portions of other Section(s) relevant to the technical permit revision. TV Minor Modifications need only fill out Sections 1-A, 1-B, 1-H, 3, and those portions of other Section(s) relevant to the minor modification. NMED may require additional portions of the application to be submitted, as needed.

3) The entire NOI or Permit application package, including the full modeling study, should be submitted electronically on compact disk(s) (CD). For permit application submittals, **two** CD copies are required (in sleeves, not crystal cases, please), with additional CD copies as specified below. NOI applications require only a single CD submittal.

4) If **air dispersion modeling** is required by the application type, include the **NMED Modeling Waiver** **OR** one additional electronic copy of the air dispersion modeling including the input and output files. The dispersion modeling ***summary report only*** should be submitted as hard copy(ies) unless otherwise indicated by the Bureau. The complete dispersion modeling study, including all input/output files, should be submitted electronically as part of the electronic submittal.

5) If subject to PSD review under 20.2.74 NMAC (PSD) or NNSR under 20.2.79 NMC include,
   a. one additional CD copy for US EPA,
   b. one additional CD copy for each federal land manager affected (NPS, USFS, FWS, USDI) and,
   c. one additional CD copy for each affected regulatory agency other than the Air Quality Bureau.

Electronic Submittal Requirements [in addition to the required hard copy(ies)]:

1) All required electronic documents shall be submitted in duplicate (2 separate CDs). A single PDF document of the entire application as submitted and the individual documents comprising the application.

2) The documents should also be submitted in Microsoft Office compatible file format (Word, Excel, etc.) allowing us to access the text and formulas in the documents (copy & paste). Any documents that cannot be submitted in a Microsoft Office compatible format shall be saved as a PDF file from within the electronic document that created the file. If you are unable to provide Microsoft office compatible electronic files or internally generated PDF files of files (items that were not created electronically: i.e. brochures, maps, graphics, etc,), submit these items in hard copy format with the number of additional hard copies corresponding to the number of CD copies required. We must be able to review the formulas and inputs that calculated the emissions.

3) It is preferred that this application form be submitted as 3 electronic files (2 MSWord docs: Universal Application section 1 and Universal Application section 3-19) and 1 Excel file of the tables (Universal Application section 2) on the CD(s). Please include as many of the 3-19 Sections as practical in a single MS Word electronic document. Create separate electronic file(s) if a single file becomes too large or if portions must be saved in a file format other than MS Word.

4) The electronic file names shall be a maximum of 25 characters long (including spaces, if any). The format of the electronic Universal Application shall be in the format: "A-3423-FacilityName". The "A" distinguishes the file as an application submittal, as opposed to other documents the Department itself puts into the database. Thus, all electronic application submittals should begin with "A-". Modifications to existing facilities should use the core permit number (i.e. '3423') the Department assigned to the facility as the next 4 digits. Use 'XXXX' for new facility applications. The format of any separate electronic submittals (additional submittals such as non-Word attachments, re-submittals, application updates) and Section document shall be in the format: "A-3423-9-description", where "9" stands for the section # (in this case Section 9-Public Notice). Please refrain, as much as possible, from submitting any scanned documents as this file format is extremely large, which uses up too much storage capacity in our database. Please take the time to fill out the header information throughout all submittals as this will identify any loose pages, including the Application Date (date submitted) & Revision # (0 for original, 1, 2, etc.; which will help keep track of subsequent partial update(s) to the original submittal. The footer information should not be modified by the applicant.

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Table 2-A: Regulated Emission Sources

Unit and stack numbering must correspond throughout the application package. If applying for a NOI under 20.2.73 NMAC, equipment exemptions under 2.72.202 NMAC do not apply.

Unit Number[1]	Source Description	Make	Model #	Serial #	Manufact-urer's Rated Capacity[3] (Specify Units)	Requested Permitted Capacity[3] (Specify Units)	Date of Manufacture[2] Date of Construction/ Reconstruction[2]	Controlled by Unit # Emissions vented to Stack #	Source Classi-fication Code (SCC)	For Each Piece of Equipment, Check One	RICE Ignition Type (CI, SI, 4SLB, 4SRB, 2SLB)[4]	Replacing Unit No.
Phase 1												
TA-3-22-3	Boiler	Union Iron Works	N/A	11804	210 MMBtu/hr	178.5 MMBtu/hr	1952 1952	F-3 TA3_S2		x Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
TA-3-22-4	Boiler	Cleaver-Brooks	CBEX Elite	TBD[5]	72.3 MMBtu/hr	72.3 MMBtu/hr	TBD[5] TBD[5]	N/A TA3_S3		☐ Existing (unchanged) ☐ To be Removed x New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
TA-3-22-5	Boiler	Cleaver-Brooks	CBEX Elite	TBD[5]	72.3 MMBtu/hr	72.3 MMBtu/hr	TBD[5] TBD[5]	N/A TA3_S4		☐ Existing (unchanged) ☐ To be Removed x New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
TA-3-22-1	Boiler	Edgemoor Iron Works	N/A	4008	210 MMBtu/hr	178.5 MMBtu/hr	1950 1950	F-1 TA3_S1		☐ Existing (unchanged) x To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
TA-3-22-2	Boiler	Edgemoor Iron Works	N/A	4009	210 MMBtu/hr	178.5 MMBtu/hr	1950 1950	F-2 TA3_S1		☐ Existing (unchanged) x To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
TA-3-22-CT-1	Combustion Turbine	Rolls-Royce	RB211-6761 DLE	2011	32 MW	27 MW	2003 2005	DLE TA3_CT		☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit x To Be Modified ☐ To be Replaced	N/A	N/A
Phase 3												
TA-3-22-3	Boiler	Union Iron Works	N/A	11804	210 MMBtu/hr	178.5 MMBtu/hr	1952 1952	F-3 TA3_S2		☐ Existing (unchanged) x To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
TA-3-22-4	Boiler	Cleaver-Brooks	CBEX Elite	TBD[5]	72.3 MMBtu/hr	72.3 MMBtu/hr	TBD[5] TBD[5]	N/A TA3_S3		x Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
TA-3-22-5	Boiler	Cleaver-Brooks	CBEX Elite	TBD[5]	72.3 MMBtu/hr	72.3 MMBtu/hr	TBD[5] TBD[5]	N/A TA3_S4		x Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
TA-3-22-CHP-1	Combined Heat and Power	Rolls-Royce/TBD[5]	RB211-6761 DLE/TBD[5]	2011/TBD[5]	47 MW	47 MW	2003/TBD[5] 2005/TBD[5]	HRSG TA3_HRSG		☐ Existing (unchanged) ☐ To be Removed x New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced	N/A	N/A
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		
										☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced		

[1] Unit numbers must correspond to unit numbers in the previous permit unless a complete cross reference table of all units in both permits is provided.
[2] Specify dates required to determine regulatory applicability.
[3] To properly account for power conversion efficiencies, generator set rated capacity shall be reported as the rated capacity of the engine in horsepower, not the kilowatt capacity of the generator set.
[4] "4SLB" means four stroke lean burn engine, "4SRB" means four stroke rich burn engine, "2SLB" means two stroke lean burn engine, "CI" means compression ignition, and "SI" means spark ignition

Applicant Notes

[5] TBD = To Be Determined, information regarding the make, model, serial number and dates of manufacture will be provided at a later date under separate cover.

Table 2-B: Insignificant Activities[1] (20.2.70 NMAC) OR Exempted Equipment (20.2.72 NMAC)

All 20.2.70 NMAC (Title V) applications must list all Insignificant Activities in this table. All 20.2.72 NMAC applications must list Exempted Equipment in this table. If equipment listed on this table is exempt under 20.2.72.202.B.5, include emissions calculations and emissions totals for 202.B.5 "similar functions" units, operations, and activities in Section 6, Calculations. Equipment and activities exempted under 20.2.72.202 NMAC may not necessarily be Insignificant under 20.2.70 NMAC (and vice versa). Unit & stack numbering must be consistent throughout the application package. Per Exemptions Policy 02-012.00 (see http://www.env.nm.gov/aqb/permit/aqb_pol.html), 20.2.72.202.B NMAC Exemptions do not apply, but 20.2.72.202.A NMAC exemptions do apply to NOI facilities under 20.2.73 NMAC. List 20.2.72.301.D.4 NMAC Auxiliary Equipment for Streamline applications in Table 2-A. The List of Insignificant Activities (for TV) can be found online at http://www.env.nm.gov/aqb/forms/InsignificantListTitleV.pdf . TV sources may elect to enter both TV Insignificant Activities and Part 72 Exemptions on this form.

Unit Number	Source Description	Manufacturer	Model No.	Max Capacity	List Specific 20.2.72.202 NMAC Exemption (e.g. 20.2.72.202.B.5)	Date of Manufacture /Reconstruction[2]	For Each Piece of Equipment, Check Onc
			Serial No.	Capacity Units	Insignificant Activity citation (e.g. IA List Item #1.a)	Date of Installation /Construction[2]	
TA-3-22-FGHTR	Fuel Gas Heater	TBD[3]	TBD[3]	0.7	20.2.72.202.B.5	TBD[3]	☐ Existing (unchanged) ☐ To be Removed x New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			TBD[3]	MMBtu/hr	N/A	2018	
TA-3-1404-GEN	Emergency Diesel Generator	Cummins	DFLC-5554001	1250	20.2.72.202.B.3	2002	x Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			E020369571	kW (generator)	N/A	2003	
TA-3-22-AHTR1	Makeup Air Heater	Cambridge	M125	1.2	20.2.72.202.B.5	TBD[3]	☐ Existing (unchanged) ☐ To be Removed x New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			TBD[3]	MMBtu/hr	N/A	TBD[3]	
TA-3-22-AHTR2	Makeup Air Heater	Cambridge	M125	1.2	20.2.72.202.B.5	TBD[3]	☐ Existing (unchanged) ☐ To be Removed x New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			TBD[3]	MMBtu/hr	N/A	TBD[3]	
TA-3-22-CHTR1	Comfort Heater	Reznor	UDBP-75	0.1	20.2.72.202.B.1(a)	TBD[3]	☐ Existing (unchanged) ☐ To be Removed x New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			TBD[3]	MMBtu/hr	N/A	TBD[3]	
TA-3-22-CHTR2	Comfort Heater	Reznor	UDBP-75	0.1	20.2.72.202.B.1(a)	TBD[3]	☐ Existing (unchanged) ☐ To be Removed x New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			TBD[3]	MMBtu/hr	N/A	TBD[3]	
TA-3-22-CHTR3	Comfort Heater	Reznor	UDBP-75	0.1	20.2.72.202.B.1(a)	TBD[3]	☐ Existing (unchanged) ☐ To be Removed x New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
			TBD[3]	MMBtu/hr	N/A	TBD[3]	
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced
							☐ Existing (unchanged) ☐ To be Removed ☐ New/Additional ☐ Replacement Unit ☐ To Be Modified ☐ To be Replaced

[1] Insignificant activities exempted due to size or production rate are defined in 20.2.70.300.D.6, 20.2.70.7.Q NMAC, and the NMED/AQB List of Insignificant Activities, dated September 15, 2008. Emissions from these insignificant activities do not need to be reported, unless specifically requested.

[2] Specify date(s) required to determine regulatory applicability.

Applicant Notes

[3] Information regarding the make, model, serial number and dates of manufacture will be provided at a later date under separate cover.

Table 2-C: Emissions Control Equipment

Unit and stack numbering must correspond throughout the application package. Only list control equipment for TAPs if the TAP's maximum uncontrolled emissions rate is over its respective threshold as listed in 20.2.72 NMAC, Subpart V, Tables A and B. In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device regardless if the applicant takes credit for the reduction in emissions.

Control Equipment Unit No.	Control Equipment Description	Date Installed	Controlled Pollutant(s)	Controlling Emissions for Unit Number(s)[1]	Efficiency (% Control by Weight)	Method used to Estimate Efficiency
F-1	Flue Gas Recirculation Fan	2001	Nitrogen Oxides	TA-3-22-1	64%	Source Test
F-2	Flue Gas Recirculation Fan	2001	Nitrogen Oxides	TA-3-22-2	64%	Source Test
F-3	Flue Gas Recirculation Fan	2001	Nitrogen Oxides	TA-3-22-3	64%	Source Test
HRSG	Heat Recovery Steam Generator with SCR catalyst and CO catalyst	2022	NO_X, CO, VOC	TA-3-22-CHP-1	NO_X: 60%, CO: 90%, VOC: 30%	Supplied by Vendor

[1] List each control device on a separate line. For each control device, list all emission units controlled by the control device.

Table 2-D: Maximum Emissions (under normal operating conditions)

☐ **This Table was intentionally left blank because it would be identical to Table 2-E.**

Maximum Emissions are the emissions at maximum capacity and prior to (in the absence of) pollution control, emission-reducing process equipment, or any other emission reduction. Calculate the hourly emissions using the worst case hourly emissions for each pollutant. For each pollutant, calculate the annual emissions as if the facility were operating at maximum plant capacity without pollution controls for 8760 hours per year, unless otherwise approved by the Department. List Hazardous Air Pollutants (HAP) & Toxic Air Pollutants (TAPs) in Table 2-I. Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		TSP[2]		PM10[2]		PM2.5[2]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Phase 1																		
TA-3-22-4																		
gas	0.76	3.33	2.71	11.88	0.26	1.14	0.18	0.79	0.54	2.38	0.54	2.38	0.54	2.38	-	-	-	-
oil	6.24	27.34	2.70	11.85	0.10	0.43	3.33	14.58	1.64	7.17	1.64	7.17	1.64	7.17	-	-	-	-
TA-3-22-5																		
gas	0.76	3.33	2.71	11.88	0.26	1.14	0.18	0.79	0.54	2.38	0.54	2.38	0.54	2.38	-	-	-	-
oil	6.24	27.34	2.70	11.85	0.10	0.43	3.33	14.58	1.64	7.17	1.64	7.17	1.64	7.17	-	-	-	-
TA-3-22-3																		
gas	28.21	123.56	7.00	30.67	0.97	4.25	1.06	4.63	1.33	5.84	1.33	5.84	1.33	5.84	-	-	-	-
oil	31.27	136.96	6.51	28.53	0.26	1.14	9.64	42.23	4.30	18.83	3.00	13.13	2.02	8.85	-	-	-	-
TA-3-22-CT-1	79.50	348.20	29.03	127.17	0.61	2.66	1.69	7.39	1.91	8.37	1.91	8.37	1.91	8.37	-	-	-	-
Phase 1 Totals	123.25	539.84	41.46	181.60	2.10	9.19	17.99	78.78	9.48	41.54	8.18	35.83	7.20	31.55	-	-	-	-
Phase 3																		
TA-3-22-4																		
gas	0.76	3.33	2.71	11.88	0.26	1.14	0.18	0.79	0.54	2.38	0.54	2.38	0.54	2.38	-	-	-	-
oil	6.24	27.34	2.70	11.85	0.10	0.43	3.33	14.58	1.64	7.17	1.64	7.17	1.64	7.17	-	-	-	-
TA-3-22-5																		
gas	0.76	3.33	2.71	11.88	0.26	1.14	0.18	0.79	0.54	2.38	0.54	2.38	0.54	2.38	-	-	-	-
oil	6.24	27.34	2.70	11.85	0.10	0.43	3.33	14.58	1.64	7.17	1.64	7.17	1.64	7.17	-	-	-	-
TA-3-22-CHP-1	35.50	155.49	87.00	381.06	4.14	18.15	0.90	3.94	6.80	29.78	6.80	29.78	6.80	29.78	-	-	-	-
Phase 3 Totals	47.98	210.17	92.43	404.82	4.66	20.43	7.56	33.10	10.07	44.12	10.07	44.12	10.07	44.12	-	-	-	-
Totals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for TSP unless TSP is set equal to PM10 and PM2.5. Note: Totals listed are worst case maximum emissions from the boilers either firing gas or oil plus worst case emissions from the CHP.

Table 2-E: Requested Allowable Emissions

Unit & stack numbering must be consistent throughout the application package. Fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E^{-4}).

Unit No.	NOx		CO		VOC		SOx		TSP[1]		PM10[1]		PM2.5[1]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Phase 1																		
TA-3-22-4																		
gas	0.76	1.52	2.71	5.43	0.26	0.52	0.18	0.36	0.54	1.09	0.54	1.09	0.54	1.09	-	-	-	-
oil	6.24	0.15	2.70	0.06	0.10	2.33E-03	3.33	0.08	1.64	0.04	1.64	0.04	1.64	0.04	-	-	-	-
TA-3-22-5																		
gas	0.76	1.52	2.71	5.43	0.26	0.52	0.18	0.36	0.54	1.09	0.54	1.09	0.54	1.09	-	-	-	-
oil	6.24	0.15	2.70	0.06	0.10	2.33E-03	3.33	0.08	1.64	0.04	1.64	0.04	1.64	0.04	-	-	-	-
TA-3-22-3																		
gas	10.16	1.47	7.00	1.01	0.97	0.14	1.06	0.15	1.33	0.19	1.33	0.19	1.33	0.19	-	-	-	-
oil	11.26	1.94	6.51	1.13	0.26	0.05	9.64	1.67	4.30	0.74	3.00	0.52	2.02	0.35	-	-	-	-
TA-3-22-CT-1	23.85	59.37	29.03	72.28	0.61	1.51	1.69	4.20	1.91	4.76	1.91	4.76	1.91	4.76	-	-	-	-
Phase 1 Totals	47.59	66.12	41.46	85.40	2.10	2.74	17.99	6.90	9.48	7.94	8.18	7.72	7.20	7.55	-	-	-	-
Phase 3																		
TA-3-22-4																		
gas	0.76	3.33	2.71	11.88	0.26	1.14	0.18	0.79	0.54	2.38	0.54	2.38	0.54	2.38	-	-	-	-
oil	6.24	0.15	2.70	0.06	0.10	2.33E-03	3.33	0.08	1.64	0.04	1.64	0.04	1.64	0.04	-	-	-	-
TA-3-22-5																		
gas	0.76	3.33	2.71	11.88	0.26	1.14	0.18	0.79	0.54	2.38	0.54	2.38	0.54	2.38	-	-	-	-
oil	6.24	0.15	2.70	0.06	0.10	2.33E-03	3.33	0.08	1.64	0.04	1.64	0.04	1.64	0.04	-	-	-	-
TA-3-22-CHP-1	14.20	62.20	8.70	38.11	2.90	12.70	0.90	3.94	6.80	29.78	6.80	29.78	6.80	29.78	-	-	-	-
Phase 3 Totals	26.68	69.15	14.13	62.00	3.42	14.99	7.56	5.69	10.07	34.62	10.07	34.62	10.07	34.62	-	-	-	-
Totals	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for TSP unless TSP is set equal to PM10 and PM2.5

Note: Totals listed are worst case maximum emissions from the boilers either firing gas or oil plus worst case emissions from the CH

Table 2-F: Additional Emissions during Startup, Shutdown, and Routine Maintenance (SSM)

☐ This table is intentionally left blank since all emissions at this facility due to routine or predictable startup, shutdown, or scehduled maintenance are no higher than those listed in Table 2-E and a malfunction emission limit is not already permitted or requested. If you are required to report GHG emissions as described in Section 6a, include any GHG emissions during Startup, Shutdown, and/or Scheduled Maintenance (SSM) in Table 2-P. Provide an explanations of SSM emissions in Section 6 and 6a.

All applications for facilities that have emissions during routine our predictable startup, shutdown or scheduled maintenance (SSM) [1], including NOI applications, must include in this table the Maximum Emissions during routine or predictable startup, shutdown and scheduled maintenance (20.2.7 NMAC, 20.2.72.203.A.3 NMAC, 20.2.73.200.D.2 NMAC). In Section 6 and 6a, provide emissions calculations for all SSM emissions reported in this table. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (https://www.env.nm.gov/aqb/permit/aqb_pol.html) for more detailed instructions. Numbers shall be expressed to at least 2 decimal points (e.g. 0.41, 1.41, or 1.41E-4).

Unit No.	NOx		CO		VOC		SOx		TSP[2]		PM10[2]		PM2.5[2]		H_2S		Lead	
	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
TA-3-22-CHP-1	11.00	0.38	304.00	9.44	35.00	1.09	0.16	5.00E-03	3.34	0.12	3.34	0.12	3.34	0.12	-	-	-	-
Totals	11.00	0.38	304.00	9.44	35.00	1.09	0.16	5.00E-03	3.34	0.12	3.34	0.12	3.34	0.12	-	-	-	-

[1] **For instance**, if the short term steady-state Table 2-E emissions are 5 lb/hr and the SSM rate is 12 lb/hr, enter 7 lb/hr in this table. If the annual steady-state Table 2-E emissions are 21.9 TPY, and the number of scheduled SSM events result in annual emissions of 31.9 TPY, enter 10.0 TPY in the table below.

[1] **Condensable Particulate Matter:** Include condensable particulate matter emissions for PM10 and PM2.5 if the source is a combustion source. Do not include condensable particulate matter for TSP unless TSP is set equal to PM10 and PM2.5.

Table 2-G: Stack Exit and Fugitive Emission Rates for Special Stacks

X I have elected to leave this table blank because this facility does not have any stacks/vents that split emissions from a single source or combine emissions from more than one source listed in table 2-A. Additionally, the emission rates of all stacks match the Requested allowable emission rates stated in Table 2-E.

Use this table to list stack emissions (requested allowable) from split and combined stacks. List Toxic Air Pollutants (TAPs) and Hazardous Air Pollutants (HAPs) in Table 2-I. List all fugitives that are associated with the normal, routine, and non-emergency operation of the facility. Unit and stack numbering must correspond throughout the application package. Refer to Table 2-E for instructions on use of the "-" symbol and on significant figures.

Stack No.	Serving Unit Number(s) from Table 2-A	NOx		CO		VOC		SOx		TSP		PM10		PM2.5		□ H_2S or □ Lead	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Totals:																	

Table 2-H: Stack Exit Conditions

Unit and stack numbering must correspond throughout the application package. Include the stack exit conditions for each unit that emits from a stack, including blowdown venting parameters and tank emissions. If the facility has multiple operating scenarios, complete a separate Table 2-H for each scenario and, for each, type scenario name here:

Stack Number	Serving Unit Number(s) from Table 2-A	Orientation (H-Horizontal V=Vertical)	Rain Caps (Yes or No)	Height Above Ground (ft)	Temp. (F)	Flow Rate		Moisture by Volume (%)	Velocity (ft/sec)	Inside Diameter (ft)
						(acfs)	(dscfs)			
TA3_3	TA-3-22-4	V	No	60	344	500			52.0	3.5
TA3_4	TA-3-22-5	V	No	60	344	500			52.0	3.5
TA3_2	TA-3-22-3	V	No	68	415	1,333			28.6	7.7
TA3_CT	TA-3-22-CT-1	V	No	59	921	7,362			73.6	11.3
TA3_HRSG	TA-3-22-CHP-1	V	No	110	170	3,718			58.4	9.0

Table 2-I: Stack Exit and Fugitive Emission Rates for HAPs and TAPs

In the table below, report the Potential to Emit for each HAP from each regulated emission unit listed in Table 2-A, only if the entire facility emits the HAP at a rate greater than or equal to one (1) ton per year For each such emission unit, HAPs shall be reported to the nearest 0.1 tpy. Each facility-wide Individual HAP total and the facility-wide Total HAPs shall be the sum of all HAP sources calculated to the nearest 0.1 ton per year. Per 20.2.72.403.A.1 NMAC, facilities not exempt [see 20.2.72.402.C NMAC] from TAP permitting shall report each TAP that has an uncontrolled emission rate in excess of its pounds per hour screening level specified in 20.2.72.502 NMAC. TAPs shall be reported using one more significant figure than the number of significant figures shown in the pound per hour threshold corresponding to the substance. Use the HAP nomenclature as it appears in Section 112 (b) of the 1990 CAAA and the TAP nomenclature as it listed in 20.2.72.502 NMAC. Include tank-flashing emissions estimates of HAPs in this table. For each HAP or TAP listed, fill all cells in this table with the emission numbers or a "-" symbol. A "-" symbol indicates that emissions of this pollutant are not expected or the pollutant is emitted in a quantity less than the threshold amounts described above.

Stack No.	Unit No.(s)	Total HAPs		Formaldehyde x HAP or □ TAP		Toluene x HAP or □ TAP		Xylene x HAP or □ TAP		Ammonia □ HAP or x TAP		Sulfuric Acid □ HAP or x TAP		Provide Pollutant Name Here □ HAP or □ TAP		Provide Pollutant Name Here □ HAP or □ TAP		Provide Pollutant Name Here □ HAP or □ TAP	
		lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr	lb/hr	ton/yr
Phase 1																			
TA3_S3	TA-3-22-4	0.2	0.3	3.0E-02	1.1E-02	2.4E-04	4.8E-04	-	-	-	-	4.0E-02	-						
TA3_S4	TA-3-22-5	0.2	0.3	3.0E-02	1.1E-02	2.4E-04	4.8E-04	-	-	-	-	4.0E-02	-						
TA3_S2	TA-3-22-3	0.4	0.1	7.6E-02	1.3E-02	5.9E-04	8.5E-05	-	-	-	-	0.1	-						
TA3_CT	TA-3-22-CT-1	0.3	0.7	0.2	0.5	3.8E-02	0.1	1.9E-02	4.6E-02	-	-	-	-						
Phase 1 Totals		1.0	1.3	0.3	0.5	3.9E-02	0.1	1.9E-02	4.6E-02	-	-	0.2	-						
Phase 3																			
TA3_S3	TA-3-22-4	0.2	0.6	3.0E-02	2.4E-02	2.4E-04	1.0E-03	-	-	-	-	4.0E-02	-						
TA3_S4	TA-3-22-5	0.2	0.6	3.0E-02	2.4E-02	2.4E-04	1.0E-03	-	-	-	-	4.0E-02	-						
TA3_HRSG	TA-3-22-CHP-1	0.2	1.0	0.1	0.4	4.9E-02	0.2	2.4E-02	0.1	5.3	-	0.3	-						
Phase 3 Totals		0.5	2.1	0.2	0.5	5.0E-02	0.2	2.4E-02	0.1	5.3	-	0.4	-						
Totals:		-	-	-	-	-	-	-	-	-	-	-	-						

Table 2-J: Fuel

Specify fuel characteristics and usage. Unit and stack numbering must correspond throughout the application package.

Unit No.	Fuel Type (low sulfur Diesel, ultra low sulfur diesel, Natural Gas, Coal, …)	Fuel Source: purchased commercial, pipeline quality natural gas, residue gas, raw/field natural gas, process gas (e.g. SRU tail gas) or other	Specify Units				
			Lower Heating Value	Hourly Usage	Annual Usage	% Sulfur	% Ash
Phase 1							
TA-3-22-3, 4 and 5	Distillate Fuel Oil	Purchased Commercial	137,000 Btu/gal	1.8 mGal/hr total	500.0 mGal/yr all	0.05%	-
TA-3-22-3, 4 and 5	Natural Gas	Pipeline Quality Natural Gas	931 Btu/scf	243.5 mscf/hr total	612 mmscf/yr all	0.75 gr/100 scf	-
TA-3-22-CT-1	Natural Gas	Pipeline Quality Natural Gas	931 Btu/scf	281.2 mscf/hr total	1,400 mmscf/yr all	0.75 gr/100 scf	-
Phase 3							
TA-3-22-4 and 5	Distillate Fuel Oil	Purchased Commercial	137,000 Btu/gal	1.8 mGal/hr total	500.0 mGal/yr all	0.05%	-
TA-3-22-4 and 5	Natural Gas	Pipeline Quality Natural Gas	931 Btu/scf	243.5 mscf/hr total	1,230 mmscf/yr all	0.75 gr/100 scf	-
TA-3-22-CHP-1	Natural Gas	Pipeline Quality Natural Gas	931 Btu/scf	366.5 mscf/hr total	3,215 mscf/hr total	0.75 gr/100 scf	-

Table 2-K: Liquid Data for Tanks Listed in Table 2-L

For each tank, list the liquid(s) to be stored in each tank. If it is expected that a tank may store a variety of hydrocarbon liquids, enter "mixed hydrocarbons" in the Composition column for that tank and enter the corresponding data of the most volatile liquid to be stored in the tank. If tank is to be used for storage of different materials, list all the materials in the "All Calculations" attachment, run the newest version of TANKS on each, and use the material with the highest emission rate to determine maximum uncontrolled and requested allowable emissions rate. The permit will specify the most volatile category of liquids that may be stored in each tank. Include appropriate tank-flashing modeling input data. Use additional sheets if necessary. Unit and stack numbering must correspond throughout the application package.

Tank No.	SCC Code	Material Name	Composition	Liquid Density (lb/gal)	Vapor Molecular Weight (lb/lb*mol)	Average Storage Conditions		Max Storage Conditions	
						Temperature (°F)	True Vapor Pressure (psia)	Temperature (°F)	True Vapor Pressure (psia)
TA-3-779	N/A	No. 2 Fuel Oil	Fuel Oil	7.4	130	59	<0.02	71	<0.02

Table 2-L: Tank Data

Include appropriate tank-flashing modeling input data. Use an addendum to this table for unlisted data categories. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.
See reference Table 2-L2. Note: 1.00 bbl = 10.159 M3 = 42.0 gal

Tank No.	Date Installed	Materials Stored	Seal Type (refer to Table 2-LR below)	Roof Type (refer to Table 2-LR below)	Capacity		Diameter (M)	Vapor Space (M)	Color (from Table VI-C)		Paint Condition (from Table VI-C)	Annual Throughput (gal/yr)	Turn-overs (per year)
					(bbl)	(M^3)			Roof	Shell			
TA-3-779	1999	No. 2 Fuel Oil	N/A	FX	5,455	867	10.7	N/A	LG	LG	Good	250,000	1.10

Table 2-L2: Liquid Storage Tank Data Codes Reference Table

Roof Type	Seal Type, Welded Tank Seal Type		Seal Type, Riveted Tank Seal Type		Roof, Shell Color	Paint Condition
FX: Fixed Roof	**Mechanical Shoe Seal**	**Liquid-mounted resilient seal**	**Vapor-mounted resilient seal**	**Seal Type**	**WH**: White	Good
IF: Internal Floating Roof	**A**: Primary only	**A**: Primary only	**A**: Primary only	**A**: Mechanical shoe, primary only	**AS**: Aluminum (specular)	Poor
EF: External Floating Roof	**B**: Shoe-mounted secondary	**B**: Weather shield	**B**: Weather shield	**B**: Shoe-mounted secondary	**AD**: Aluminum (diffuse)	
P: Pressure	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**C**: Rim-mounted secondary	**LG**: Light Gray	
					MG: Medium Gray	
					BL: Black	
					OT: Other (specify)	

Note: 1.00 bbl = 0.159 M^3 = 42.0 gal

Table 2-M: Materials Processed and Produced (Use additional sheets as necessary.)

Material Processed				Material Produced			
Description	**Chemical Composition**	**Phase (Gas, Liquid, or Solid)**	**Quantity (specify units)**	**Description**	**Chemical Composition**	**Phase**	**Quantity (specify units)**
N/A - No material is processed or produced							

Table 2-N: CEM Equipment

Enter Continuous Emissions Measurement (CEM) Data in this table. If CEM data will be used as part of a federally enforceable permit condition, or used to satisfy the requirements of a state or federal regulation, include a copy of the CEM's manufacturer specification sheet in the Information Used to Determine Emissions attachment. Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Stack No.	Pollutant(s)	Manufacturer	Model No.	Serial No.	Sample Frequency	Averaging Time	Range	Sensitivity	Accuracy
N/A - None present									

Table 2-O: Parametric Emissions Measurement Equipment

Unit and stack numbering must correspond throughout the application package. Use additional sheets if necessary.

Unit No.	Parameter/Pollutant Measured	Location of Measurement	Unit of Measure	Acceptable Range	Frequency of Maintenance	Nature of Maintenance	Method of Recording	Averaging Time
	N/A - None present							

Table 2-P: Greenhouse Gas Emissions

Applications submitted under 20.2.70, 20.2.72, & 20.2.74 NMAC are required to complete this Table. Power plants, Title V major sources, and PSD major sources must report and calculate all GHG emissions for each unit. Applicants must report potential emission rates in short tons per year (see Section 6.a for assistance). Include GHG emissions during Startup, Shutdown, and Scheduled Maintenance in this table. For minor source facilities that are not power plants, are not Title V, or are not PSD, there are three options for reporting GHGs 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHG as a second separate unit; OR 3) check the following box ☐ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

		CO_2 ton/yr	N_2O ton/yr	CH_4 ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]									**Total GHG** Mass Basis ton/yr[4]	**Total CO_2e** ton/yr[5]
Unit No.	**GWPs [1]**	**1**	**298**	**25**	**22,800**	**footnote 3**										
Phase 1																
TA-3-22-4	**mass GHG**	37336	7.2E-02	0.7	-	-									37337	37375
	CO_2e	37336	21	18	-	-									-	-
TA-3-22-5	**mass GHG**	37336	7.2E-02	0.7	-	-									37337	37375
	CO_2e	37336	21	18	-	-									-	-
TA-3-22-3	**mass GHG**	92154	0.2	1.8	-	-									92156	92251
	CO_2e	92154	53.1	43.8	-	-									-	-
TA-3-22-CT-1	**mass GHG**	144074	0.3	3	-	-									144077	144223
	CO_2e	144074	81	68	-	-									-	-
TA-3-22-AHTR1	**mass GHG**	638	1.2E-03	1.2.E-02	-	-									638	639
	CO_2e	638	0	0.3	-	-									-	-
TA-3-22-AHTR2	**mass GHG**	638	1.2.E-03	1.2E-02	-	-									638	639
	CO_2e	638	0	0.3	-	-									-	-
TA-3-22-CHTR1	**mass GHG**	27	5.1E-05	5.1E-04	-	-									27	27
	CO_2e	27	1.5E-02	1.3E-02	-	-									-	-
TA-3-22-CHTR2	**mass GHG**	27	5.1E-05	5.1E-04	-	-									27	27
	CO_2e	27	1.5E-02	1.3E-02	-	-									-	-
TA-3-22-CHTR3	**mass GHG**	27	5.1E-05	5.1E-04	-	-									27	27
	CO_2e	27	1.5E-02	1.3E-02	-	-									-	-
	mass GHG	0	0	0	-	-									-	-
	CO_2e	0	0	0	-	-									-	-
Total	**mass GHG**	312258	0.6	6	-	-									312265	312584
	CO_2e	312258	178	148	-	-									-	-

Table 2-P: Greenhouse Gas Emissions

Applications submitted under 20.2.70, 20.2.72, & 20.2.74 NMAC are required to complete this Table. Power plants, Title V major sources, and PSD major sources must report and calculate all GHG emissions for each unit. Applicants must report potential emission rates in short tons per year (see Section 6.a for assistance). Include GHG emissions during Startup, Shutdown, and Scheduled Maintenance in this table. For minor source facilities that are not power plants, are not Title V, or are not PSD, there are three options for reporting GHGs 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHG as a second separate unit; OR 3) check the following box ☐ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

		CO_2 ton/yr	N_2O ton/yr	CH_4 ton/yr	SF_6 ton/yr	PFC/HFC ton/yr[2]									**Total GHG** Mass Basis ton/yr[4]	**Total CO_2e** ton/yr[5]
Unit No.	**GWPs [1]**	**1**	**298**	**25**	**22,800**	**footnote 3**										
Phase 3																
TA-3-22-4	**mass GHG**	37336	7.2E-02	0.7	-	-									37337	37375
	CO_2e	37336	21	18	-	-									-	-
TA-3-22-5	**mass GHG**	37336	7.2E-02	0.7	-	-									37337	37375
	CO_2e	37336	21	18	-	-									-	-
TA-3-22-FGHTR	**mass GHG**	359	6.8E-04	6.8E-03	-	-									359	359
	CO_2e	359	0.2	0.2	-	-									-	-
TA-3-22-CHP-1	**mass GHG**	187779	0.4	4	-	-									187783	187981
	CO_2e	187779	106	96	-	-									-	-
TA-3-22-AHTR1	**mass GHG**	638	1.2E-03	1.2E-02	-	-									638	639
	CO_2e	638	0	0.3	-	-									-	-
TA-3-22-AHTR2	**mass GHG**	638	1.2E-03	1.2E-02	-	-									638	639
	CO_2e	638	0	0.3	-	-									-	-
TA-3-22-CHTR1	**mass GHG**	27	5.1E-05	5.1E-04	-	-									27	27
	CO_2e	27	1.5E-02	1.3E-02	-	-									-	-
TA-3-22-CHTR2	**mass GHG**	27	5.1E-05	5.1E-04	-	-									27	27
	CO_2e	27	1.5E-02	1.3E-02	-	-									-	-
TA-3-22-CHTR3	**mass GHG**	27	5.1E-05	5.1E-04	-	-									27	27
	CO_2e	27	1.5E-02	1.3E-02	-	-									-	-
	mass GHG	0	0	0	-	-									-	-
	CO_2e	0	0	0	-	-									-	-
Total	**mass GHG**	264168	0.5	5	-	-									264173	264450
	CO_2e	264168	150	133	-	-									-	-

[1] **GWP** (Global Warming Potential): Applicants must use the most current GWPs codified in Table A-1 of 40 CFR part 98. GWPs are subject to change, therefore, applicants need to check 40 CFR 98 to confirm GWP values.

[2] For **HFCs** or **PFCs** describe the specific HFC or PFC compound and use a separate column for each individual compound.

[3] For each new compound, enter the appropriate GWP for each HFC or PFC compound from Table A-1 in 40 CFR 98.

[4] Green house gas emissions on a **mass basis** is the ton per year green house gas emission before adjustment with its GWP.

[5] **CO_2e** means Carbon Dioxide Equivalent and is calculated by multiplying the TPY mass emissions of the green house gas by its GWP.

Section 3

Application Summary

The **Application Summary** shall include a brief description of the facility and its process, the type of permit application, the applicable regulation (i.e. 20.2.72.200.A.X, or 20.2.73 NMAC) under which the application is being submitted, and any air quality permit numbers associated with this site. If this facility is to be collocated with another facility, provide details of the other facility including permit number(s). In case of a revision or modification to a facility, provide the lowest level regulatory citation (i.e. 20.2.72.219.B.1.d NMAC) under which the revision or modification is being requested. Also describe the proposed changes from the original permit, how the proposed modification will affect the facility's operations and emissions, de-bottlenecking impacts, and changes to the facility's major/minor status (both PSD & Title V).

Routine or predictable emissions during Startup, Shutdown, and Maintenance (SSM): Provide an overview of how SSM emissions are accounted for in this application. Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on SSM emissions.

The purpose of this requested modification to the existing New Source Review permit for the LANL TA-3 Power Plant is to allow for the permanent shut down of existing boilers TA-3-22-1, TA-3-22-2 and TA-3-22-3 each rated at a capacity of 178.5 MMBtu/hr and the construction and installation of two new auxiliary boilers (TA-3-22-4 and TA-3-22-5) each rated at a capacity of 72.3 MMBtu/hr as well as convert the existing combustion turbine, TA-3-22-CT-1, to a Combined Heat and Power (CHP) system capable of generating both steam and electricity for the site. The infrastructure within the main power plant, consisting of the existing three boilers and three turbines, is aging and becoming less reliable for electrical and steam generation. It is our goal to meet more of our future electrical generation and steam needs with the CHP. It is a newer, more efficient unit and results in lower air emissions.

The TA-3 Power Plant boilers and turbine together are currently limited operationally by annual fuel restrictions to ensure no one pollutant exceeds an emission rate greater than 100 tons per year making the plant a minor source for PSD permitting purposes. With this modification, the plant will keep its designation as a minor source for PSD.

This application requests increasing the existing CGTG fuel limit to allow more operational hours for the newer and more efficient CHP and increasing the existing fuel restriction for the existing boilers due to the anticipated usage of the new auxiliary boilers. This revision to existing fuel restrictions maintains the plant's minor source status. The modification also requests allowing the CHP to operate in a range of 50% to 100% load.

Start-up, shut down and maintenance (SSM) emissions are provided in the emission calculations section of the application and in the permit application forms. SSM emissions are only shown for the combined cycle due to there being no shut down emissions associated with the new auxiliary boilers. Start-up emissions for the boilers are accounted for in the normal operation emission rates already shown. Maintenance emissions for the boilers are also accounted for in the normal operation emission rates already shown.

Phase 1 – Auxiliary Boiler Installation, Comfort Heater and Makeup Air Heater Installation

During the period of time when the new boilers are being constructed, the existing boilers will operate as currently permitted. Once the two new auxiliary boilers are declared fully operational, existing boilers TA-3-22-1 and TA-3-22-2 will be permanently shut down and removed from service. TA-3-22-3 will be kept temporarily as a hot standby. Also, comfort heaters and makeup air heaters will be installed in the building housing the auxiliary boilers. These heaters will be permitted as exempt sources. Once the CHP plant is fully operational, then TA-3-22-3 will be permanently shut down.

Phase 2 – Steam/Condensate Line Refurbishment, Steam to Hot Water Conversion

Steam and condensate lines will be repaired and upgraded from the steam plant through TA-3 in order to provide comfort heating. It is anticipated that this phase of the project will not generate air emissions.

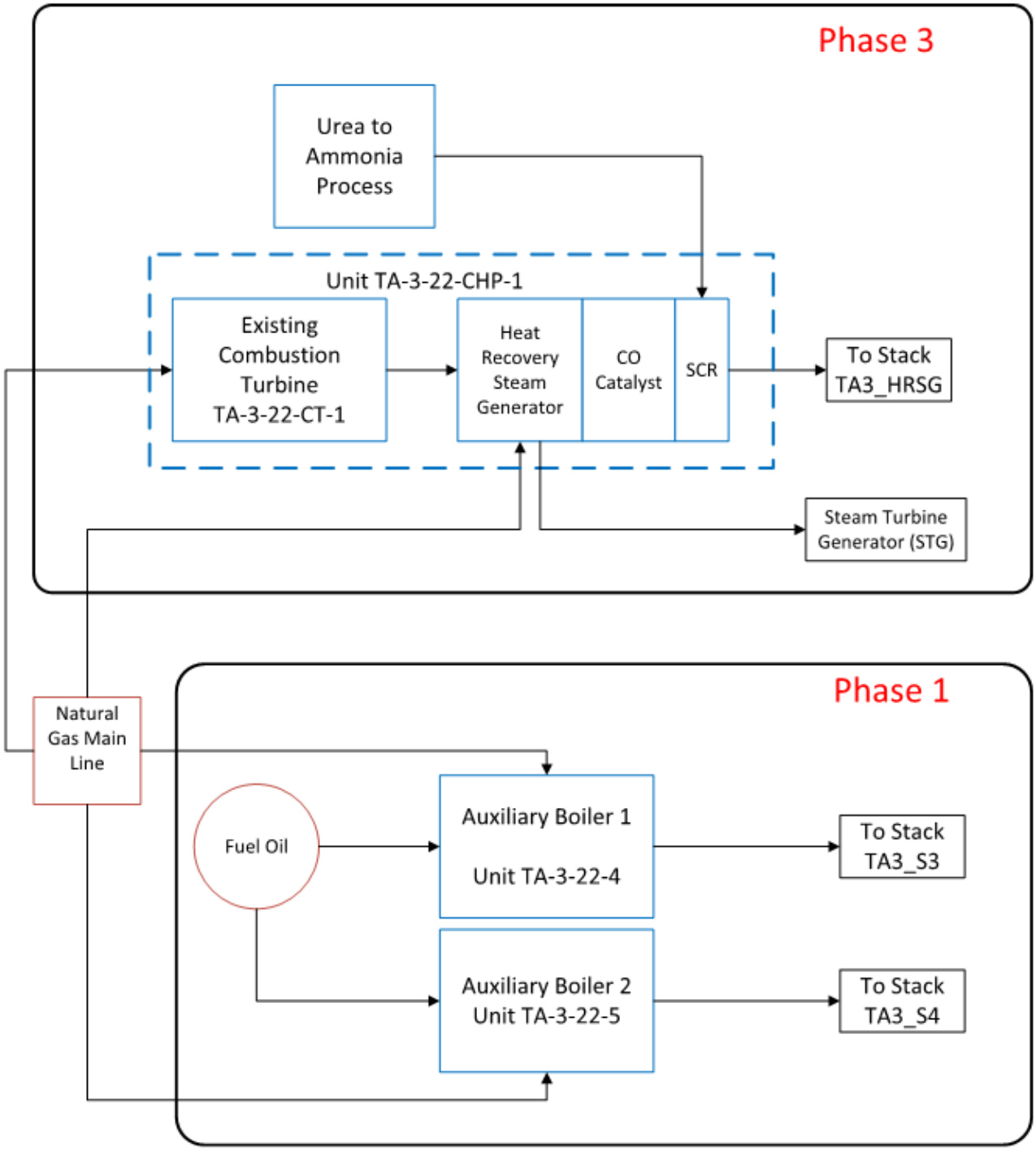
Phase 3 – Combined Heat and Power Conversion, Fuel Gas Heater Installation

The modification also includes the construction and installation of a Heat Recovery Steam Generator (HRSG), which will be installed on the exhaust of the existing Combustion Gas Turbine Generator (CGTG), TA-3-22-CT-1. This will eliminate the existing CGTG stack. All CGTG emissions are emitted through the new HRSG stack. This modification will allow the exhaust gas from the CGTG to create steam inside the HRSG. A duct burner inside the HRSG is used to increase the temperature of the exhaust gas if needed. This modification will change the CGTG from a simple cycle operation to a Combined Heat and Power (CHP) operation. Also associated with the new CHP will be a new Steam Turbine Generator (STG) that can take steam from the HRSG and generate additional electricity. The new auxiliary boilers will not be able to generate steam for running the new STG. Also, the fuel gas heater, which is rated at 0.7 MMBTU/hr, will be installed on the HP gas line. The fuel gas heater will be permitted as an exempt source.

Section 4

Process Flow Sheet

A **process flow sheet** and/or block diagram indicating the individual equipment, all emission points and types of control applied to those points. The unit numbering system should be consistent throughout this application.



Section 5

Plot Plan Drawn To Scale

A **plot plan drawn to scale** showing emissions points, roads, structures, tanks, and fences of property owned, leased, or under direct control of the applicant. This plot plan must clearly designate the restricted area as defined in UA1, Section 1-D.12. The unit numbering system should be consistent throughout this application.

Section 6

All Calculations

Show all calculations used to determine both the hourly and annual controlled and uncontrolled emission rates. All calculations shall be performed keeping a minimum of three significant figures. Document the source of each emission factor used (if an emission rate is carried forward and not revised, then a statement to that effect is required). If identical units are being permitted and will be subject to the same operating conditions, submit calculations for only one unit and a note specifying what other units to which the calculations apply. All formulas and calculations used to calculate emissions must be submitted. The "Calculations" tab in the UA2 has been provided to allow calculations to be linked to the emissions tables. Add additional "Calc" tabs as needed. If the UA2 or other spread sheets are used, all calculation spread sheet(s) shall be submitted electronically in Microsoft Excel compatible format so that formulas and input values can be checked. Format all spread sheets and calculations such that the reviewer can follow the logic and verify the input values. Define all variables. If calculation spread sheets are not used, provide the original formulas with defined variables. Additionally, provide subsequent formulas showing the input values for each variable in the formula. All calculations, including those calculations are imbedded in the Calc tab of the UA2 portion of the application, the printed Calc tab(s), should be submitted under this section.

Tank Flashing Calculations: The information provided to the AQB shall include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., NOI, permit, or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis. If Hysis is used, all relevant input parameters shall be reported, including separator pressure, gas throughput, and all other relevant parameters necessary for flashing calculation.

SSM Calculations: It is the applicant's responsibility to provide an estimate of SSM emissions or to provide justification for not doing so. In this Section, provide emissions calculations for Startup, Shutdown, and Routine Maintenance (SSM) emissions listed in the Section 2 SSM and/or Section 22 GHG Tables and the rational for why the others are reported as zero (or left blank in the SSM/GHG Tables). Refer to "Guidance for Submittal of Startup, Shutdown, Maintenance Emissions in Permit Applications (http://www.env.nm.gov/aqb/permit/app_form.html) for more detailed instructions on calculating SSM emissions. If SSM emissions are greater than those reported in the Section 2, Requested Allowables Table, modeling may be required to ensure compliance with the standards whether the application is NSR or Title V. Refer to the Modeling Section of this application for more guidance on modeling requirements.

Glycol Dehydrator Calculations: The information provided to the AQB shall include the manufacturer's maximum design recirculation rate for the glycol pump. If GRI-Glycalc is used, the full input summary report shall be included as well as a copy of the gas analysis that was used.

Road Calculations: Calculate fugitive particulate emissions and enter haul road fugitives in Tables 2-A, 2-D and 2-E for:

1. If you transport raw material, process material and/or product into or out of or within the facility and have PER emissions greater than 0.5 tpy.
2. If you transport raw material, process material and/or product into or out of the facility more frequently than one round trip per day.

Significant Figures:

A. All emissions standards are deemed to have at least two significant figures, but not more than three significant figures.

B. At least 5 significant figures shall be retained in all intermediate calculations.

C. In calculating emissions to determine compliance with an emission standard, the following rounding off procedures shall be used:

(1) If the first digit to be discarded is less than the number 5, the last digit retained shall not be changed;

(2) If the first digit discarded is greater than the number 5, or if it is the number 5 followed by at least one digit other than the number zero, the last figure retained shall be increased by one unit; **and**

(3) If the first digit discarded is exactly the number 5, followed only by zeros, the last digit retained shall be rounded upward if it is an odd number, but no adjustment shall be made if it is an even number.

(4) The final result of the calculation shall be expressed in the units of the standard.

Control Devices: In accordance with 20.2.72.203.A(3) and (8) NMAC, 20.2.70.300.D(5)(b) and (e) NMAC, and 20.2.73.200.B(7) NMAC, the permittee shall report all control devices and list each pollutant controlled by the control device

regardless if the applicant takes credit for the reduction in emissions. The applicant can indicate in this section of the application if they chose to not take credit for the reduction in emission rates. For notices of intent submitted under 20.2.73 NMAC, only uncontrolled emission rates can be considered to determine applicability unless the state or federal Acts require the control. This information is necessary to determine if federally enforceable conditions are necessary for the control device, and/or if the control device produces its own regulated pollutants or increases emission rates of other pollutants.

See Form UA-2 and calculations following this sheet for more information.

Criteria Pollutant Emission Estimates - Phase 1 - Aux. Boilers

Operational Data

Fuel				
Natural Gas				
	Heat Content (HHV)	1030	BTU/SCF	
	Sulfur Content	0.75	grains/ 100 SCF	
#2 Fuel Oil				
	Heat Content	137,000	BTU/GAL	
	Sulfur Content	0.05	wt%	
Aux. Boilers (each)				Proposed Annual Fuel Limit (all aux. boilers)
Maximum Heat Input - gas (derated for altitude)		72.3	mmBTU/hr	
Maximum Fuel Consumption - gas		70.2	mSCF/hr	562 mmSCF/yr
Maximum Heat Input - oil (derated for altitude)		69.4	mmBTU/hr	
Maximum Fuel Consumption - oil		0.5	mGAL/hr	50 mGAL/yr

Notes

1 The maximum heat input for each boiler of 72.3 MMBtu/hr while firing natural gas is the derated value provided by the vendor at 7,500 feet.
2 The maximum heat input for each boiler of 69.4 MMBtu/hr while firing #2 fuel oil is the derated value provided by the vendor at 7,500 feet.

Emission Factors

	NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Boiler - gas (lb/mmBTU)	0.0105	0.0375	0.0025	0.0036	0.0075	0.0075	0.0075
Boiler - oil (lb/mmBTU)	0.0900	0.0390	0.0480	0.0014	0.0236	0.0236	0.0236

Notes

Emission Factors - Boilers - Natural Gas

1 NO_X - Emission factor was provided by the vendor.
2 CO - Emission factor was provided by the vendor.
3 SO_X - Calculated based upon sulfur content of natural gas of 0.75 gr S/100 scf.
4 VOC - Emission factor was provided by the vendor.
5 TSP, PM_{10} and $PM_{2.5}$ - Emission factor provided by the vendor.
Assuming emission factor is the same for all particulate sizes.

Emission Factors - Boilers - #2 Fuel Oil

1 NO_X - Emission factor was provided by the vendor.
2 CO - Emission factor was provided by the vendor.
3 SO_X - Calculated based upon sulfur content of 0.05% wt.
4 VOC - Emission factor was provided by the vendor.
5 TSP, PM_{10} and $PM_{2.5}$ - Emission factor provided by the vendor.
Assuming emission factor is the same for all particulate sizes.

Maximum Emissions

		NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Boiler (each) gas	lb/hr	0.8	2.7	0.18	0.3	0.5	0.5	0.5
	tpy	3.3	11.9	0.8	1.1	2.4	2.4	2.4
Boiler (each) oil	lb/hr	6.2	2.7	3.3	0.1	1.6	1.6	1.6
	tpy	27.3	11.8	14.6	0.4	7.2	7.2	7.2
Totals	lb/hr	12.5	5.4	6.7	0.5	3.3	3.3	3.3
	tpy	54.7	23.8	29.2	2.3	14.3	14.3	14.3

Notes

1 Maximum emissions calculated above assuming 8,760 hours per year and no control efficiencies are applied.

2 For total hourly and annual emission criteria pollutant rates, the maximum hourly and annual pollutant rate from either firing natural gas or fuel oil was added into the total, not both cases.

Requested Allowable Emissions

		NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Boiler (each) gas	lb/hr	0.8	2.7	0.2	0.3	0.5	0.5	0.5
	tpy	1.5	5.4	0.4	0.5	1.1	1.1	1.1
Boiler (each) oil	lb/hr	6.2	2.7	3.3	0.1	1.6	1.6	1.6
	tpy	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Totals	lb/hr	12.5	5.4	6.7	0.5	3.3	3.3	3.3
	tpy	3.3	11.0	0.9	1.0	2.2	2.2	2.2

Notes

1 Requested allowable emissions reflect and natural gas/fuel oil restrictions on boilers.

2 For total hourly and annual emission criteria pollutant rates, the maximum hourly pollutant rate from either firing natural gas or fuel oil was added into the total, not both cases.

Hazardous Air Pollutant Emission Calculations

HAP Emission Estimates - Boilers - Natural Gas

HAP		Emission Factor		Emission Estimate lb/hr	tpy
Organics		lb/MMscf		(each boiler)	(all boilers)
	POM	8.82E-05		6.2E-06	2.5E-05
	Benzene	2.10E-03		1.5E-04	5.9E-04
	Dichlorobenzene	1.20E-03		8.4E-05	3.4E-04
	Formaldehyde	7.50E-02		5.3E-03	2.1E-02
	Hexane	1.80E+00		1.3E-01	5.1E-01
	Naphthalene	6.10E-04		4.3E-05	1.7E-04
	Toluene	3.40E-03		2.4E-04	9.6E-04
Metals					
	Arsenic	2.00E-04		1.4E-05	5.6E-05
	Beryllium	1.20E-05		8.4E-07	3.4E-06
	Cadmium	1.10E-03		7.7E-05	3.1E-04
	Chromium	1.40E-03		9.8E-05	3.9E-04
	Cobalt	8.40E-05		5.9E-06	2.4E-05
	Lead	5.00E-04		3.5E-05	1.4E-04
	Manganese	3.80E-04		2.7E-05	1.1E-04
	Mercury	2.60E-04		1.8E-05	7.3E-05
	Nickel	2.10E-03		1.5E-04	5.9E-04
	Selenium	2.40E-05		1.7E-06	6.7E-06
			total	1.3E-01	0.5
POM					
	2-Methylnaphthalene	2.40E-05			
	3-Methylchloranthrene	1.80E-06			
	7,12-Dimethylbenz(a)anthracene	1.60E-05			
	Acenaphthene	1.80E-06			
	Acenaphthylene	1.80E-06			
	Anthracene	2.40E-06			
	Benz(a)anthracene	1.80E-06		POM estimates above	
	Benzo(a)pyrene	1.20E-06		under Organics.	
	Benzo(b)fluoranthene	1.80E-06			
	Benzo(g,h,i)perylene	1.20E-06			
	Benzo(k)fluoranthene	1.80E-06			
	Chrysene	1.80E-06			
	Dibenzo(a,h)anthracene	1.20E-06			
	Fluoranthene	3.00E-06			
	Fluorene	2.80E-06			
	Indeno(1,2,3-cd)pyrene	1.80E-06			
	Phenanathrene	1.70E-05			
	Pyrene	5.00E-06			
	total	8.82E-05			

Notes

1 All emission factors from AP-42, 7/98, Section 1.4 - Natural Gas Combustion, Tables 1.4-3 and 1.4-4.

2 Hourly values based on maximum hourly fuel capacity of each boiler.

3 Annual tpy values based on annual hours of operation.

HAP Emission Estimates - Boilers - #2 Fuel Oil

HAP	Emission Factor lb/1000 gal		Emission Estimate lb/hr (each boiler)	Emission Estimate tpy (all boilers)
Organics				
Formaldehyde	4.80E-02		2.4E-02	1.2E-03
POM	3.30E-03		1.7E-03	8.0E-05
Metals				
Arsenic	5.48E-04		2.8E-04	1.3E-05
Beryllium	4.11E-04		2.1E-04	1.0E-05
Cadmium	4.11E-04		2.1E-04	1.0E-05
Chromium	4.11E-04		2.1E-04	1.0E-05
Lead	1.23E-03		6.2E-04	3.0E-05
Manganese	8.22E-04		4.2E-04	2.0E-05
Mercury	4.11E-04		2.1E-04	1.0E-05
Nickel	4.11E-04		2.1E-04	1.0E-05
Selenium	2.06E-03		1.0E-03	5.0E-05
		total	2.9E-02	1.4E-03

Notes

1 All emission factors from AP-42, 9/98, Section 1.3, Fuel Oil Combustion, Tables 1.3-8 and 1.3-10, for distillate oil.
2 Hourly values based on maximum hourly fuel capacity of each boiler.
3 Annual tpy values based on maximum annual hours of operation.

Dispersion Model Input Emission Rates

Emission Estimates - lb/hr

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$
Boiler (each) - gas	0.8	2.7	0.2	0.5	0.5	0.5
Boiler (each) - oil	6.2	2.7	3.3	1.6	1.6	1.6

Emission Estimates - Boilers - g/s

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$
Stack 1	0.79	0.34	0.42	0.21	0.21	0.21
Stack 2	0.79	0.34	0.42	0.21	0.21	0.21

Notes

1 For boilers, selected higher value (shaded) of natural gas versus oil.
2 To convert lb/hr to g/s, multiply by 0.126.

Criteria Pollutant Emission Estimates - Phase 1 - #3 Boiler (Existing Source)

Operational Data

Fuel				
Natural Gas				
	Heat Content (HHV)	1030	BTU/SCF	
	Sulfur Content	0.75	grains/ 100 SCF	
#2 Fuel Oil				
	Heat Content	137,000	BTU/GAL	
	Sulfur Content	0.05	wt%	
#3 Boiler				Proposed Annual Fuel Limit
Maximum Heat Input - gas (derated for altitude)		178.5	mmBTU/hr	
Maximum Fuel Consumption - gas		173.3	mSCF/hr	50.0 mmSCF/yr
Maximum Fuel Consumption - oil		1.3	mGAL/hr	450.0 mGAL/yr

Emission Factors

	NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Boiler - gas (lb/mSCF)	0.0586	0.0404	0.0061	0.0056	0.0077	0.0077	0.0077
Boiler - oil (lb/mGAL)	8.6400	5.0000	7.4000	0.2000	3.3000	2.3000	1.5500

Notes

Emission Factors - Boiler - Natural Gas

1 NOx - The factor is the average value from FGR September 2002 compliance test results.

2 CO - From AP-42,1995,Section 1.4 -Natural Gas Combustion.Older AP-42 value closer to compliance test values.

3 SOx - 2 gr S/100 scf, or 20,000 gr S/MMscf x lb/7000 gr x 2 lbs SO2/1 lb S.

4 VOC, PM, PM_{10} and $PM_{2.5}$ - From AP-42, 7/98, Section 1.4 - Natural Gas Combustion.

5 Emission factors adjusted by ratio of average LANL HHV 1030 to AP-42 value of 1020 (1030/1020 = 1.01).

Emission Factors - Boilers - #2 Fuel Oil

1 NOx -Factor assumes similar reduction for oil as test results natural gas.

2 CO, VOC, PM, PM_{10} and $PM_{2.5}$- From AP-42, 9/98, Section 1.3 - Fuel Oil Combustion.

3 SOx - From AP-42,9/98,Section 1.3 -Fuel Oil Combustion,Table 1.3-1 corrected by EPA on 4/28/00,using 0.05% S.

Maximum Emissions

			NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Boiler - gas		lb/hr	28.2	7.0	1.1	1.0	1.3	1.3	1.3
		tpy	123.6	30.7	4.6	4.3	5.8	5.8	5.8
Boiler - oil		lb/hr	31.3	6.5	9.6	0.3	4.3	3.0	2.0
		tpy	137.0	28.5	42.2	1.1	18.8	13.1	8.8
	Totals	lb/hr	31.3	7.0	9.6	1.0	4.3	3.0	2.0
		tpy	137.0	30.7	42.2	4.3	18.8	13.1	8.8

Notes

1 Maximum emissions calculated above assuming 8,760 hours per year and no control efficiencies are applied.

2 For total hourly and annual emission criteria pollutant rates, the maximum hourly and annual pollutant rate from either firing natural gas or fuel oil was added into the total, not both cases.

Requested Allowable Emissions

			NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Boiler - gas		lb/hr	10.2	7.0	1.1	1.0	1.3	1.3	1.3
		tpy	1.5	1.0	0.2	0.1	0.2	0.2	0.2
Boiler - oil		lb/hr	11.3	6.5	9.6	0.3	4.3	3.0	2.0
		tpy	1.9	1.1	1.7	0.05	0.7	0.5	0.3
	Totals	lb/hr	11.3	7.0	9.6	1.0	4.3	3.0	2.0
		tpy	3.4	2.1	1.8	0.2	0.9	0.7	0.5

Notes

1 Requested allowable emissions reflect and natural gas/fuel oil restrictions on boilers.

2 For total hourly and annual emission criteria pollutant rates, the maximum hourly pollutant rate from either firing natural gas or fuel oil was added into the total, not both cases.

Hazardous Air Pollutant Emission Calculations

HAP Emission Estimates - Boilers - Natural Gas

HAP	Emission Factor lb/MMscf	Emission Estimate lb/hr	Emission Estimate tpy
Organics			
POM	8.82E-05	1.5E-05	2.2E-06
Benzene	2.10E-03	3.6E-04	5.3E-05
Dichlorobenzene	1.20E-03	2.1E-04	3.0E-05
Formaldehyde	7.50E-02	1.3E-02	1.9E-03
Hexane	1.80E+00	3.1E-01	4.5E-02
Naphthalene	6.10E-04	1.1E-04	1.5E-05
Toluene	3.40E-03	5.9E-04	8.5E-05
Metals			
Arsenic	2.00E-04	3.5E-05	5.0E-06
Beryllium	1.20E-05	2.1E-06	3.0E-07
Cadmium	1.10E-03	1.9E-04	2.8E-05
Chromium	1.40E-03	2.4E-04	3.5E-05
Cobalt	8.40E-05	1.5E-05	2.1E-06
Lead	5.00E-04	8.7E-05	1.3E-05
Manganese	3.80E-04	6.6E-05	9.5E-06
Mercury	2.60E-04	4.5E-05	6.5E-06
Nickel	2.10E-03	3.6E-04	5.3E-05
Selenium	2.40E-05	4.2E-06	6.0E-07
	total	3.3E-01	4.7E-02
POM			
2-Methylnaphthalene	2.40E-05		
3-Methylchloranthrene	1.80E-06		
7,12-Dimethylbenz(a)anthracene	1.60E-05		
Acenaphthene	1.80E-06		
Acenaphthylene	1.80E-06		
Anthracene	2.40E-06		
Benz(a)anthracene	1.80E-06	POM estimates above	
Benzo(a)pyrene	1.20E-06	under Organics.	
Benzo(b)fluoranthene	1.80E-06		
Benzo(g,h,i)perylene	1.20E-06		
Benzo(k)fluoranthene	1.80E-06		
Chrysene	1.80E-06		
Dibenzo(a,h)anthracene	1.20E-06		
Fluoranthene	3.00E-06		
Fluorene	2.80E-06		
Indeno(1,2,3-cd)pyrene	1.80E-06		
Phenanathrene	1.70E-05		
Pyrene	5.00E-06		
total	8.82E-05		

Notes

1 All emission factors from AP-42, 7/98, Section 1.4 - Natural Gas Combustion, Tables 1.4-3 and 1.4-4.

2 Hourly values based on maximum hourly fuel capacity of each boiler.

3 Annual tpy values based on annual hours of operation.

HAP Emission Estimates - Boilers - #2 Fuel Oil

HAP	Emission Factor lb/1000 gal		Emission Estimate lb/hr	tpy
Organics				
Formaldehyde	4.80E-02		6.3E-02	1.1E-02
POM	3.30E-03		4.3E-03	7.4E-04
Metals				
Arsenic	5.48E-04		7.1E-04	1.2E-04
Beryllium	4.11E-04		5.4E-04	9.2E-05
Cadmium	4.11E-04		5.4E-04	9.2E-05
Chromium	4.11E-04		5.4E-04	9.2E-05
Lead	1.23E-03		1.6E-03	2.8E-04
Manganese	8.22E-04		1.1E-03	1.8E-04
Mercury	4.11E-04		5.4E-04	9.2E-05
Nickel	4.11E-04		5.4E-04	9.2E-05
Selenium	2.06E-03		2.7E-03	4.6E-04
		total	7.6E-02	1.3E-02

Notes

1 All emission factors from AP-42, 9/98, Section 1.3, Fuel Oil Combustion, Tables 1.3-8 and 1.3-10, for distillate oil.
2 Hourly values based on maximum hourly fuel capacity of each boiler.
3 Annual tpy values based on maximum annual hours of operation.

Dispersion Model Input Emission Rates

Emission Estimates - lb/hr

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$
Boiler (each) - gas	10.2	7.0	1.1	1.3	1.3	1.3
Boiler (each) - oil	11.3	6.5	9.6	4.3	3.0	2.0

Emission Estimates - Boilers - g/s

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$
Stack 1	1.42	0.88	1.21	0.54	0.38	0.25

Notes

1 For boilers, selected higher value (shaded) of natural gas versus oil.
2 To convert lb/hr to g/s, multiply by 0.126.

Criteria Pollutant Emission Estimates - Phases 1 & 3 - Heaters (Exempt Source)

Operational Data

Fuel

Natural Gas

Heat Content (HHV)	1030	BTU/SCF
Sulfur Content	0.75	grains/ 100 SCF

Makeup Air Heater

Maximum Heat Input (derated)	1.2	mmBTU/hr
Maximum Fuel Consumption - gas	1.2	mSCF/hr

Comfort Heater

Maximum Heat Input (derated)	0.1	mmBTU/hr
Maximum Fuel Consumption - gas	0.1	mSCF/hr

Emission Factors

	NO_x	CO	SO_x	VOC	TSP	PM_{10}	$PM_{2.5}$
Makeup Air Heater - gas (lb/mmBTU)	0.0005	0.0031	0.0006	0.0054	0.0075	0.0075	0.0075
Comfort Heater - gas (lb/mmBTU)	0.0980	0.0824	0.0006	0.0054	0.0075	0.0075	0.0075

Notes

Emission Factors - Makeup Air Heaters - Natural Gas

1 NO_x - Emission factor calculated using information obtained from manufacturer cut sheet. Concentration listed on sheet converted to 3% O_2.
2 CO - Emission factor calculated using information obtained from manufacturer cut sheet. Concentration listed on sheet converted to 3% O_2.
3 SO_x - From AP-42, 1995, Section 1.4 -Natural Gas Combustion.
4 VOC - From AP-42, 1995, Section 1.4 -Natural Gas Combustion.
5 TSP, PM_{10} and $PM_{2.5}$ - From AP-42, 1995, Section 1.4 -Natural Gas Combustion. Assuming emission factor is the same for all particulate sizes.

Emission Factors - Comfort Heaters - Natural Gas

1 NO_x - From AP-42, 1995, Section 1.4 -Natural Gas Combustion.
2 CO - From AP-42, 1995, Section 1.4 -Natural Gas Combustion.
3 SO_x - From AP-42, 1995, Section 1.4 -Natural Gas Combustion.
4 VOC - From AP-42, 1995, Section 1.4 -Natural Gas Combustion.
5 TSP, PM_{10} and $PM_{2.5}$ - From AP-42, 1995, Section 1.4 -Natural Gas Combustion. Assuming emission factor is the same for all particulate sizes.

Maximum Allowable Emissions - Makeup Air Heaters

		NO_x	CO	SO_x	VOC	TSP	PM_{10}	$PM_{2.5}$
Makeup Air Heater (each)	lb/hr	6.4E-04	3.9E-03	7.3E-04	6.7E-03	9.3E-03	9.3E-03	9.3E-03
	tpy	2.8E-03	1.7E-02	3.2E-03	2.9E-02	4.1E-02	4.1E-02	4.1E-02
Totals	lb/hr	1.3E-03	7.8E-03	1.5E-03	1.3E-02	1.9E-02	1.9E-02	1.9E-02
	tpy	5.6E-03	3.4E-02	6.4E-03	5.9E-02	8.1E-02	8.1E-02	8.1E-02

Maximum Allowable Emissions - Comfort Heaters

		NO_x	CO	SO_x	VOC	TSP	PM_{10}	$PM_{2.5}$
Comfort Heater (each)	lb/hr	5.1E-03	4.3E-03	3.2E-05	2.8E-04	3.9E-04	3.9E-04	3.9E-04
	tpy	2.3E-02	1.9E-02	1.4E-04	1.2E-03	1.7E-03	1.7E-03	1.7E-03
Totals	lb/hr	1.5E-02	1.3E-02	9.5E-05	8.5E-04	1.2E-03	1.2E-03	1.2E-03
	tpy	6.8E-02	5.7E-02	4.1E-04	3.7E-03	5.1E-03	5.1E-03	5.1E-03

Hazardous Air Pollutant Emission Calculations

HAP Emission Estimates - Makeup Air Heaters (Exempt Sources) - Natural Gas

HAP	Emission Factor lb/MMscf		Emission Estimate lb/hr (each heater)	Emission Estimate tpy (all heaters)
Organics				
POM	8.82E-05		1.1E-07	9.3E-07
Benzene	2.10E-03		2.5E-06	2.2E-05
Dichlorobenzene	1.20E-03		1.5E-06	1.3E-05
Formaldehyde	7.50E-02		9.1E-05	7.9E-04
Hexane	1.80E+00		2.2E-03	1.9E-02
Naphthalene	6.10E-04		7.4E-07	6.5E-06
Toluene	3.40E-03		4.1E-06	3.6E-05
Metals				
Arsenic	2.00E-04		2.4E-07	2.1E-06
Beryllium	1.20E-05		1.5E-08	1.3E-07
Cadmium	1.10E-03		1.3E-06	1.2E-05
Chromium	1.40E-03		1.7E-06	1.5E-05
Cobalt	8.40E-05		1.0E-07	8.9E-07
Lead	5.00E-04		6.0E-07	5.3E-06
Manganese	3.80E-04		4.6E-07	4.0E-06
Mercury	2.60E-04		3.1E-07	2.8E-06
Nickel	2.10E-03		2.5E-06	2.2E-05
Selenium	2.40E-05		2.9E-08	2.5E-07
		total	2.3E-03	2.0E-02
POM				
2-Methylnaphthalene	2.40E-05			
3-Methylchloranthrene	1.80E-06			
7,12-Dimethylbenz(a)anthracene	1.60E-05			
Acenaphthene	1.80E-06			
Acenaphthylene	1.80E-06			
Anthracene	2.40E-06			
Benz(a)anthracene	1.80E-06		POM estimates above	
Benzo(a)pyrene	1.20E-06		under Organics.	
Benzo(b)fluoranthene	1.80E-06			
Benzo(g,h,i)perylene	1.20E-06			
Benzo(k)fluoranthene	1.80E-06			
Chrysene	1.80E-06			
Dibenzo(a,h)anthracene	1.20E-06			
Fluoranthene	3.00E-06			
Fluorene	2.80E-06			
Indeno(1,2,3-cd)pyrene	1.80E-06			
Phenanathrene	1.70E-05			
Pyrene	5.00E-06			
total	8.82E-05			

Notes

1 All emission factors from AP-42, 7/98, Section 1.4 - Natural Gas Combustion, Tables 1.4-3 and 1.4-4.

2 Hourly values based on maximum hourly fuel capacity of the heater.

3 Annual tpy values based on annual hours of operation.

Hazardous Air Pollutant Emission Calculations

HAP Emission Estimates - Comfort Heaters (Exempt Sources) - Natural Gas

HAP	Emission Factor lb/MMscf	Emission Estimate lb/hr (each heater)	Emission Estimate tpy (all heaters)
Organics			
POM	8.82E-05	4.6E-09	6.1E-08
Benzene	2.10E-03	1.1E-07	1.4E-06
Dichlorobenzene	1.20E-03	6.3E-08	8.3E-07
Formaldehyde	7.50E-02	3.9E-06	5.2E-05
Hexane	1.80E+00	9.5E-05	1.2E-03
Naphthalene	6.10E-04	3.2E-08	4.2E-07
Toluene	3.40E-03	1.8E-07	2.3E-06
Metals			
Arsenic	2.00E-04	1.1E-08	1.4E-07
Beryllium	1.20E-05	6.3E-10	8.3E-09
Cadmium	1.10E-03	5.8E-08	7.6E-07
Chromium	1.40E-03	7.4E-08	9.7E-07
Cobalt	8.40E-05	4.4E-09	5.8E-08
Lead	5.00E-04	2.6E-08	3.4E-07
Manganese	3.80E-04	2.0E-08	2.6E-07
Mercury	2.60E-04	1.4E-08	1.8E-07
Nickel	2.10E-03	1.1E-07	1.4E-06
Selenium	2.40E-05	1.3E-09	1.7E-08
	total	9.9E-05	1.3E-03
POM			
2-Methylnaphthalene	2.40E-05		
3-Methylchloranthrene	1.80E-06		
7,12-Dimethylbenz(a)anthracene	1.60E-05		
Acenaphthene	1.80E-06		
Acenaphthylene	1.80E-06		
Anthracene	2.40E-06		
Benz(a)anthracene	1.80E-06	POM estimates above	
Benzo(a)pyrene	1.20E-06	under Organics.	
Benzo(b)fluoranthene	1.80E-06		
Benzo(g,h,i)perylene	1.20E-06		
Benzo(k)fluoranthene	1.80E-06		
Chrysene	1.80E-06		
Dibenzo(a,h)anthracene	1.20E-06		
Fluoranthene	3.00E-06		
Fluorene	2.80E-06		
Indeno(1,2,3-cd)pyrene	1.80E-06		
Phenanathrene	1.70E-05		
Pyrene	5.00E-06		
total	8.82E-05		

Notes

1 All emission factors from AP-42, 7/98, Section 1.4 - Natural Gas Combustion, Tables 1.4-3 and 1.4-4.

2 Hourly values based on maximum hourly fuel capacity of the heater.

3 Annual tpy values based on annual hours of operation.

Criteria Pollutant Emission Estimates - Phase 3 - Aux. Boilers

Operational Data

Fuel				
Natural Gas				
	Heat Content (HHV)	1030	BTU/SCF	
	Sulfur Content	0.75	grains/ 100 SCF	
#2 Fuel Oil				
	Heat Content	137,000	BTU/GAL	
	Sulfur Content	0.05	wt%	
Aux. Boilers (each)				Proposed Annual Fuel Limit (all aux. boilers)
Maximum Heat Input - gas (derated for altitude)		72.3	mmBTU/hr	
Maximum Fuel Consumption - gas		70.2	mSCF/hr	1230 mmSCF/yr
Maximum Heat Input - oil (derated for altitude)		69.4	mmBTU/hr	
Maximum Fuel Consumption - oil		0.5	mGAL/hr	500 mGAL/yr

Notes

1 The maximum heat input for each boiler of 72.3 MMBtu/hr while firing natural gas is the derated value provided by the vendor at 7,500 feet.
2 The maximum heat input for each boiler of 69.4 MMBtu/hr while firing #2 fuel oil is the derated value provided by the vendor at 7,500 feet.

Emission Factors

	NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Boiler - gas (lb/mmBTU)	0.0105	0.0375	0.0025	0.0036	0.0075	0.0075	0.0075
Boiler - oil (lb/mmBTU)	0.0900	0.0390	0.0480	0.0014	0.0236	0.0236	0.0236

Notes

Emission Factors - Boilers - Natural Gas

1 NO_X - Emission factor was provided by the vendor.
2 CO - Emission factor was provided by the vendor.
3 SO_X - Calculated based upon sulfur content of natural gas of 0.75 gr S/100 scf.
4 VOC - Emission factor was provided by the vendor.
5 TSP, PM_{10} and $PM_{2.5}$ - Emission factor provided by the vendor.
Assuming emission factor is the same for all particulate sizes.

Emission Factors - Boilers - #2 Fuel Oil

1 NO_X - Emission factor was provided by the vendor.
2 CO - Emission factor was provided by the vendor.
3 SO_X - Calculated based upon sulfur content of 0.05% wt.
4 VOC - Emission factor was provided by the vendor.
5 TSP, PM_{10} and $PM_{2.5}$ - Emission factor provided by the vendor.
Assuming emission factor is the same for all particulate sizes.

Maximum Emissions

		NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Boiler (each) gas	lb/hr	0.8	2.7	0.2	0.3	0.5	0.5	0.5
	tpy	3.3	11.9	0.8	1.1	2.4	2.4	2.4
Boiler (each) oil	lb/hr	6.2	2.7	3.3	0.1	1.6	1.6	1.6
	tpy	27.3	11.8	14.6	0.4	7.2	7.2	7.2
Totals	lb/hr	12.5	5.4	6.7	0.5	3.3	3.3	3.3
	tpy	54.7	23.8	29.2	2.3	14.3	14.3	14.3

Notes

1 Maximum emissions calculated above assuming 8,760 hours per year and no control efficiencies are applied.

2 For total hourly and annual emission criteria pollutant rates, the maximum hourly and annual pollutant rate from either firing natural gas or fuel oil was added into the total, not both cases.

Requested Allowable Emissions

		NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Boiler (each) gas	lb/hr	0.8	2.7	0.2	0.3	0.5	0.5	0.5
	tpy	3.3	11.9	0.8	1.1	2.4	2.4	2.4
Boiler (each) oil	lb/hr	6.2	2.7	3.3	0.1	1.6	1.6	1.6
	tpy	0.1	6.5E-02	0.1	2.3E-03	3.9E-02	3.9E-02	3.9E-02
Totals	lb/hr	12.5	5.4	6.7	0.5	3.3	3.3	3.3
	tpy	7.0	23.9	1.7	2.3	4.8	4.8	4.8

Notes

1 Requested allowable emissions reflect and natural gas/fuel oil restrictions on boilers.

2 For total hourly and annual emission criteria pollutant rates, the maximum hourly pollutant rate from either firing natural gas or fuel oil was added into the total, not both cases.

Hazardous Air Pollutant Emission Calculations

HAP Emission Estimates - Boilers - Natural Gas

HAP	Emission Factor	Emission Estimate	
		lb/hr	tpy
Organics	lb/MMscf	(each boiler)	(all boilers)
POM	8.82E-05	6.2E-06	5.4E-05
Benzene	2.10E-03	1.5E-04	1.3E-03
Dichlorobenzene	1.20E-03	8.4E-05	7.4E-04
Formaldehyde	7.50E-02	5.3E-03	4.6E-02
Hexane	1.80E+00	1.3E-01	1.1E+00
Naphthalene	6.10E-04	4.3E-05	3.8E-04
Toluene	3.40E-03	2.4E-04	2.1E-03
Metals			
Arsenic	2.00E-04	1.4E-05	1.2E-04
Beryllium	1.20E-05	8.4E-07	7.4E-06
Cadmium	1.10E-03	7.7E-05	6.8E-04
Chromium	1.40E-03	9.8E-05	8.6E-04
Cobalt	8.40E-05	5.9E-06	5.2E-05
Lead	5.00E-04	3.5E-05	3.1E-04
Manganese	3.80E-04	2.7E-05	2.3E-04
Mercury	2.60E-04	1.8E-05	1.6E-04
Nickel	2.10E-03	1.5E-04	1.3E-03
Selenium	2.40E-05	1.7E-06	1.5E-05
	total	1.3E-01	1.2
POM			
2-Methylnaphthalene	2.40E-05		
3-Methylchloranthrene	1.80E-06		
7,12-Dimethylbenz(a)anthracene	1.60E-05		
Acenaphthene	1.80E-06		
Acenaphthylene	1.80E-06		
Anthracene	2.40E-06		
Benz(a)anthracene	1.80E-06	POM estimates above	
Benzo(a)pyrene	1.20E-06	under Organics.	
Benzo(b)fluoranthene	1.80E-06		
Benzo(g,h,i)perylene	1.20E-06		
Benzo(k)fluoranthene	1.80E-06		
Chrysene	1.80E-06		
Dibenzo(a,h)anthracene	1.20E-06		
Fluoranthene	3.00E-06		
Fluorene	2.80E-06		
Indeno(1,2,3-cd)pyrene	1.80E-06		
Phenanathrene	1.70E-05		
Pyrene	5.00E-06		
total	8.82E-05		

Notes

1 All emission factors from AP-42, 7/98, Section 1.4 - Natural Gas Combustion, Tables 1.4-3 and 1.4-4.

2 Hourly values based on maximum hourly fuel capacity of each boiler.

3 Annual tpy values based on annual hours of operation.

HAP Emission Estimates - Boilers - #2 Fuel Oil

HAP	Emission Factor	Emission Estimate	
		lb/hr	tpy
Organics	lb/1000 gal	(each boiler)	(all boilers)
Formaldehyde	4.80E-02	2.4E-02	1.2E-03
POM	3.30E-03	1.7E-03	8.0E-05
Metals			
Arsenic	5.48E-04	2.8E-04	1.3E-05
Beryllium	4.11E-04	2.1E-04	1.0E-05
Cadmium	4.11E-04	2.1E-04	1.0E-05
Chromium	4.11E-04	2.1E-04	1.0E-05
Lead	1.23E-03	6.2E-04	3.0E-05
Manganese	8.22E-04	4.2E-04	2.0E-05
Mercury	4.11E-04	2.1E-04	1.0E-05
Nickel	4.11E-04	2.1E-04	1.0E-05
Selenium	2.06E-03	1.0E-03	5.0E-05
	total	2.9E-02	1.4E-03

Notes

1 All emission factors from AP-42, 9/98, Section 1.3, Fuel Oil Combustion, Tables 1.3-8 and 1.3-10, for distillate oil.
2 Hourly values based on maximum hourly fuel capacity of each boiler.
3 Annual tpy values based on maximum annual hours of operation.

Dispersion Model Input Emission Rates

Emission Estimates - lb/hr

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$
Boiler (each) - gas	0.8	2.7	0.2	0.5	0.5	0.5
Boiler (each) - oil	6.2	2.7	3.3	1.6	1.6	1.6

Emission Estimates - Boilers - g/s

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$
Stack 1	0.79	0.34	0.42	0.21	0.21	0.21
Stack 2	0.79	0.34	0.42	0.21	0.21	0.21

Notes

1 For boilers, selected higher value (shaded) of natural gas versus oil.
2 To convert lb/hr to g/s, multiply by 0.126.

Criteria Pollutant Emission Estimates - Phase 3 - Combustion Turbine + HRSG (Combined Heat and Power)

Operational Data

Fuel			
Natural Gas			
	Heat Content (HHV)	1030 BTU/SCF	
	Sulfur Content	0.75 grains/ 100 SCF	
Combined Heat and Power (CHP)			Proposed Annual Fuel Limit (CHP)
Maximum Fuel Consumption		366.5 mSCF/hr	3215 mmSCF/yr

Notes

1 The maximum fuel consumption for the CHP is based on the maximum firing rate and higher heating value (Case Numbers #7 & #51) taken from "LANL Estimated Emission Data Sheet - August 30, 2017.pdf".

Maximum Emissions

			NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$	NH_3
CHP		lb/hr	35.5	87.0	0.9	4.1	6.8	6.8	6.8	5.3
		tpy	155.5	381.1	3.9	18.1	29.8	29.8	29.8	-
	Totals	lb/hr	35.5	87.0	0.9	4.1	6.8	6.8	6.8	5.3
		tpy	155.5	381.1	3.9	18.1	29.8	29.8	29.8	-

Notes

1 Maximum emissions calculated above assuming 8,760 hours per year and no control efficiencies are applied.
2 CHP emissions taken from "LANL Estimated Emission Data Sheet - August 30, 2017.pdf". Maximum firing rate cases (Case Numbers 7 & 51) were used.
3 Pollutant control device efficiencies for CHP's Selective Catalytic Reactor (SCR) and CO catalyst are as follows:
NO_X: 60%, CO: 90%, VOC: 30%
4 For total hourly and annual emission criteria pollutant rates, the maximum hourly and annual pollutant rate from either firing natural gas or fuel oil was added into the total, not both cases.

Requested Allowable Emissions

			NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$	NH_3
CHP		lb/hr	14.2	8.7	0.9	2.9	6.8	6.8	6.8	5.3
		tpy	62.2	38.1	3.9	12.7	29.8	29.8	29.8	-
	Totals	lb/hr	14.2	8.7	0.9	2.9	6.8	6.8	6.8	5.3
		tpy	62.2	38.1	3.9	12.7	29.8	29.8	29.8	-

Notes

1 CHP emissions taken from "LANL Estimated Emission Data Sheet - August 30, 2017.pdf". Maximum firing rate cases (Case Numbers 7 & 51) were used.
2 Requested allowable emissions reflect and natural gas/fuel oil restrictions on boilers.
3 Requested allowable emissions reflect NO_X, CO and VOC controls and natural gas restrictions on CHP.
4 For total hourly and annual emission criteria pollutant rates, the maximum hourly pollutant rate from either firing natural gas or fuel oil was added into the total, not both cases.

Hazardous Air Pollutant Emission Calculations

HAP Emission Estimates - CHP - Natural Gas

HAP	Emission Factor		Emission Estimate	
	lb/MMBtu	lb/MMscf	lb/hr	tpy
Organics				
1,3-Butadiene	4.30E-07	4.43E-04	1.6E-04	7.1E-04
Acetaldehyde	4.00E-05	4.12E-02	1.5E-02	6.6E-02
Acrolein	6.40E-06	6.59E-03	2.4E-03	1.1E-02
Benzene	1.20E-05	1.24E-02	4.5E-03	2.0E-02
Ethylbenzene	3.20E-05	3.30E-02	1.2E-02	5.3E-02
Formaldehyde	-	-	1.0E-01	4.4E-01
Naphthalene	1.30E-06	1.34E-03	4.9E-04	2.1E-03
PAH	2.20E-06	2.27E-03	8.3E-04	3.6E-03
Propylene oxide	2.90E-05	2.99E-02	1.1E-02	4.8E-02
Toluene	1.30E-04	1.34E-01	4.9E-02	2.1E-01
Xylenes	6.40E-05	6.59E-02	2.4E-02	1.1E-01
		total	2.2E-01	0.96

Notes

1 All emission factors (except formaldehyde) from AP-42, 4/2000, Section 3-1, Natural Gas Turbines, Table 3.1-3.
2 Hourly value for formaldehyde taken from "LANL Estimated Emission Data Sheet - August 30, 2017.pdf". Maximum firing rate cases (Case Numbers 7 & 51) were used.
3 Hourly values based on maximum hourly fuel consumption at 100% load.
4 Annual values based on annual hours of operation.
5 No emission reduction for emission control equipment taken for HAP emission estimates.

Dispersion Model Input Emission Rates

Emission Estimates - lb/hr

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$	NH_3
CHP	14.2	8.7	0.9	6.8	6.8	6.8	5.3

Emission Estimates - CHP - g/s

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$	NH_3
CHP	1.79	1.10	0.11	0.86	0.86	0.86	0.67

Notes

1 For boilers, selected higher value (shaded) of natural gas versus oil.
2 To convert lb/hr to g/s, multiply by 0.126.

Startup, Shutdown and Maintenance (SSM) Emission Estimates - Phase 3 - CHP

Number of Start Stop Events per year	100							
	NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$	units
Number of Start Operation (Ignition to 100% load, lasts 30 min.)	100	100	100	100	100	100	100	per year
PTE emissions per event	5.5	128.0	8.0E-02	14.7	1.7	1.7	1.7	lbs/event
hourly PTE emissions	11.0	256.0	0.2	29.4	3.3	3.3	3.3	lbs/hr
annual PTE emissions	0.3	6.4	4.0E-03	0.7	0.1	0.1	0.1	tons/year
	NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$	units
Number of Stop Operation (50% Load to Fuel Cut-Off, lasts 12 min.)	100	100	100	100	100	100	100	per year
PTE emissions per event	2.0	60.8	2.0E-02	7.0	0.6	0.6	0.6	lbs/event
hourly PTE emissions	10.0	304.0	0.1	35.0	3.2	3.2	3.2	lbs/hr
annual PTE emissions	0.1	3.0	1.0E-03	0.4	3.2E-02	3.2E-02	3.2E-02	tons/year

	NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$	units
Totals:	11.0	304.0	0.2	35.0	3.3	3.3	3.3	lbs/hr
	0.4	9.4	5.0E-03	1.1	0.1	0.1	0.1	tons/year

Notes

1 The SSM calculation is provided by the vendor.

Dispersion Model Input Emission Rates

SSM Emission Estimates - CHP - lb/hr

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$
Start Operation	11.0	256.0	1.6E-01	3.3	3.3	3.3
Stop Operation	10.0	304.0	1.0E-01	3.2	3.2	3.2

SSM Emission Estimates - CHP - g/s

	NO_X	CO	SO_X	TSP	PM_{10}	$PM_{2.5}$
CHP	1.4	38.3	2.0E-02	0.4	0.4	0.4

Notes

1 Selected higher value (shaded) of start versus stop operation.

2 To convert lb/hr to g/s, multiply by 0.126.

Criteria Pollutant Emission Estimates - Phase 3 - Fuel Gas Heater (Exempt Source)

Operational Data

Fuel

Natural Gas

Heat Content (HHV)	1030	BTU/SCF
Sulfur Content	0.75	grains/ 100 SCF

Fuel Gas Heater

Maximum Heat Input (derated)	0.7	mmBTU/hr
Maximum Fuel Consumption - gas	0.7	mSCF/hr

Emission Factors

	NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Heater - gas (lb/mmBTU)	0.1500	0.0906	0.0021	0.0500	0.0001	0.0001	0.0001

Notes

Emission Factors - Heater - Natural Gas

1 NO_X - Emission factor was provided by the vendor.

2 CO - Emission factor was provided by the vendor.

3 SO_X - 0.75 gr S/100 scf, or 75,000 gr S/MMscf x lb/7000 gr x 2 lbs SO_2/1 lb S. Converted to lb/mmBTU using HHV of natural gas.

4 VOC - Emission factor was provided by the vendor.

5 TSP, PM_{10} and $PM_{2.5}$ - Emission factor provided by the vendor.
Assuming emission factor is the same for all particulate sizes.

Maximum Allowable Emissions

		NO_X	CO	SO_X	VOC	TSP	PM_{10}	$PM_{2.5}$
Heater	lb/hr	0.11	0.06	1.46E-03	3.50E-02	7.00E-05	7.00E-05	7.00E-05
	tpy	0.46	0.28	6.38E-03	0.15	3.07E-04	3.07E-04	3.07E-04

Hazardous Air Pollutant Emission Calculations

HAP Emission Estimates - Fuel Gas Heater (Exempt Source) - Natural Gas

HAP	Emission Factor lb/MMscf		Emission Estimate lb/hr	tpy
Organics				
POM	8.82E-05		6.0E-08	2.6E-07
Benzene	2.10E-03		1.4E-06	6.3E-06
Dichlorobenzene	1.20E-03		8.2E-07	3.6E-06
Formaldehyde	7.50E-02		5.1E-05	2.2E-04
Hexane	1.80E+00		1.2E-03	5.4E-03
Naphthalene	6.10E-04		4.1E-07	1.8E-06
Toluene	3.40E-03		2.3E-06	1.0E-05
Metals				
Arsenic	2.00E-04		1.4E-07	6.0E-07
Beryllium	1.20E-05		8.2E-09	3.6E-08
Cadmium	1.10E-03		7.5E-07	3.3E-06
Chromium	1.40E-03		9.5E-07	4.2E-06
Cobalt	8.40E-05		5.7E-08	2.5E-07
Lead	5.00E-04		3.4E-07	1.5E-06
Manganese	3.80E-04		2.6E-07	1.1E-06
Mercury	2.60E-04		1.8E-07	7.7E-07
Nickel	2.10E-03		1.4E-06	6.3E-06
Selenium	2.40E-05		1.6E-08	7.1E-08
		total	1.3E-03	5.6E-03
POM				
2-Methylnaphthalene	2.40E-05			
3-Methylchloranthrene	1.80E-06			
7,12-Dimethylbenz(a)anthracene	1.60E-05			
Acenaphthene	1.80E-06			
Acenaphthylene	1.80E-06			
Anthracene	2.40E-06			
Benz(a)anthracene	1.80E-06		POM estimates above	
Benzo(a)pyrene	1.20E-06		under Organics.	
Benzo(b)fluoranthene	1.80E-06			
Benzo(g,h,i)perylene	1.20E-06			
Benzo(k)fluoranthene	1.80E-06			
Chrysene	1.80E-06			
Dibenzo(a,h)anthracene	1.20E-06			
Fluoranthene	3.00E-06			
Fluorene	2.80E-06			
Indeno(1,2,3-cd)pyrene	1.80E-06			
Phenanathrene	1.70E-05			
Pyrene	5.00E-06			
total	8.82E-05			

Notes

1 All emission factors from AP-42, 7/98, Section 1.4 - Natural Gas Combustion, Tables 1.4-3 and 1.4-4.

2 Hourly values based on maximum hourly fuel capacity of the heater.

3 Annual tpy values based on annual hours of operation.

Pollutant Emission Estimates - Toxic Air Pollutant (TAP) Sulfuric Acid Formation from Combustion Sources

Operational Data

Fuel		
Natural Gas		
Heat Content (HHV)	1030	BTU/SCF
#2 Fuel Oil		
Heat Content	137,000	BTU/GAL
#3 Boiler		
Maximum Heat Input - gas (derated for altitude)	178.5	mmBTU/hr
Maximum Fuel Consumption - gas	173.3	mSCF/hr
Maximum Fuel Consumption - oil	1.3	mGAL/hr
Aux. Boilers (each)		
Maximum Heat Input - gas (derated for altitude)	72.3	mmBTU/hr
Maximum Fuel Consumption - gas	70.2	mSCF/hr
Maximum Heat Input - oil (derated for altitude)	69.4	mmBTU/hr
Maximum Fuel Consumption - oil	0.5	mGAL/hr

Notes

Calculation Method - H_2SO_4 Formation from Combustion - CHP, Boilers

1 Calculation method taken from, "An Updated Method for Estimating Total Sulfuric Acid Emissions from Stationary Power Plants", Southern Company Generation and Energy Marketing, March 2003.

Formula used for the boiler calculations is as follows:

$E1 = K*F1*F2*E2$

where:

E1= total H_2SO_4 released from combustion, lbs/hr
K= Molecular weight ratio between H_2SO_4 and SO_2 = 1.153
F1= Fuel Impact Factor (Natural Gas = #2 Fuel Oil = 0.01)
F2= Technology Impact Factor = 1
E2= Sulfur Dioxide emissions, lbs/hr

Formula used for the boiler calculations is as follows:

$E1 = K*F1*F2*E2$

where:

E1= total H_2SO_4 released from combustion, lbs/hr
K= Molecular weight ratio between H_2SO_4 and SO_2 = 1.153
F1= Fuel Impact Factor (Natural Gas = 0.01)
F2= Technology Impact Factor = 1
E2= Sulfur Dioxide emissions, lbs/hr

Assuming sulfuric acid formation from fuel gas heater, comfort heaters and air preheaters to be negligible.

H_2SO_4 Emissions

		SO_X	H_2SO_4
Aux. Boiler (each) gas	lb/hr	0.2	2.1E-03
Aux. Boiler (each) oil	lb/hr	3.3	3.8E-02
#3 Boiler gas	lb/hr	1.1	1.2E-02
#3 Boiler oil	lb/hr	9.6	1.1E-01
CHP*	lb/hr	0.9	3.0E-01

* Note: Sulfuric acid hourly rate for CHP provided by the vendor.

Total Sulfuric Acid: 0.5 lbs/hr

Section 6.a

Green House Gas Emissions

(Submitting under 20.2.70, 20.2.72 20.2.74 NMAC)

Title V (20.2.70 NMAC), Minor NSR (20.2.72 NMAC), and PSD (20.2.74 NMAC) applicants must estimate and report greenhouse gas (GHG) emissions to verify the emission rates reported in the public notice, determine applicability to 40 CFR 60 Subparts, and to evaluate Prevention of Significant Deterioration (PSD) applicability. GHG emissions that are subject to air permit regulations consist of the sum of an aggregate group of these six greenhouse gases: carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Calculating GHG Emissions:

1. Calculate the ton per year (tpy) GHG mass emissions and GHG CO_2e emissions from your facility.
2. GHG mass emissions are the sum of the total annual tons of greenhouse gases without adjusting with the global warming potentials (GWPs). GHG CO_2e emissions are the sum of the mass emissions of each individual GHG multiplied by its GWP found in Table A-1 in 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Emissions from routine or predictable start up, shut down, and maintenance must be included.
4. Report GHG mass and GHG CO_2e emissions in Table 2-P of this application. Emissions are reported in **short** tons per year and represent each emission unit's Potential to Emit (PTE).
5. All Title V major sources, PSD major sources, and all power plants, whether major or not, must calculate and report GHG mass and CO2e emissions for each unit in Table 2-P.
6. For minor source facilities that are not power plants, are not Title V, and are not PSD there are three options for reporting GHGs in Table 2-P: 1) report GHGs for each individual piece of equipment; 2) report all GHGs from a group of unit types, for example report all combustion source GHGs as a single unit and all venting GHGs as a second separate unit; 3) or check the following □ By checking this box, the applicant acknowledges the total CO2e emissions are less than 75,000 tons per year.

Sources for Calculating GHG Emissions:

- Manufacturer's Data
- AP-42 Compilation of Air Pollutant Emission Factors at http://www.epa.gov/ttn/chief/ap42/index.html
- EPA's Internet emission factor database WebFIRE at http://cfpub.epa.gov/webfire/
- 40 CFR 98 Mandatory Green House Gas Reporting except that tons should be reported in short tons rather than in metric tons for the purpose of PSD applicability.
- API Compendium of Greenhouse Gas Emissions Methodologies for the Oil and Natural Gas Industry. August 2009 or most recent version.
- Sources listed on EPA's NSR Resources for Estimating GHG Emissions at http://www.epa.gov/nsr/clean-air-act-permitting-greenhouse-gases:

Global Warming Potentials (GWP):
Applicants must use the Global Warming Potentials codified in Table A-1 of the most recent version of 40 CFR 98 Mandatory Greenhouse Gas Reporting. The GWP for a particular GHG is the ratio of heat trapped by one unit mass of the GHG to that of one unit mass of CO_2 over a specified time period.

"Greenhouse gas" for the purpose of air permit regulations is defined as the aggregate group of the following six gases: carbon dioxide, nitrous oxide, methane, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. **(20.2.70.7 NMAC, 20.2.74.7 NMAC).** You may also find GHGs defined in 40 CFR 86.1818-12(a).

Metric to Short Ton Conversion:
Short tons for GHGs and other regulated pollutants are the standard unit of measure for PSD and title V permitting programs. 40 CFR 98 Mandatory Greenhouse Reporting requires metric tons.
1 metric ton = 1.10231 short tons (per Table A-2 to Subpart A of Part 98 – Units of Measure Conversions)

See calculations following this sheet for more information.

Pollutant Emission Estimates - Greenhouse Gas (GHG) Emissions

Operational Data

Fuel		
Natural Gas		
Heat Content (HHV)	1030	BTU/SCF
#2 Fuel Oil		
Heat Content	137,000	BTU/GAL
Aux. Boilers (each)		
Maximum Heat Input - gas (derated for altitude)	72.3	mmBTU/hr
Maximum Fuel Consumption - gas	70.2	mSCF/hr
Maximum Heat Input - oil (derated for altitude)	69.4	mmBTU/hr
Maximum Fuel Consumption - oil	0.5	mGAL/hr
#3 Boiler		
Maximum Heat Input - gas (derated for altitude)	178.5	mmBTU/hr
Maximum Fuel Consumption - gas	173.3	mSCF/hr
Maximum Fuel Consumption - oil	1.3	mGAL/hr
Fuel Gas Heater		
Maximum Heat Input	0.7	mmBTU/hr
Maximum Fuel Consumption - gas	0.7	mSCF/hr
Makeup Air Heater		
Maximum Heat Input	1.2	mmBTU/hr
Maximum Fuel Consumption - gas	1.2	mSCF/hr
Comfort Heater		
Maximum Heat Input	0.1	mmBTU/hr
Maximum Fuel Consumption - gas	0.1	mSCF/hr
Combustion Turbine		
Maximum Fuel Consumption	281.2	mSCF/hr
Combined Heat and Power (CHP)		
Maximum Fuel Consumption	366.5	mSCF/hr

Emission Factors

	CO_2	CH_4	N_2O
Natural Gas (lb/mmBTU)	116.9761	0.0022	0.0002
#2 Fuel Oil (lb/mmBTU)	163.0522	0.0066	0.0013

Global Warming Potentials

	CO_2	CH_4	N_2O	SF_6	PFC/HFC
Carbon dioxide equivalent (CO_2e)	1	25	298	22800	see 40 CFR 98

Notes

Emission Factors - GHG - Natural Gas & #2 Fuel Oil

1 Emission factor values (in kg CO_2/mmBTU) taken from Table C-1, 40 CFR Part 98 and converted to lb CO_2/mmBTU.

2 Emission factor values (in kg/mmBTU) taken from Table C-2, 40 CFR Part 98 and converted to lb/mmBTU.

Emission Factors - GHG - Global Warming Potentials (GWPs)

1 GWPs taken from Table A-1, 40 CFR Part 98.

Phase 1 GHG (CO_2e) Emissions from Combustion Sources

	CO_2e (stpy)
Aux. Boiler (each) gas	37103
Aux. Boiler (each) oil	272
Existing Boiler gas	91550
Existing Boiler oil	701
CT	144223
Makeup Air Heaters	1278
Comfort Heaters	81
Totals	312584

Phase 3 GHG (CO_2e) Emissions from Combustion Sources

	CO_2e (stpy)
Aux. Boiler (each) gas	37103
Aux. Boiler (each) oil	272
CHP	187973
Fuel Gas Heater	359
Makeup Air Heaters	1278
Comfort Heaters	81
Start Stop CHP	8
Totals	264450

Section 7

Information Used To Determine Emissions

Information Used to Determine Emissions shall include the following:

- √ If manufacturer data are used, include specifications for emissions units and control equipment, including control efficiencies specifications and sufficient engineering data for verification of control equipment operation, including design drawings, test reports, and design parameters that affect normal operation.
- ☐ If test data are used, include a copy of the complete test report. If the test data are for an emissions unit other than the one being permitted, the emission units must be identical. Test data may not be used if any difference in operating conditions of the unit being permitted and the unit represented in the test report significantly effect emission rates.
- √ If the most current copy of AP-42 is used, reference the section and date located at the bottom of the page. Include a copy of the page containing the emissions factors, and clearly mark the factors used in the calculations.
- ☐ If an older version of AP-42 is used, include a complete copy of the section.
- ☐ If an EPA document or other material is referenced, include a complete copy.
- ☐ Fuel specifications sheet.
- ☐ If computer models are used to estimate emissions, include an input summary (if available) and a detailed report, and a disk containing the input file(s) used to run the model. For tank-flashing emissions, include a discussion of the method used to estimate tank-flashing emissions, relative thresholds (i.e., permit or major source (NSPS, PSD or Title V)), accuracy of the model, the input and output from simulation models and software, all calculations, documentation of any assumptions used, descriptions of sampling methods and conditions, copies of any lab sample analysis.

The following information is enclosed:

- The estimated emission spreadsheet pages for the CHP dated August 30, 2017 provided by Siemens.
- The estimated emission spreadsheet pages for the auxiliary boilers dated November 20, 2017 provided by Siemens.
- A copy of "An Updated Method for Estimating Total Sulfuric Acid Emissions from Stationary Power Plants", March 2003, Southern Company Generation and Energy Marketing.
- Selected pages from AP-42 Sections 1.3 Fuel Oil Combustion, 1.4 Natural Gas Combustion, and Section 3.1 Stationary Gas Turbines.
- Tables C-1 and C-2 from Code of Federal Regulations (CFR), Title 40, Part 98, Mandatory Greenhouse Gas Reporting, Subpart C.

SIEMENS

US1485 - Los Alamos National Laboratory

SGT-A30 RB (fka RB 211) - Estimated Exhaust Stack Emissions

Combined Cycle

"LANL Estimated Emission Data Sheet - August 30, 2017.pdf

Estimated Emissions Data Sheet
August 30, 2017

CASE NUMBER	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
LOADPOINT NUMBER	**020**	**021**	**022**	**023**	**024**	**025**	**026**	**027**	**028**	**029**	**030**	**031**	**032**	**033**	**034**	**035**	**036**	**037**	**038**	**039**	**040**	**041**
FUEL TYPE	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
GT LOAD LEVEL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
NET FUEL HEATING VALUE, Btu/lb_m (LHV)	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962
GROSS FUEL HEATING VALUE, Btu/lb_m (HHV)	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222
AMBIENT DRY BULB TEMPERATURE, °F	97	75	59	59	51	29	3	97	75	59	59	97	75	59	59	51	29	3	97	75	59	59
AMBIENT RELATIVE HUMIDITY, %	9	28	60	47	38	66	82	9	28	60	47	9	28	60	47	38	66	82	9	28	60	47
BAROMETRIC PRESSURE, psi_a	11.197	11.197	11.328	11.328	11.328	11.197	11.197	11.197	11.197	11.328	11.328	11.197	11.197	11.328	11.328	11.328	11.197	11.197	11.197	11.197	11.328	11.328
EVAPORATIVE COOLER STATUS	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON
DUCT BURNER STATUS	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
GT FUEL FLOW, lb_m/hr	8,786	9,660	10,251	10,240	10,488	11,274	11,373	10,266	10,289	10,395	10,492	8,787	9,660	10,251	10,240	10,488	11,274	11,373	10,266	10,289	10,395	10,492
DUCT BURNER FUEL FLOW, lb_m/hr	4,178	4,588	4,883	4,883	4,883	4,883	4,883	4,871	4,877	4,883	4,883	---	---	---	---	---	---	---	---	---	---	---
HRSG STACK EXHAUST GAS																						
EXHAUST FLOW, lb_m/hr	501,011	541,105	567,909	568,385	580,290	616,005	639,815	566,785	567,585	576,321	577,909	496,834	536,517	563,025	563,502	575,407	611,121	634,931	561,914	562,708	571,438	573,026
OXYGEN, Vol. %	10.99	10.76	10.60	10.66	10.77	10.90	11.25	10.46	10.50	10.62	10.62	14.05	13.86	13.75	13.81	13.86	13.81	14.06	13.60	13.64	13.71	13.71
CARBON DIOXIDE, Vol. %	4.56	4.63	4.69	4.68	4.67	4.63	4.49	4.68	4.69	4.66	4.68	3.15	3.20	3.23	3.23	3.24	3.28	3.19	3.23	3.24	3.23	3.25
WATER, Vol. %	9.42	9.93	10.24	9.97	9.55	9.31	8.77	10.92	10.68	10.40	10.23	6.69	7.17	7.45	7.18	6.81	6.73	6.27	8.15	7.91	7.66	7.49
NITROGEN, Vol. %	74.16	73.81	73.61	73.82	74.13	74.29	74.61	73.07	73.27	73.46	73.61	75.22	74.89	74.69	74.91	75.21	75.30	75.59	74.15	74.34	74.53	74.68
ARGON, Vol. %	0.87	0.87	0.86	0.87	0.87	0.87	0.88	0.86	0.86	0.86	0.86	0.88	0.88	0.88	0.88	0.88	0.88	0.89	0.87	0.87	0.87	0.88
MOLECULAR WEIGHT	28.34	28.29	28.26	28.29	28.34	28.36	28.41	28.19	28.21	28.24	28.26	28.51	28.46	28.44	28.47	28.51	28.52	28.56	28.36	28.39	28.41	28.43
STACK EXHAUST TEMPERATURE, °F	165	167	173	165	165	166	170	173	166	166	165	200	207	211	211	212	221	259	214	212	213	213
HRSG STACK EMISSIONS (Based on USEPA Test Methods):																						
NO_X, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NO_X, lb_m/hr as NO_2	11.3	12.4	13.2	13.2	13.4	14.1	14.2	13.2	13.2	13.3	13.4	7.7	8.4	8.9	8.9	9.2	9.8	9.9	9.0	9.0	9.1	9.2
NH_3, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NH_3, lb_m/hr	4.2	4.6	4.9	4.9	5.0	5.3	5.3	4.9	4.9	5.0	5.0	2.9	3.2	3.3	3.3	3.4	3.7	3.7	3.3	3.4	3.4	3.4
CO, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
CO, lb_m/hr	6.9	7.6	8.1	8.1	8.2	8.6	8.7	8.1	8.1	8.1	8.2	4.7	5.2	5.5	5.5	5.6	6.0	6.1	5.5	5.5	5.5	5.6
VOC, ppmvd @ 15% O_2 as CH_4	6.0	5.9	5.9	5.9	5.9	5.8	5.8	5.9	5.9	5.9	5.9	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
VOC, lb_m/hr as CH_4	2.4	2.6	2.8	2.8	2.8	2.9	2.9	2.8	2.8	2.8	2.8	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.1	1.1	1.2	1.2
SO_2, lb_m/hr	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.8	0.8	0.8	0.8	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
PARTICULATES, lb_m/hr	6.5	6.6	6.7	6.7	6.7	6.8	6.8	6.7	6.7	6.7	6.7	5.4	5.4	5.4	5.4	5.5	5.5	5.5	5.4	5.4	5.4	5.5
CH_2O, ppbvd @ 15% O_2	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CH_2O, lb_m/hr	0.07	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

NOTES:

- All data is ESTIMATED, NOT guaranteed and is for ONE unit.
- Gas fuel composition (mole percent) is: 94.09% CH_4, 3.868% C_2H_6, 0.803% C_3H_8, 0.196% iC_4H_{10}, 0.043% iC_5H_{12}, 0.01% nC_6H_{14}, 0.612% N_2, 0.375% CO2, and assumes ~ 0.75 grains S/100 SCF.
- Gas fuel must be in compliance with the Siemens Gas Fuel Specification.
- NO_X emissions assume the use of an SCR system with ammonia injection. CO and VOC emissions assume the use of an oxidation catalyst.
- VOC consist of total hydrocarbons excluding methane and ethane and are expressed in terms of methane (CH_4).
- Particulates are per US EPA Method 5 and 202 (front and back half).
- Emissions exclude ambient air contributions and assume steady-state conditions.
- Please be advised that the information contained in this transmittal has been prepared and is being transmitted per customer request specifically for information purposes only.
  Data included in any permit application or Environmental Impact Statement are strictly the customer's responsibility. Siemens is available to review permit application data upon request.

SIEMENS

US1485 - Los Alamos National Laboratory

SGT-A30 RB (fka RB 211) - Estimated Exhaust Stack Emissions

Combined Cycle

"LANL Estimated Emission Data Sheet - August 30, 2017.pdf

Estimated Emissions Data Sheet
August 30, 2017

CASE NUMBER	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**
LOADPOINT NUMBER	**042**	**043**	**044**	**045**	**046**	**047**	**048**	**049**	**050**	**051**	**052**	**053**	**054**	**055**	**056**	**057**	**058**	**059**	**060**	**061**	**062**	**063**
FUEL TYPE	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
GT LOAD LEVEL	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
NET FUEL HEATING VALUE, Btu/lb_m (LHV)	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962
GROSS FUEL HEATING VALUE, Btu/lb_m (HHV)	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222
AMBIENT DRY BULB TEMPERATURE, °F	97	75	59	59	29	3	51	97	75	59	59	97	75	59	59	51	29	3	97	75	59	59
AMBIENT RELATIVE HUMIDITY, %	9	28	60	47	66	82	38	9	28	60	47	9	28	60	47	38	66	82	9	28	60	47
BAROMETRIC PRESSURE, psi_a	11.197	11.197	11.328	11.328	11.197	11.197	11.328	11.197	11.197	11.328	11.328	11.197	11.197	11.328	11.328	11.328	11.197	11.197	11.197	11.197	11.328	11.328
EVAPORATIVE COOLER STATUS	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON
DUCT BURNER STATUS	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
GT FUEL FLOW, lb_m/hr	7,340	8,007	8,462	8,450	9,254	9,526	8,640	8,477	8,417	8,585	8,589	6,163	6,637	6,925	6,920	7,042	7,405	7,389	6,931	6,931	6,991	6,995
DUCT BURNER FUEL FLOW, lb_m/hr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
STACK EXHAUST GAS (Downstream of DSCR)																						
EXHAUST FLOW, lb_m/hr	429,372	457,944	477,786	478,579	514,294	519,850	488,103	476,992	473,024	481,754	482,548	377,784	395,245	401,594	402,388	406,356	412,705	423,817	399,213	399,213	400,800	401,594
OXYGEN, Vol. %	14.28	14.06	13.93	14.00	13.98	13.91	14.06	13.78	13.82	13.85	13.90	14.57	14.32	14.11	14.18	14.20	14.00	14.24	13.94	13.99	13.99	14.04
CARBON DIOXIDE, Vol. %	3.04	3.11	3.14	3.14	3.20	3.27	3.15	3.15	3.15	3.16	3.16	2.91	2.99	3.06	3.06	3.09	3.20	3.11	3.08	3.08	3.10	3.09
WATER, Vol. %	6.50	7.00	7.29	7.01	6.57	6.40	6.63	7.99	7.73	7.54	7.32	6.23	6.77	7.13	6.85	6.51	6.56	6.10	7.85	7.59	7.41	7.19
NITROGEN, Vol. %	75.30	74.96	74.76	74.97	75.36	75.54	75.28	74.21	74.42	74.58	74.75	75.40	75.05	74.82	75.03	75.32	75.37	75.66	74.26	74.47	74.63	74.80
ARGON, Vol. %	0.88	0.88	0.88	0.88	0.88	0.89	0.88	0.87	0.87	0.87	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.89	0.87	0.87	0.88	0.88
MOLECULAR WEIGHT	28.52	28.47	28.45	28.48	28.53	28.55	28.52	28.37	28.40	28.42	28.44	28.54	28.49	28.46	28.49	28.53	28.53	28.57	28.38	28.41	28.43	28.45
STACK EXHAUST TEMPERATURE, °F	192	196	200	200	211	239	202	203	200	201	201	184	186	186	186	187	192	230	189	186	186	186
STACK EMISSIONS (Based on USEPA Test Methods):																						
NO_X, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NO_X, lb_m/hr as NO_2	6.4	7.0	7.4	7.4	8.1	8.3	7.5	7.4	7.4	7.5	7.5	5.4	5.8	6.1	6.1	6.2	6.5	6.5	6.1	6.1	6.1	6.1
NH_3, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NH_3, lb_m/hr	2.4	2.6	2.8	2.8	3.0	3.1	2.8	2.8	2.8	2.8	2.8	2.0	2.2	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.3	2.3
CO, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
CO, lb_m/hr	3.9	4.3	4.5	4.5	4.9	5.1	4.6	4.5	4.5	4.6	4.6	3.3	3.6	3.7	3.7	3.8	4.0	4.0	3.7	3.7	3.7	3.7
VOC, ppmvd @ 15% O_2 as CH_4	3.7	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.9	3.7	3.6	3.6	3.6	3.5	4.9	3.6	3.6	3.6	3.6
VOC, lb_m/hr as CH_4	0.9	0.9	1.0	0.9	1.0	1.1	1.0	0.9	0.9	1.0	1.0	0.8	0.8	0.8	0.8	0.8	0.8	1.1	0.8	0.8	0.8	0.8
SO_2, lb_m/hr	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
PARTICULATES, lb_m/hr	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
CH_2O, ppbvd @ 15% O_2	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CH_2O, lb_m/hr	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

NOTES:

- All data is ESTIMATED, NOT guaranteed and is for ONE unit.
- Gas fuel composition (mole percent) is: 94.09% CH_4, 3.868% C_2H_6, 0.803% C_3H_8, 0.196% iC_4H_{10}, 0.043% iC_5H_{12}, 0.01% nC_6H_{14}, 0.612% N_2, 0.375% CO2, and assumes ~ 0.75 grains S/100 SCF.
- Gas fuel must be in compliance with the Siemens Gas Fuel Specification.
- NO_X emissions assume the use of an SCR system with ammonia injection. CO and VOC emissions assume the use of an oxidation catalyst.
- VOC consist of total hydrocarbons excluding methane and ethane and are expressed in terms of methane (CH_4).
- Particulates are per US EPA Method 5 and 202 (front and back half).
- Emissions exclude ambient air contributions and assume steady-state conditions.
- Please be advised that the information contained in this transmittal has been prepared and is being transmitted per customer request specifically for information purposes only.
  Data included in any permit application or Environmental Impact Statement are strictly the customer's responsibility. Siemens is available to review permit application data upon request.

SIEMENS

US1485 - Los Alamos National Laboratory

SGT-A30 RB (fka RB 211) - Estimated Exhaust Stack Emissions

Combined Cycle

"LANL Estimated Emission Data Sheet - August 30, 2017.pdf

Estimated Emissions Data Sheet
August 30, 2017

CASE NUMBER	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**
LOADPOINT NUMBER	**064**	**065**	**066**	**067**	**068**	**069**	**070**	**071**	**072**	**073**	**074**	**075**	**076**	**077**	**078**	**079**	**080**	**081**	**082**	**083**	**084**	**085**
FUEL TYPE	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
GT LOAD LEVEL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
NET FUEL HEATING VALUE, Btu/lb_m (LHV)	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962
GROSS FUEL HEATING VALUE, Btu/lb_m (HHV)	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222
AMBIENT DRY BULB TEMPERATURE, °F	97	75	59	59	51	29	3	97	75	59	59	97	75	59	59	51	29	3	97	75	59	59
AMBIENT RELATIVE HUMIDITY, %	9	28	60	47	38	66	82	9	28	60	47	9	28	60	47	38	66	82	9	28	60	47
BAROMETRIC PRESSURE, psi_a	11.197	11.197	11.328	11.328	11.328	11.197	11.197	11.197	11.197	11.328	11.328	11.197	11.197	11.328	11.328	11.328	11.197	11.197	11.197	11.197	11.328	11.328
EVAPORATIVE COOLER STATUS	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON
DUCT BURNER STATUS	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
GT FUEL FLOW, lb_m/hr	8,787	9,660	10,251	10,492	10,488	11,274	11,373	10,266	10,289	10,395	10,492	8,787	9,660	10,251	10,240	10,488	11,274	11,373	10,266	10,289	10,395	10,492
DUCT BURNER FUEL FLOW, lb_m/hr	4,178	4,588	4,863	4,963	4,883	4,883	4,883	4,871	4,877	4,883	4,883	---	---	---	---	---	---	---	---	---	---	---
STACK EXHAUST GAS (Downstream of DSCR)																						
EXHAUST FLOW, lb_m/hr	501,011	541,105	567,888	577,988	580,290	616,005	639,815	566,785	567,585	576,321	577,909	496,834	536,517	563,025	563,502	575,407	611,121	634,931	561,914	562,708	571,438	573,026
OXYGEN, Vol. %	10.99	10.76	10.61	10.61	10.77	10.90	11.25	10.46	10.50	10.62	10.62	14.05	13.86	13.75	13.81	13.86	13.81	14.06	13.60	13.64	13.71	13.71
CARBON DIOXIDE, Vol. %	4.56	4.63	4.68	4.71	4.67	4.63	4.49	4.68	4.69	4.66	4.68	3.15	3.20	3.23	3.23	3.24	3.28	3.19	3.23	3.24	3.23	3.25
WATER, Vol. %	9.42	9.93	10.23	10.01	9.55	9.31	8.77	10.92	10.68	10.40	10.23	6.69	7.17	7.45	7.18	6.81	6.73	6.27	8.15	7.91	7.66	7.49
NITROGEN, Vol. %	74.16	73.81	73.61	73.80	74.13	74.29	74.61	73.07	73.27	73.46	73.61	75.22	74.89	74.69	74.91	75.21	75.30	75.59	74.15	74.34	74.53	74.68
ARGON, Vol. %	0.87	0.87	0.86	0.87	0.87	0.87	0.88	0.86	0.86	0.86	0.86	0.88	0.88	0.88	0.88	0.88	0.88	0.89	0.87	0.87	0.87	0.88
MOLECULAR WEIGHT	28.34	28.29	28.26	28.29	28.34	28.36	28.41	28.19	28.21	28.24	28.26	28.51	28.46	28.44	28.47	28.51	28.52	28.56	28.36	28.39	28.41	28.43
STACK EXHAUST TEMPERATURE, °F	166	167	166	166	165	168	170	168	166	166	166	200	207	211	210	210	214	225	213	212	212	212
STACK EMISSIONS (Based on USEPA Test Methods):																						
NO_X, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NO_X, lb_m/hr as NO_2	11.3	12.4	13.2	13.5	13.4	14.1	14.2	13.2	13.2	13.3	13.4	7.7	8.4	8.9	8.9	9.2	9.8	9.9	9.0	9.0	9.1	9.2
NH_3, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NH_3, lb_m/hr	4.2	4.6	4.9	5.0	5.0	5.3	5.3	4.9	4.9	5.0	5.0	2.9	3.2	3.3	3.3	3.4	3.7	3.7	3.3	3.4	3.4	3.4
CO, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
CO, lb_m/hr	6.9	7.6	8.1	8.2	8.2	8.6	8.7	8.1	8.1	8.1	8.2	4.7	5.2	5.5	5.5	5.6	6.0	6.1	5.5	5.5	5.5	5.6
VOC, ppmvd @ 15% O_2 as CH_4	5.9	5.9	5.9	5.9	5.9	5.8	5.8	5.9	5.9	5.9	5.9	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
VOC, lb_m/hr as CH_4	2.4	2.6	2.8	2.8	2.8	2.9	2.9	2.8	2.8	2.8	2.8	1.0	1.1	1.1	1.1	1.2	1.2	1.3	1.1	1.1	1.2	1.2
SO_2, lb_m/hr	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.8	0.8	0.8	0.8	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
PARTICULATES, lb_m/hr	6.5	6.6	6.7	6.8	6.7	6.8	6.8	6.7	6.7	6.7	6.7	5.4	5.4	5.4	5.4	5.5	5.5	5.5	5.4	5.4	5.4	5.5
CH_2O, ppbvd @ 15% O_2	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CH_2O, lb_m/hr	0.07	0.08	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.09	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

NOTES:

- All data is ESTIMATED, NOT guaranteed and is for ONE unit.
- Gas fuel composition (mole percent) is: 94.09% CH_4, 3.868% C_2H_6, 0.803% C_3H_8, 0.196% iC_4H_{10}, 0.043% iC_5H_{12}, 0.01% nC_6H_{14}, 0.612% N_2, 0.375% CO2, and assumes ~ 0.75 grains S/100 SCF.
- Gas fuel must be in compliance with the Siemens Gas Fuel Specification.
- NO_X emissions assume the use of an SCR system with ammonia injection. CO and VOC emissions assume the use of an oxidation catalyst.
- VOC consist of total hydrocarbons excluding methane and ethane and are expressed in terms of methane (CH_4).
- Particulates are per US EPA Method 5 and 202 (front and back half).
- Emissions exclude ambient air contributions and assume steady-state conditions.
- Please be advised that the information contained in this transmittal has been prepared and is being transmitted per customer request specifically for information purposes only.
  Data included in any permit application or Environmental Impact Statement are strictly the customer's responsibility. Siemens is available to review permit application data upon request.

SIEMENS

US1485 - Los Alamos National Laboratory

SGT-A30 RB (fka RB 211) - Estimated Exhaust Stack Emissions

Combined Cycle

"LANL Estimated Emission Data Sheet - August 30, 2017.pdf

Estimated Emissions Data Sheet
August 30, 2017

CASE NUMBER	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**	**86**	**87**	**88**
LOADPOINT NUMBER	**086**	**087**	**088**	**089**	**090**	**091**	**092**	**093**	**094**	**095**	**096**	**097**	**098**	**099**	**100**	**101**	**102**	**103**	**104**	**105**	**106**	**107**
FUEL TYPE	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
GT LOAD LEVEL	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%
NET FUEL HEATING VALUE, Btu/lb_m (LHV)	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962	20,962
GROSS FUEL HEATING VALUE, Btu/lb_m (HHV)	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222	23,222
AMBIENT DRY BULB TEMPERATURE, °F	97	75	59	59	51	29	3	97	75	59	59	97	75	59	59	51	29	3	97	75	59	59
AMBIENT RELATIVE HUMIDITY, %	9	28	60	47	38	66	82	9	28	60	47	9	28	60	47	38	66	82	9	28	60	47
BAROMETRIC PRESSURE, psi_a	11.197	11.197	11.328	11.328	11.328	11.197	11.197	11.197	11.197	11.328	11.328	11.197	11.197	11.328	11.328	11.328	11.197	11.197	11.197	11.197	11.328	11.328
EVAPORATIVE COOLER STATUS	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON
DUCT BURNER STATUS	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
GT FUEL FLOW, lb_m/hr	7,340	8,007	8,462	8,450	8,640	9,254	9,526	8,477	8,417	8,585	8,589	6,163	6,637	6,925	6,920	7,042	7,405	7,389	6,931	6,931	6,991	6,995
DUCT BURNER FUEL FLOW, lb_m/hr	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
STACK EXHAUST GAS (Downstream of DSCR)																						
EXHAUST FLOW, lb_m/hr	429,372	457,944	477,786	478,579	488,103	514,294	519,850	476,992	473,024	481,754	482,548	377,784	395,245	401,594	402,388	406,356	412,705	423,817	399,213	399,213	400,800	401,594
OXYGEN, Vol. %	14.28	14.06	13.93	14.00	14.06	13.98	13.91	13.78	13.82	13.85	13.90	14.57	14.32	14.11	14.18	14.20	14.00	14.24	13.94	13.99	13.99	14.04
CARBON DIOXIDE, Vol. %	3.04	3.11	3.14	3.14	3.15	3.20	3.27	3.15	3.15	3.16	3.16	2.91	2.99	3.06	3.06	3.09	3.20	3.11	3.08	3.08	3.10	3.09
WATER, Vol. %	6.50	7.00	7.29	7.01	6.63	6.57	6.40	7.99	7.73	7.54	7.32	6.23	6.77	7.13	6.85	6.51	6.56	6.10	7.85	7.59	7.41	7.19
NITROGEN, Vol. %	75.30	74.96	74.76	74.97	75.28	75.36	75.54	74.21	74.42	74.58	74.75	75.40	75.05	74.82	75.03	75.32	75.37	75.66	74.26	74.47	74.63	74.80
ARGON, Vol. %	0.88	0.88	0.88	0.88	0.88	0.88	0.89	0.87	0.87	0.87	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.89	0.87	0.87	0.88	0.88
MOLECULAR WEIGHT	28.52	28.47	28.45	28.48	28.52	28.53	28.55	28.37	28.40	28.42	28.44	28.54	28.49	28.46	28.49	28.53	28.53	28.57	28.38	28.41	28.43	28.45
STACK EXHAUST TEMPERATURE, °F	191	196	199	198	199	202	202	202	199	200	200	184	185	186	185	184	184	192	188	186	186	185
STACK EMISSIONS (Based on USEPA Test Methods):																						
NO_X, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NO_X, lb_m/hr as NO_2	6.4	7.0	7.4	7.4	7.5	8.1	8.3	7.4	7.4	7.5	7.5	5.4	5.8	6.1	6.1	6.2	6.5	6.5	6.1	6.1	6.1	6.1
NH_3, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
NH_3, lb_m/hr	2.4	2.6	2.8	2.8	2.8	3.0	3.1	2.8	2.8	2.8	2.8	2.0	2.2	2.3	2.3	2.3	2.4	2.4	2.3	2.3	2.3	2.3
CO, ppmvd @ 15% O_2	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
CO, lb_m/hr	3.9	4.3	4.5	4.5	4.6	4.9	5.1	4.5	4.5	4.6	4.6	3.3	3.6	3.7	3.7	3.8	4.0	4.0	3.7	3.7	3.7	3.7
VOC, ppmvd @ 15% O_2 as CH_4	3.7	3.6	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.9	3.7	3.6	3.6	3.6	3.5	4.9	3.6	3.6	3.6	3.6
VOC, lb_m/hr as CH_4	0.9	0.9	1.0	0.9	1.0	1.0	1.1	0.9	0.9	1.0	1.0	0.8	0.8	0.8	0.8	0.8	0.8	1.1	0.8	0.8	0.8	0.8
SO_2, lb_m/hr	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
PARTICULATES, lb_m/hr	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.3	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4
CH_2O, ppbvd @ 15% O_2	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
CH_2O, lb_m/hr	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10

NOTES:

- All data is ESTIMATED, NOT guaranteed and is for ONE unit.
- Gas fuel composition (mole percent) is: 94.09% CH_4, 3.868% C_2H_6, 0.803% C_3H_8, 0.196% iC_4H_{10}, 0.043% iC_5H_{12}, 0.01% nC_6H_{14}, 0.612% N_2, 0.375% CO2, and assumes ~ 0.75 grains S/100 SCF.
- Gas fuel must be in compliance with the Siemens Gas Fuel Specification.
- NO_X emissions assume the use of an SCR system with ammonia injection. CO and VOC emissions assume the use of an oxidation catalyst.
- VOC consist of total hydrocarbons excluding methane and ethane and are expressed in terms of methane (CH_4).
- Particulates are per US EPA Method 5 and 202 (front and back half).
- Emissions exclude ambient air contributions and assume steady-state conditions.
- Please be advised that the information contained in this transmittal has been prepared and is being transmitted per customer request specifically for information purposes only.
  Data included in any permit application or Environmental Impact Statement are strictly the customer's responsibility. Siemens is available to review permit application data upon request.

Cleaver-Brooks Boiler Expected Emission Data — **With Economizer**

Producing Steam Firing — **Nat Gas** 0.75 grains Sulfur/100 scf

BACKGROUND INFORMATION

Date	11/20/17	Boiler Model	CBEX Elite
Author	Dan Smidt	Altitude (feet)	7500
Customer	LANL	Operating Pressure (psig)	125.00
City & State	Los Alamos, NM	Furnace Volume (cuft)	616.00
		Furnace Heat Release (btu/hr/cu ft)	140,743
		Heating Surface (sqft)	5711
		Nox System	9

Nat Gas		Firing Rate			
		25%	**50%**	**75%**	**100%**
Horsepower		450	900	1350	1800
Input , Btu/hr		18,038,000	35,921,000	54,044,000	72,342,000
CO	ppm	50	50	50	50
	lb/MMBtu	0.0375	0.0375	0.0375	0.0375
	lb/hr	0.68	1.35	2.03	2.71
	tpy	2.961	5.897	8.872	11.876
NOx	ppm	9	9	9	9
	lb/MMBtu	0.0105	0.0105	0.0105	0.0105
	lb/hr	0.19	0.38	0.57	0.76
	tpy	0.830	1.652	2.485	3.327
NO	ppm	7.7	7.7	7.7	7.7
	lb/MMBtu	0.009	0.009	0.009	0.009
	lb/hr	0.16	0.32	0.48	0.65
	tpy	0.66	1.32	1.99	2.66
NO_2	ppm	1.4	1.4	1.4	1.4
	lb/MMBtu	0.002	0.002	0.002	0.002
	lb/hr	0.03	0.06	0.09	0.11
	tpy	0.17	0.33	0.50	0.67
SOx	ppm	~~0.34~~ 1.48	~~0.34~~ 1.48	~~0.34~~ 1.48	~~0.34~~ 1.48
	lb/MMBtu	~~0.0006~~ 0.0025	~~0.0006~~ 0.0025	~~0.0006~~ 0.0025	0.0006 0.0025
	lb/hr	~~0.0106~~ 0.0045	~~0.0211~~ 0.009	~~0.0318~~ 0.135	~~0.0426~~ 0.181
	tpy	~~0.047~~ 0.0198	~~0.093~~ 0.393	~~0.139~~ 0.592	~~0.187~~ 0.793
VOCs	ppm	8	8	8	8
(Non-Methane Only)	lb/MMBtu	0.0036	0.0036	0.0036	0.0036
	lb/hr	0.064	0.128	0.192	0.258
VOCs does not include any background VOC emissions.	tpy	0.281	0.560	0.843	1.128
PM10 (Filterable)	ppm	N/A	N/A	N/A	N/A
	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.034	0.067	0.101	0.135
	tpy	0.147	0.293	0.441	0.590
PM10 (Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.101	0.201	0.302	0.404
	tpy	0.442	0.879	1.323	1.771
PM2.5 (Filterable)	lb/MMBtu	0.0019	0.0019	0.0019	0.0019
	lb/hr	0.034	0.067	0.101	0.135
	tpy	0.147	0.293	0.441	0.590
PM2.5 (Condensable)	lb/MMBtu	0.0056	0.0056	0.0056	0.0056
	lb/hr	0.101	0.201	0.302	0.404
	tpy	0.442	0.879	1.323	1.771
Exhaust Data					
Temperature, F		292	309	327	344
Flow	ACFM	7,255	14,245	21,947	30,029
	SCFM (70 Degrees Fah.)	3,975	7,627	11,475	15,361
	DSCFM	3,577	6,834	10,282	13,763
	lb/hr	17,887	34,323	51,639	69,123
Velocity	ft/sec	12.57	24.68	38.02	52.02
	ft/min	754	1,481	2,281	3,121

Notes:

1) All ppm levels are corrected to dry at 3% oxygen.
2) Emission data based on actual boiler efficiency.
3) % H2O , by volume in exhaust gas is **16.05** % O2, by volume **3.81**
4) Water vapor in exhaust gas is **99.39** lbs/MMBtu of fuel fired
5) CO2 produced is **116.31** lbs/MMBtu of fuel fired
6) Particulate is exclusive of any particulates in combustion air or other sources of residual particulates from material.
PM level indicated on this form is based on combustion air and fuel being clean and turndown up to 4:1.
7) Heat input is based on high heating value (HHV).
8.) Emission produced in tons per year (tpy) is based on 24 hours per day for 365 days = 8,760 hours per year
9.) Exhaust data is based on a clean and properly sealed boiler.
10.) Emission data is based on a burner turndown of 4 to 1.
11.) Maximum flame temperature is 2800 degrees fahrenheit.

14) Fuel High Heating Value = **1000** Btu/FT^3

Cleaver-Brooks Boiler Expected Emission Data — **With Economizer**

Producing Steam Firing **#2 Oil**

BACKGROUND INFORMATION

Date	11/20/17	Boiler Model	CBEX Elite
Author	Dan Smidt	Altitude (feet)	7500
Customer	LANL	Operating Pressure (psig)	125
City & State	Los Alamos, NM	Furnace Volume (cuft)	616.00
		Furnace Heat Release (btu/hr/cu ft)	134,924
		Heating Surface (sqft)	5711
		Nox System	9

#2 Oil		Firing Rate			
		25%	**50%**	**75%**	**100%**
Horsepower		450	900	1350	1800
Input , Btu/hr		17,450,000	34,453,000	51,824,000	69,351,000
CO	ppm	50	50	50	50
	lb/MMBtu	0.039	0.039	0.039	0.039
	lb/hr	0.680	1.342	2.018	2.701
	tpy	2.976	5.876	8.839	11.829
NOx	ppm	70	70	70	70
	lb/MMBtu	0.090	0.090	0.090	0.090
	lb/hr	1.56	3.09	4.64	6.21
	tpy	6.844	13.513	20.326	27.200
NO	ppm	67	67	67	67
	lb/MMBtu	0.085	0.085	0.085	0.085
	lb/hr	1.48	2.93	4.41	5.90
	tpy	6.502	12.837	19.309	25.840
NO_2	ppm	4	4	4	4
	lb/MMBtu	0.004	0.004	0.004	0.004
	lb/hr	0.08	0.15	0.23	0.31
	tpy	0.342	0.676	1.016	1.360
SOx	ppm	27	27	27	27
	lb/MMBtu	0.048	0.048	0.048	0.048
	lb/hr	0.838	1.655	2.489	3.331
	tpy	3.671	7.248	10.903	14.590
VOCs	ppm	3	3	3	3
(Non-Methane Only)	lb/MMBtu	0.0014	0.0014	0.0014	0.0014
	lb/hr	0.025	0.049	0.074	0.099
VOCs does not include any	tpy	0.109	0.216	0.324	0.434
background VOC emissions.					
PM10(Filterable)	ppm	N/A	N/A	N/A	N/A
	lb/MMBtu	0.0143	0.0143	0.0143	0.0143
	lb/hr	0.25	0.49	0.740	0.99
	tpy	1.092	2.156	3.243	4.339
PM10(Condensable)	lb/MMBtu	0.0093	0.0093	0.0093	0.0093
	lb/hr	0.162	0.320	0.481	0.644
	tpy	0.710	1.401	2.108	2.821
PM2.5(Filtable)	lb/MMBtu	0.0143	0.0143	0.0143	0.0143
	lb/hr	0.25	0.49	0.74	0.99
	tpy	1.092	2.156	3.243	4.339
PM2.5(Condensable)	lb/MMBtu	0.0093	0.0093	0.0093	0.0093
	lb/hr	0.162	0.320	0.481	0.644
	tpy	0.710	1.401	2.108	2.821
Exhaust Data					
Temperature, F		291	308	325	342
Flow	ACFM	8,096	13,763	21,173	28,963
	SCFM (70 Degrees Fah.)	4,442	7,379	11,099	14,853
	DSCFM	4,184	6,871	10,335	13,830
	lb/hr	19,987	33,206	49,947	66,840
Velocity	ft/sec	14	24	37	50
	ft/min	841	1,431	2,201	3,010

Notes:

1) All ppm levels are corrected to dry at 3% oxygen.

Oil emission levels are based on the following fuel constituent levels:

Ash Content	**0.0100**	%, by weight
Conradson Carbon Residue	**0.0000**	%, by weight
Fuel-bound Nitrogen Content	**0.01500**	%, by weight
Sulfur Content	**0.0500**	%, by weight

2) If any of the actual fuel constituent levels are different than indicated above, the emissions will change.

3.) Boilers rated above 40 hp , emission data is based on a burner turndown of 4 to 1.

4) Emission data based on actual boiler efficiency.

5) % H2O , by volume in exhaust gas is **11.01** % O2, by volume **3.93**

6) Percent water vapor in exhaust gas is **66.42** lbs/MMBtu of fuel fired

7) CO2 produced is **157.74** lbs/MMBtu of fuel fired

8) Particulate is exclusive of any particulates in combustion air or other sources of residual particulates from material.

9) Heat input is based on high heating value (HHV).

10.) Emission produced in tons per year (tpy) is based on 24 hours per day for 365 days = 8,760 hours per year

11.) Exhaust data is based on a clean and properly sealed boiler.

Cleaver-Brooks Boiler Expected **Steam Perf. Data** **With Economizer**

9 - PPM Nox System

BACKGROUND INFORMATION			The ASME Power Test Code , PTC 4.1 Heat Loss Method equations were used to calculate fuel-to- steam efficiencies. The listed efficiency accounts for loss up the stack , boiler radiation and convection losses.	
Date	11/06/17			
Author	Dan Smidt			
Customer	LANL			
City & State	Los Alamos, NM			
Boiler Model	CBEX Elite			
Design Pressure (psig)	150			
Furnace Volume (cuft)	616.00			
	5711			
ENTHALPY				
Steam Enthalpy, hg (Btu/lb)	1193	1193	1193	1193
Sat. Liquid Enthalpy, hfw (Btu/lb)	325	325	325	325
Feedwater Enthalpy, hfw (Btu/lb)	194	194	194	194
LOAD				
Operating BHP	**1800**	**1350**	**900**	**450**
Steam Flow Rate, (lbm/hr)	58,516	43,887	29,258	14,629
% Continous Blowdown	3	3	3	3
Continous Blowdown (lbm/hr)	1,810	1,357	905	452
Water Flow Rate Thru Econ , (Gpm)	126.60	95.00	63.30	31.60
Firing Rate	**100%**	**75%**	**50%**	**25%**
Fuel Type	**Nat Gas**	**Nat Gas**	**Nat Gas**	**Nat Gas**
EXCESS AIR				
Excess Air Leaving Boiler	25.0%	25.0%	25.0%	30.0%
O2 Leaving Boiler	4.5%	4.5%	4.5%	5.2%
CO2 Leaving Boiler	9.2%	9.2%	9.2%	8.8%
PRESSURE				
Steam Operating Pressure, (psig)	125	125	125	125
TEMPERATURES				
Flue Gas Temp. Leaving Boiler (°F)	443	421	398	376
Flue Gas Temp. Lvg Economizer (°F)	344	327	309	292
Water Temp. Entering Econ. (°F)	227	227	227	227
Water Temp. Leaving Econ. (°F)	258	256	254	254
Steam Temperature (°F)	353	353	353	353
Combustion Air Temperature (°F)	80	80	80	80
ENERGY				
Heat Output , (Btu/hr)	60,255,000	45,191,250	30,127,500	15,063,750
HHV Fuel-to-Steam Efficiency (%)	83.29	83.62	83.87	83.51
HHV Heat Input (Btu.hr)	72,342,003	54,044,302	35,921,325	18,037,998

Cleaver-Brooks Boiler Expected **Steam Performance Data** **With Economizer**

9 - PPM Nox System

BACKGROUND INFORMATION			The ASME Power Test Code , PTC 4.1 Heat Loss Method equations were used to calculate fuel-to- steam efficiencies. The listed efficiency accounts for loss up the stack , boiler radiation and convection losses.	
Date	11/06/17			
Author	Dan Smidt			
Customer	LANL			
City & State	Los Alamos, NM			
Boiler Model	CBEX Elite			
Design Pressure (psig)	150			
Furnace Volume (cuft)	616			
	5711			
HEAT LOSS				
Dry Gas (%)	5.42	5.08	4.71	4.54
H2 and H2O in Fuel (%)	10.91	10.84	10.76	10.69
Moisture in Air (%)	0.07	0.07	0.06	0.06
Radiation & Conv. (%)	0.30	0.40	0.60	1.20
Total Heat Loss (%)	16.71	16.38	16.13	16.49
FLOW RATES				
HHV Gas Flow Rate (SCFH)	72,342	1000	35,921	1000
Gas LHV (Btu/lb)	19,712	54044	19,712	18038
Gas HHV (Btu/lb)	21,830	21,830	21,830	21,830
Gas Flow Rate (lbm/hr)	3,314	2,476	1,646	826
Dry Air Weight (lbm/lbm fuel)	19.73	19.73	19.73	20.52
Air for Combustion (lbm/hr)	65,387	48,848	32,468	16,956
Flue Gas to Stack (lbm/hr)	69,123	51,639	34,323	17,887
RESISTANCE				
Economizer (in WC)	0.48	0.27	0.07	0.00
Furnace Pressure (in WC)	14.42	7.58	3.35	0.91
Burner Press. Drop (in WC)	10.00	5.58	2.47	0.67
Net Resistance (in WC)	24.90	13.43	5.88	1.58
HEAT RELEASE				
Furnace Heat Release (Btu/hr/cuft)	117,438	87,734	58,314	29,282
Furnace Heat Release Rate (Btu/hr/sqft)	140,743	105,145	69,886	35,093
Heat Absorption Rate (Btu/hr/sqft)	10,551	7,913	5,275	2,638

Cleaver-Brooks Boiler Expected Steam Perf. Data With Economizer

9 - PPM Nox System)

BACKGROUND INFORMATION				
Date	11/06/17		The ASME Power Test Code , PTC 4.1 Heat Loss Method equations were used to calculate fuel-to- steam efficiencies. The listed efficiency accounts for loss up the stack , boiler radiation and convection losses.	
Author	Dan Smidt			
Customer	LANL			
City & State	Los Alamos, NM			
Boiler Model	CBEX Elite			
Design Pressure (psig)	150			
Furnace Volume (cuft)	616.00			
	5711			
ENTHALPY				
Steam Enthalpy, hg (Btu/lb)	1193	1193	1193	1193
Sat. Liquid Enthalpy, hfw (Btu/lb)	325	325	325	325
Water Enthalpy , hfw (Btu/lb)	194	194	194	194
LOAD				
Operating BHP	**1800**	**1350**	**900**	**450**
Steam Flow Rate, (lbm/hr)	58,516	43,887	58,516	14,629
% Continous Blowdown	3	3	3	3
Water Flow Rate Thru Econ , (Gpm)	126.60	95.00	63.30	31.60
Continous Blowdown (lbm/hr)	1,810	1,357	905	452
Firing Rate	**100%**	**75%**	**50%**	**25%**
Fuel Type	**ULSD Oil**	**ULSD Oil**	**ULSD Oil**	**ULSD Oil**
EXCESS AIR				
Excess Air Leaving Boiler	25.0%	25.0%	25.0%	50.0%
O2 Leaving Boiler	4.4%	4.4%	4.4%	7.3%
CO2 Leaving Boiler	11.9%	11.9%	11.9%	9.8%
PRESSURE				
Steam Operating Pressure , (Psig)	125	125	125	125
TEMPERATURES				
Flue Gas Temp. Leaving Boiler (°F)	443	421	398	376
Flue Gas Temp. Lvg Economizer (°F)	444	431	398	376
Water Temp. Entering Econ. (°F)	227	227	227	227
Water Temp. Leaving Econ. (°F)	257	255	253	253
Steam Temperature (°F)	353	353	353	353
Combustion Air Temperature (°F)	80	80	80	80
ENERGY				
Heat Output, (Btu/hr)	60,255,000	45,191,250	30,127,500	15,063,750
HHV Fuel-to-Steam Efficiency (%)	86.27	86.60	86.86	85.72
HHV Heat Input (Btu.hr)	69,846,808	52,185,489	34,685,931	17,572,724

Cleaver-Brooks Boiler Expected **Steam Performance Data** **With Economizer**

9 - PPM Nox System)

BACKGROUND INFORMATION				
Date	11/06/17		The ASME Power Test Code , PTC 4.1 Heat Loss Method equations were used to calculate fuel-to- steam efficiencies. The listed efficiency accounts for loss up the stack , boiler radiation and convection losses.	
Author	Dan Smidt			
Customer	LANL			
City & State	Los Alamos, NM			
Boiler Model	CBEX Elite			
Design Pressure (psig)	150			
Furnace Volume (cuft)	616.00			
HEAT LOSS				
Dry Gas (%)	5.84	5.46	5.07	4.54
H2 and H2O in Fuel (%)	7.49	7.44	7.38	7.33
Moisture in Air (%)	0.10	0.10	0.09	0.10
Radiation & Conv. (%)	0.30	0.40	0.60	1.20
Total Heat Loss (%)	13.73	13.40	13.14	13.17
FLOW RATES				
Oil HHV (Btu/Lb)	19,612	19,612	19,612	19,612
Oil Flow Rate (Lbs/Hr)	3,561	2,661	1,769	896
Oil HHV (Btu/Gal)	143,219	143,219	143,219	143,219
Oil Flow Rate (Gal/hr)	488	364	242	123
Dry Air Weight (lb/lb fuel)	18.34	18.34	18.34	22.00
Air for Combustion (lb/hr)	65,308	48,795	32,432	19,717
Flue Gas to Stack (lb/hr)	69,290	51,770	34,410	20,719
RESISTANCE				
Economizer (in WC)	0.44	0.25	0.06	0.01
Furnace Pressure (in WC)	14.42	8.02	3.53	0.96
Burner Press. Drop (in WC)	10.00	5.58	2.47	0.91
Net Resistance (in WC)	24.86	13.85	6.06	1.87
HEAT RELEASE				
Furnace Heat Release (Btu/hr/cuft)	113,388	84,717	56,308	28,527
Furnace Heat Release Rate (Btu/hr/sqft)	135,889	101,528	67,482	34,188
Heat Absorption Rate (Btu/hr/sqft)	10,551	7,913	5,275	2,638

An Updated Method for Estimating Total Sulfuric Acid Emissions from Stationary Power Plants

Larry S. Monroe, Ph.D.
Research and Environmental Affairs Department
Southern Company Generation and Energy Marketing
Post Office Box 2641
Birmingham, AL 35291

Revised March 2003

Keith E. Harrison
Research and Environmental Affairs Department
Southern Company Generation and Energy Marketing
Post Office Box 2641
Birmingham, AL 35291

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Executive Summary

This paper presents the latest update to the Southern Company method of estimating both the *manufacturing* threshold value and *release* of sulfuric acid (H_2SO_4) from stationary utility sources. The U. S. Environmental Protection Agency's Toxic Release Inventory (TRI) reporting system requires that, beginning in 1998, electric utilities estimate their emissions of over 600 chemical compounds. Sulfuric acid is one of the compounds included in the TRI requirement. EPA defines sulfuric acid aerosols as "includ[ing] mists, vapors, gas, fog, and other airborne forms of any particle size." Since the original method was limited in scope to pulverized fuel boilers, but the reporting requirement covers all of the fossil-fired generating sites, the original method has been expanded to include other firing methods of coal, cyclone boilers in particular, oil- and gas-fired boilers and turbines, and pollution control equipment effects on sulfuric acid manufacture and release. The most notable of the pollution control equipment effects are the manufacture of sulfuric acid by selective catalytic reduction processes installed for NOx emissions control and the manufacture from flue gas conditioning systems used to assist electrostatic precipitators. A necessary part of this analysis involves the interaction between ammonia and the sulfuric acid vapor present.

The mathematical scheme to produce the results in the present method is to calculate the combustion manufacture and release estimates, then to repeat the calculation for any SCR or flue gas conditioning systems in use. This 3-step approach is then repeated for each fuel utilized at the site for the year. After the series of calculations are performed, the manufacture and release estimates are summed to yield the final values.

This update to the method (Harrison, March 2003) considers scenarios where units equipped with scrubbers operate in some degree of bypass mode. Optional equations to calculate the release of sulfuric acid have been provided for use where applicable. Other previous updates include the addition of a factor representing the SCR catalyst SO_2 oxidation rate to the equation calculating the sulfuric acid manufactured in the SCR. This results in a more accurate representation, since earlier versions tied the sulfuric acid manufactured in the SCR to that manufactured in combustion. While the previous assumption proved sufficient for units burning Eastern Bituminous compliance coals, the revised method proves more robust when applied to a wider variety of coals and SCR catalysts designs. This revision also includes a correction to account for additional sulfuric acid capture in downstream equipment where FGC is used. This correction will result in a reduction in the estimate of sulfuric acid released for applications only where scrubbers and/or baghouses are installed downstream of FGC systems.

As with all generalized estimating procedures, this approach and the various suggested factors may not be appropriate for every installation. When data are present, they should obviously be used along with any known factors used in place of the generalized numbers presented here. Any data that either confirm or contradict the predictions of this method are desired by the author, in order to increase the accuracy of the predictions. Southern Company offers this method as a guideline and expressly offers no warranty for the method and consequently does not assume any responsibility or liability resulting from the use of this procedure.

Introduction

Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA), also known as the Toxic Release Inventory (TRI), requires facilities that "manufacture," "process," or "otherwise use" a listed chemical above certain threshold amounts to report their annual releases of the chemical to EPA and state agencies. For sulfuric acid in general, the TRI reporting requirements are triggered if a facility "manufactures" or "processes" more than 25,000 pounds of this chemical or "otherwise uses" more than 10,000 pounds of it in a given calendar year.

Sulfuric acid is a listed TRI chemical. In June 1995, the U. S. Environmental Protection Agency (EPA) modified the list of chemicals subject to the EPCRA § 313 reporting requirements so that only aerosol forms of sulfuric acid would be subject to the TRI reporting requirements [1]. EPA defines sulfuric acid aerosols as "includ[ing] mists, vapors, gas, fog, and other airborne forms of any particle size." Although initially it appeared that only liquid droplets of sulfuric acid needed to be reported, the present method estimates the sulfuric acid emissions regardless of the physical state of the molecules.

Beginning on July 1, 1999, certain coal- and oil-fired electric power plants are required to report annual releases of TRI chemicals that they manufacture, process or otherwise use above threshold amounts. Under EPA's EPCRA § 313 regulations, coal- and oil-fired electric utilities are deemed to "manufacture" sulfuric acid. Thus, electric utilities will have to submit TRI reports on sulfuric acid releases if they "manufacture" more than 25,000 pounds of the chemical in a given reporting year [2]. Previously, Southern Company had published two papers, detailing a predictive method for estimating sulfuric acid manufacture and emissions from coal-fired power plants [3,4].

In coal-fired power plants, sulfuric acid (H_2SO_4) is created in the ductwork downstream of the boiler by the combination of water vapor and sulfur trioxide (SO_3), both of which are produced during the coal combustion process. Furthermore, the use of NOx reduction processes, namely selective catalytic reduction (SCR) and selective non-catalytic reduction (SNCR), affect the manufacture and release of sulfuric acid. SCR systems utilize a vanadium-based catalyst to affect the destruction of NOx, in which an unfortunate side reaction increases the amount of SO_2 that is converted to SO_3. Obviously, this increase will lead to a reportable increase in the amount of H_2SO_4 manufactured and a likely increase in the amount released. SCR and SNCR systems both utilize ammonia to achieve NOx reductions. Ammonia, being a chemical base, is quite reactive with the acidic SO_3 and H_2SO_4 molecules, producing a solid at typical stack conditions. Therefore, any ammonia escaping these NOx reduction processes, usually referred to as ammonia slip, has the potential to react with sulfuric acid or its precursor, thus reducing the release.

Coal-fired power plants also occasionally use a system to modify the fly ash to increase the ability of an electrostatic precipitator (ESP) to collect the ash. These systems are generally one of three types: sulfur trioxide (SO_3) addition to decrease resistivity of fly ash, SO_3 and ammonia (NH_3) addition to both decrease resistivity and increase ash cohesivity, and ammonia addition to either decrease resistivity by reacting with native SO_3 or to decrease overall SO_3 emissions. Any SO_3 injected is typically manufactured on site and will add to the TRI manufactured thresholds. Additionally, any excess SO_3 will travel through the process, with some fraction emitted from the stack, increasing the release. The use of ammonia for flue gas conditioning will have the same consequences as discussed above for NOx reduction processes, lowering the actual emissions of

sulfuric acid. The method presented in this paper is intended to accurately estimate these process additions to the manufacture and release of sulfuric acid. While ammonia is a chemical that is required to be reported under TRI, this method does not attempt to estimate those releases.

The updated method presented here also increases the scope of the predictions to include cyclone-fired boilers and the use of fuel oil, petroleum coke, and natural gas in boilers, combustion turbines, and combined cycle plants. Therefore, the present method attempts to address the needs to estimate sulfuric acid manufacture and emissions from any stationary utility source.

In the paper, the prediction method is presented along with discussions of key assumptions that have been made. First the combustion process is discussed, followed by the effects of ammonia-based NOx controls, and then the effects of flue gas conditioning on manufacture and release of sulfuric acid. The proposed method for dealing with multiple fuel situations is described next. Finally, a series of example calculations is presented.

MANUFACTURE AND RELEASE FROM COMBUSTION

The method is only slightly changed from the last update [4], and details of the supporting information for the calculations can be found there. The method is exactly the same -- the amount of sulfuric acid manufactured is computed from either the coal data (amount burned and sulfur content) or the amount of SO_2 released according to the CEM data. Units having controls for SO_2 emissions **must** use the coal data approach, or at least CEM data ahead of the scrubber. The previous paper [4] included a method to correct the CEM data for non-ideal stack flow conditions; that calculation would apply but is not repeated here.

Sulfuric Acid Manufactured from Combustion

The following relationship is proposed to estimate the H_2SO_4 *manufactured* from combustion in utility sources:

$$E1 = K \bullet F1 \bullet E2$$

where, E1 = total H_2SO_4 *manufactured* from combustion, lbs/yr
K = Molecular weight and units conversion constant = 98.07 / 64.04 • 2000 = 3,063
98.07 = Molecular weight of H_2SO_4; 64.04 = Molecular weight of SO_2
Conversion from tons per year to pounds per year – multiply by 2000.
F1 = Fuel Impact Factor
E2 = Sulfur dioxide (SO_2) emissions either: (1) recorded by a continuous emissions monitor, tons/yr, or (2) calculated from coal burn data, tons/yr.

In the derivation of this relationship, the following assumptions are made:

- SO_3 concentrations are proportional to SO_2 concentrations.
- The grade of coal being burned impacts the rate of conversion from SO_2 to SO_3.
- All SO_3 that forms is converted to H_2SO_4.
- The rate of SO_3 formation is independent of the boiler firing rate (unit load).

Fuel Impact Factor (F1)

The proposed values for the Fuel Impact Factor (F1) are provided in Table 1. In proposing these factors, corroborating and/or conflicting information regarding the Fuel Impact Factor for these and other fuels and/or firing conditions are sought. The values have been expanded from dry bottom wall-fired and tangentially-fired boilers to include cyclone boilers, which are known to produce higher levels of H_2SO_4, probably because of higher temperatures and more fine fly ash to catalyze the reaction. Thus, cyclones have higher Fuel Impact Factors. The table also clarifies some earlier confusion over bituminous and subbituminous Western coals. As can be seen, the F1 factors now also include natural gas, fuel oil, and petroleum coke in selected firing systems.

Table 1
F1 --- Fuel Factor Listing

Fuel	Equipment	F1
E. Bituminous	PC Boiler	0.008
W. Bituminous	PC Boiler	0.00111
Subbituminous	PC Boiler	0.000556
Lignite	PC Boiler	0.001
E. Bituminous	Cyclone	0.016
W. Bituminous	Cyclone	0.00222
Subbituminous	Cyclone	0.00112
Lignite	Cyclone	0.00112
Petroleum Coke	Boiler	0.04
Natural Gas	Boiler	0.01
#2 Fuel Oil	Boiler	0.01
#6 Fuel Oil	Boiler	0.025
Used Oil	Boiler	0.0175
Natural Gas	CT	See Table 2
#2 Fuel Oil	CT	See Table 2
Natural Gas	CC	0.0555
Other Alternative Fuels	Any	0.04
Other Alternative Fuels, cofired with coal, >75% coal by heat input	NA	Use same F1 as the coal F1

SO_2 Total from Combustion

The mass rate of SO_2 produced by combustion can also be calculated from the coal burn data [5]. The following relationship is used to estimate the rate of SO_2 emissions:

$$E2 = K1 \bullet K2 \bullet C1 \bullet S1$$

where, E2 = SO_2 mass rate, tons/yr
C1 = Coal burn, tons/yr
S1 = Coal sulfur weighted average, %
K1 = Molecular weight and units conversion constant = (64.04)/(100 • 32.06) = 0.02
64.04 = molecular weight of SO_2; 32.06 = molecular weight of S;
100 = conversion of % S to fraction
K2 = Sulfur conversion to SO_2, implicit from EPA AP-42 [5]
= 0.95 for bituminous coals
= 0.875 for subbituminous coals
= 0.55 to 0.85 for lignite, based on the Na content
= 1.0 for oil

When any source uses a system to control SO_2 emissions, the fuel basis **must** be used for the manufacturing and release calculations. **CEM data after a flue gas desulfurization system cannot be used.**

Simple cycle combustion turbines (CT) exhaust at elevated temperatures, usually around 1000°F. The chemistry of SO_3 and water to make sulfuric acid vapor is temperature dependent, that is, the amount of sulfuric acid molecules that are formed is related to the temperature of the exhaust. The TRI reporting rules require the reporting of sulfuric acid and not of its precursor, SO_3. Therefore, the amount of manufactured and released sulfuric acid for a CT is dependent upon its stack temperature. Table 2 combines the temperature-based SO_3 to H_2SO_4 conversion with the SO_2 to SO_3 conversion to give the Fuel Impact Factor, F1.

Table 2 F1 --- Fuel Factors for Simple CT	
Stack T, °F	F1
300	0.055
400	0.055
500	0.047
600	0.022
700	0.0055
750	0.0027
800	0.0013
850	0.00071
900	0.00039
950	0.00022
1000	0.00013
1050	0.00008
1100	0.00005
1150	0.00003
1200	0.00002

Sulfuric Acid Released from Combustion

When the estimate of total H_2SO_4 *manufactured* by a facility exceeds 25,000 pounds per year, the facility is required to estimate how much of this H_2SO_4 is *released* in airborne form to the atmosphere. This amount, then, is the reportable quantity.

The following relationship is proposed to predict the quantity of H_2SO_4 *released* from the combustion-related sulfuric acid:

$$E1'_{comb} = K \bullet F1 \bullet F2 \bullet E2$$

where, $E1'_{comb}$ = total H_2SO_4 *released* from combustion, lbs/yr

K = Molecular weight and units conversion constant = 98.07 / 64.04 • 2000 = 3,063
98.07 = Molecular weight of H_2SO_4; 64.04 = Molecular weight of SO_2
Conversion from tons per year to pounds per year – multiply by 2000.

F1 = Fuel Impact Factor

E2= Sulfur dioxide (SO_2) emissions either: (1) recorded by a continuous emissions monitor, tons/yr, or (2) calculated from coal burn data, tons/yr.

F2 = Technology Impact Factor

Table 3 F2 --- Technology Impact Factors	
Pollution Control Device	F2
Air preheater – Eastern bituminous coals	0.50
Air preheater – West. bit., subbit., & lignite	0.90
Air Preheater – other fuels	0.50
Hot-side electrostatic precipitator	1.00
Cold-side electrostatic precipitator	0.50
Baghouse	0.10
Wet scrubber	0.50
Spray dryer & baghouse	0.01
Mag-ox mixed with fuel oil	0.50
Mag-ox sprayed into furnace	0.25

F2 factors for the use of magnesium-based additives in oil-fired boilers have been proposed. These additives are used to control furnace slagging caused by the vanadium in the oil or to control sulfuric acid emissions or both. The fuel oil vanadium can also catalyze SO_2 to SO_3 oxidation, but the additive, when added to the oil, tends to effectively bind up the vanadium, partially reducing its catalytic effect. Addition of magnesium-based additives in the fuel oil tend to be less effective in controlling the emissions of sulfuric acid than the same additive sprayed into the furnace downstream of the flame zone.

Optional Scrubber Bypass Calculation. Those units equipped scrubbers where some of the flue gas bypasses the scrubber should take this into account in their combustion release calculations. No credit for sulfuric acid removal should be taken for the fraction of the flue gas that bypasses the scrubber. Therefore, this amount of the flue gas should not be multiplied by the F2 factor for the scrubber. However, it should still be multiplied by the F2 factors for the other control devices.

A modified equation considering partial scrubber bypass is given below and should be used where appropriate.

$$E1'_{comb} = [SB_f + (1 - SB_f) \bullet F2_s] \bullet K \bullet F1 \bullet E2 \bullet F2_x$$

where, SB_f = fraction of scrubber bypass, as a decimal
$F2_s$ = F2 for scrubber
$F2_x$ = All other applicable F2's except for scrubber.

MANUFACTURE AND RELEASE FROM SCR AND SNCR PROCESSES

As regulations require lower emissions of NOx from power plant sources, additional equipment to control these emissions will be added to some power plants. The most effective NOx control technology at present is the selective catalytic reduction (SCR) process. An SCR consists of a series of catalyst layers in the flue gas flow which uses ammonia to chemically convert NOx

species to harmless molecular nitrogen, N_2. There are two main effects of this technology on sulfuric acid manufacture and release. The typical catalyst used for NOx reduction is based on the transition metal vanadium, V. An unfortunate side effect of the use of this element is the further oxidation of SO_2 to SO_3 through the catalyst layers. Conversions between 0.75 and 1% of the SO_2 to SO_3 are typical for low-to-medium sulfur coal-fired SCR applications. However, higher values of conversion have been specified in some cases. Therefore, the first implication of the use of an SCR system on a coal-fired plant is an increased manufacture of SO_3 and subsequently sulfuric acid.

The second effect of the use of SCR systems on sulfuric acid emissions is the possibility of reactions between the ammonia used for NOx reduction and the SO_3 and/or sulfuric acid in the flue gas. Small concentrations of ammonia and SO_3, at parts per million levels, can react at temperatures from 650°F to ambient. The reaction of interest is between the small amount of ammonia that escapes the catalytic chamber (ammonia slip) and the sulfuric acid or SO_3 in the bulk of the flue gas. Ammonia slip from SCR systems is expected to range between 0 and 2 ppm, with 10 ppm possible under some circumstances. The reactions between ammonia and SO_3/H_2SO_4 will occur in the temperature regime of the air preheater and will result in a solid product that will deposit in the preheater or accumulate on the surface of the fly ash. Any SO_3/H_2SO_4 that participates in these reactions is effectively neutralized and is no longer chemically sulfuric acid, and is not required to be reported as a release of sulfuric acid. (Under some circumstances, this solid product may require reporting under TRI as an ammonia release, but that subject is not explored in this paper.)

A second, but less utilized NOx reduction process with implications on this method is the selective non-catalytic reduction (SNCR) process where the reagent, ammonia or urea, is injected into the convective sections of a boiler. Other similar technologies also employ ammonia or urea injection in regions of the boiler for NOx reduction. However, the reaction chemistry is the same; therefore, no distinction is made in the following discussion. The higher temperature of the injection location (1800 to 2000°F, as compared to 700°F for SCR) allows the reagent to react directly with the NOx, and a catalyst is not necessary. Since a catalyst is not employed, there is no additional manufacture of sulfuric acid. However, reduction of the amount of sulfuric acid released may also be accomplished through reactions with the remaining ammonia. Typically, SNCR systems operate with higher levels of ammonia slip, say 5 to 10 ppm versus the 2 ppm for an SCR system. Therefore, it is expected that SNCR systems will reduce the overall release of sulfuric acid, while SCR systems will typically increase both the manufacture and release of sulfuric acid.

The reactions between SO_3/H_2SO_4 and ammonia produce two products, ammonium sulfate $(NH_4)_2SO_4$ and/or ammonium bisulfate NH_4HSO_4. While both are solids, the bisulfate pairs one ammonia molecule with one of sulfuric acid and the sulfate requires two ammonia molecules for each sulfuric acid. Usually, the reaction product is determined by the stoichiometry, the relative amount of each substance that is present. When ammonia is present in an amount over twice the concentration of the sulfuric acid, the reaction product will always be the ammonium sulfate. Conversely, when sulfuric acid is present in concentrations greater than ammonia, the product will be ammonium bisulfate. Between these two extremes, a mixture of ammonium sulfate and bisulfate is produced.

For bituminous coals with low-to-medium levels of sulfur, an SCR system will always produce an excess of sulfuric acid as compared to any possible ammonia slip, and thus it is expected to produce ammonium bisulfate. For lower rank U.S. coals, the sulfuric acid is typically adsorbed by the ash, and it is likely that the ammonia will be in higher concentrations than the sulfuric acid. Then, ammonium sulfate is the likely product. For SNCR systems, ammonia slip levels are higher, so the probability is higher of producing more ammonium sulfate. Certainly with coals from the Western U.S., the alkaline nature of the ash will sharply reduce the amount of SO_3 present and usually the sulfate form will predominate. For Eastern bituminous coals, it is likely that the bisulfate chemical form will be the product of the reactions.

For the purposes of predicting sulfuric acid emissions, these distinctions are not important. The reaction path for the ammonia-sulfuric acid reactions are assumed to be stepwise in order. That is, the sulfuric acid will capture a single ammonia molecule producing the bisulfate form. If additional ammonia is available, the bisulfate can react with another ammonia molecule to form the sulfate. It is assumed here that all of the sulfuric acid forms the bisulfate before any further reaction to the sulfate form occurs. That assumption leads to the calculation strategy where the ammonia captures all of the sulfuric acid it can as the bisulfate form. Since the bisulfate is no longer reportable, the sulfuric acid disappears from the calculation. If any additional ammonia reacts with the bisulfate, it is of no consequence to the sulfuric acid calculation -- although this issue will be important when estimating ammonia releases.

Sulfuric Acid Manufactured from SCR and SNCR

The following relationship is proposed to estimate the total H_2SO_4 *manufactured* from a SCR or SNCR-equipped coal-fired utility boiler:

$$E1_{SCR} = K \bullet S2 \bullet f_s \bullet E2$$

where, $E1_{SCR}$ = Total H_2SO_4 manufactured from SCR, lbs per year
K = Conversion factor = 3063
$S2$ = SCR catalyst SO_2 oxidation rate (specified as a decimal, typically from 0-0.03)
f_s = Operating factor of SCR system, fraction of coal burn when SCR operates
generally, = 0.8 for year-round peaking operation
= 0.98 for year-round base-loaded operation
= 0.5 for seasonal operation
$E2$ = SO_2 produced, tons per year

With,

$$E1_{SNCR} = 0$$

by definition.

Sulfuric Acid Released from SCR and SNCR

$$E1'_{SCR} = [E1_{SCR} - (K_s \bullet B \bullet f_s \bullet S_{NH3})] \bullet F2 \bullet F2$$

where, $E1'_{SCR}$ = Total H_2SO_4 released from SCR, lbs per year

$E1_{SCR}$ = Total H_2SO_4 manufactured from SCR, lbs per year
K_s = Conversion factor = 3799
B = Coal burn in TBtu/yr
f_s = Operating factor of SCR system, fraction of coal burn when SCR operates
generally, = 0.8 for year-round peaking operation
= 0.98 for year-round base-loaded operation
= 0.5 for seasonal operation
S_{NH3} = NH_3 slip from SCR/SNCR, ppmv at 6% O_2, wet;
SCR averages 0.75 ppmv
SNCR averages 3.5 ppmv
F2 = Technology Impact Factors, all that apply

The conversion factor of 3799 corrects all of the various units to yield the result in pounds per year of sulfuric acid. The elements of the calculation of this constant are described below.

The U.S. Code of Federal Regulations 40, Part 60, Table 19-1 "F Factors for Various Fuels" lists that 1 million Btu of heat input for bituminous or subbituminous coal will produce 10,640 wet standard cubic feet of flue gas, defined at 0% oxygen and on a wet basis at 20C and 760 mm Hg. Correcting this volume to 6% O_2 (typical at ESP conditions) yields a volume of 14,925 scf. The standard volume of one pound mole of any gas is 359 scf, defined at 0C and 760 mm Hg. Converting this to the English units standard of 20C (68°F), one pound mole occupies 385 standard cubic feet. Using these in the equation above,

$(K_s \bullet B \bullet f_s \bullet S_{NH3})$ = lbs H_2SO_4 per yr =

B TBtu	S_{NH3} scf NH_3	1 lb mol NH_3	1 lb mol H_2SO_4	98 lbs H_2SO_4
year	10^6 scf flue gas	385 scf NH_3	1 lb mol NH_3	1 lb mol H_2SO_4

14925 scf fg	10^6 MBtu
1 MBtu	TBtu

Grouping terms,

$= B \bullet f_s \bullet S_{NH3} \bullet 3799$

Therefore, the value of K_s is equal to 3799 lbs H_2SO_4/(TBtu • ppmv NH_3 @ 6% O_2 and wet).

If you prefer to specify the quantity of NH_3 at different conditions, the following formula can be used to convert to different bases of the definition:

K_s (O_2, H_2O) = 3799 (6% O_2, 8.1% H_2O) • [(100-8.1)/(100-new H_2O)]
[(20.9 – 6.0)/(20.9 – new O_2)]

Therefore, if the ammonia is quantified at a ppm level that is defined at 0% oxygen and a dry basis, the value of K_s that should be used is:

$$K_s\ (O_2, H_2O) = 3799\ (6\%\ O_2, 8.1\%\ H_2O) \bullet [(100\text{-}8.1)/(100\text{-}0)] \\ [(20.9 - 6.0)/(20.9 - 0)]$$

$$= 2489\ \text{lbs}\ H_2SO_4/(\text{TBtu} \bullet \text{ppmv}\ NH_3\ @\ 0\%\ O_2\ \text{and dry}).$$

Therefore, the K_s at any other condition used to define the ppm level at which ammonia is quantified can be calculated by following this formula.

Be aware that the calculation for SNCR will always be negative, while the SCR result will usually still be positive. Since the SNCR does not create any sulfuric acid, it removes some of the sulfuric acid produced in combustion.

Optional Scrubber Bypass Calculation. Those units equipped scrubbers where some of the flue gas bypasses the scrubber should take this into account in their SCR/SNCR release calculations also, as in the combustion release calculations. No credit for sulfuric acid removal should be taken for the fraction of the flue gas that bypasses the scrubber. Therefore, this amount of the flue gas should not be multiplied by the F2 factor for the scrubber. However, it should still be multiplied by the F2 factors for the other control devices.

A modified equation considering partial scrubber bypass is given below and should be used where appropriate.

$$E1'_{SCR} = [SB_f + (1 - SB_f) \bullet F2_s] \bullet [E1_{SCR} - (K_s \bullet B \bullet f_s \bullet S_{NH3})] \bullet F2_x$$

where, SB_f = fraction of scrubber bypass, as a decimal
$F2_s$ = F2 for scrubber
$F2_x$ = All other applicable F2's except for scrubber.

MANUFACTURE AND RELEASE FROM FLUE GAS CONDITIONING

Another process used in power plants that can affect the manufacture and release of sulfuric acid is the injection of SO_3, SO_3 plus NH_3, or NH_3 alone to assist in particulate control in an ESP or baghouse. For SO_3 injection, the chemical is typically made on site from sulfur fuel in a sulfur burner. This combustion process produces SO_2, which is then catalytically oxidized to SO_3, with a conversion typically > 95%. When injected into the flue gas, the SO_3 immediately reacts with water vapor to create sulfuric acid vapors, thus resulting in the manufacture of sulfuric acid that may require reporting for TRI purposes.

The following section documents a method to estimate both the manufacture and any subsequent release due to these flue gas conditioning systems.

Sulfuric Acid Manufactured from FGC

Any SO_3 system for ash resistivity control is usually controlled at a fixed concentration rate for the flue gas. In other words, the controls strive to maintain a fixed concentration of added SO_3 in the flue gas, typically between 5 and 7 parts per million by volume. The manufactured calculation uses the setpoint of the injection system as the basis for the calculation. The system is assumed to operate during most of the plant's operation, perhaps not being used in startup and low load operation.

$$E1_{FGC} = K_e \bullet B \bullet f_e \bullet I_s$$

where, $E1_{FGC}$ = Total H_2SO_4 manufactured from FGC, lbs per year
K_e = Conversion factor = 3799
B = Coal burn in TBtu/yr
F_e = Operating factor of FGC system, fraction of coal burn when FGC operates
generally = 0.8
I_s = SO_3 injection rate in ppmv at 6% O_2, wet;
generally, = 7 ppmv if before the APH
= 5 ppmv if after the APH

Systems that inject ammonia alone obviously do not manufacture sulfuric acid, and systems that use both SO_3 and NH_3 together still manufacture sulfuric acid at the same rate, regardless of whether ammonia is used or not. However, in systems that inject ammonia alone, any remaining ammonia may reduce the release of sulfuric acid by reacting with any available SO_3.

Sulfuric Acid Released from FGC

The subsequent release of that portion of sulfuric acid associated with flue gas conditioning can be estimated from:

$$E1'_{FGC} = [E1_{FGC} - (K_e \bullet B \bullet f_e \bullet I_{NH3})] \bullet F3 \bullet F2$$

where, $E1'_{FGC}$ = Total H_2SO_4 released from FGC, lbs per year
$E1_{FGC}$ = Total H_2SO_4 manufactured from FGC, lbs per year
K_e = Conversion factor = 3799
B = Coal burn in TBtu/yr
f_e = Operating factor of FGC system, fraction of fuel burn when FGC operates
generally = 0.8
I_{NH3} = NH_3 injection for dual flue gas conditioning, ppmv at 6% O_2, wet;
generally 3 ppmv NH_3 if operating, = 0 if no ammonia is used
F3 = Technology Impact Factors for FGC, see Table 4
F2 = Technology Impact Factors, <u>for equipment after ESP only</u>
If no control after ESP, F2 = 1.

Table 4 F3 – Technology Impact Factors for FGC With Cold-Side ESPs		
Location	Coals	F3
Upstream of APH	bituminous	0.25
Upstream of APH	W. bit., subbit., & lig.	0.05
Downstream of APH	bituminous	0.10
Downstream of APH	W. bit., subbit., & lig.	0.02
For other fuels, use F3 = 0.5 for startup fuel and F3 = coal factor for fuels co-fired as a minor fraction (<25%) with coal.		

This approach leads to a possible contradiction in the behavior of SO_3/H_2SO_4 depending on the place in which the SO_3/H_2SO_4 enters the system. For SO_3 created in combustion, SCR, or introduced as FGC ahead of the air preheater, the method predicts removals of 75% for Eastern bituminous coals in an air preheater and cold-side ESP. However, for SO_3 injected for FGC downstream of the air preheater, 90% will be removed in a cold-side ESP for the Eastern bituminous coal. For bituminous coals, the F3 numbers for upstream injection of SO_3 mirror the behavior of SO_3 formed from combustion or SCR, that is, the method predicts the same result for a molecule of SO_3 found ahead of the air preheater, regardless of its origin. However, for Western bituminous or subbituminous and lignite coals, SO_3 originating from combustion or an SCR is collected with 75% efficiency in the air heater and cold-side ESP. For SO_3 injected as FGC for these Western or low-ranked fuels, SO_3 injected ahead of the air heater is removed with a 95% efficiency through the air heater and ESP, and 98% when injected downstream of the air heater. Since these Western bituminous, subbituminous, and lignite coals have alkaline ash, any SO_3 injected for FGC will be captured by both physical deposition, and by chemical reaction. For this reason, the removals assumed for these coals are much higher than for Eastern bituminous coals.

Since data are somewhat scarce for this subject, these assumptions have been made based on an estimate that injection of SO_3 downstream of an air preheater, where the temperature is lower, would result in more surface condensation than injection at the higher air preheater inlet temperatures. An analog to this system would be the difference in winter precipitation observed for different surface temperatures. When the air temperatures close to the ground are just around the freezing point, freezing rain (ice mixed with liquid water) is observed. However, when the air temperatures at the ground are well below the freezing point, either sleet or snow (solid ice) is seen. For SO_3 injection, the injection behind the air preheater is typically below the acid dewpoint, so it is expected that the injected SO_3 is condensed on fly ash more readily than the slower cooling in the flue gas through the air preheater.

As with any of these calculations, if the user has any plant data, detailed estimates, or relevant information for a particular case, it should be used for the estimates of manufacturing and releases of sulfuric acid.

Optional Scrubber Bypass Calculation. Those units equipped scrubbers where some of the flue gas bypasses the scrubber should take this into account in their FGC release calculations also. No credit for sulfuric acid removal should be taken for the fraction of the flue gas that bypasses the scrubber. Therefore, this amount of the flue gas should not be multiplied by the F2 factor for the scrubber. However, it should still be multiplied by the F2 factors for the other control devices.

A modified equation considering partial scrubber bypass is given below and should be used where appropriate.

$$E1'_{FGC} = [SB_f + (1 - SB_f) \bullet F2_s] \bullet [E1_{FGC} - (K_e \bullet B \bullet f_e \bullet I_{NH3})] \bullet F3 \bullet F2_x$$

where, SB_f = fraction of scrubber bypass, as a decimal
$F2_s$ = F2 for scrubber
$F2_x$ = All other applicable F2's except for scrubber.

TOTAL MANUFACTURE AND RELEASE FOR SOURCE

Total manufacture and release of sulfuric acid for the source is the sum of the three manufacture or release results. Therefore, if a site burns coal and uses both SCR and FGC, the amount of sulfuric acid manufactured in combustion, the SCR, and the FGC system would be added together to result in the total amount manufactured for this source. The amount released calculated for combustion, SCR, and FGC are also summed to arrive at a total. It is possible for a calculated release from SCR and/or FGC to be negative, which implies that the net result of the ammonia in the system is to remove some or all of the sulfuric acid generated from combustion. Under this approach, it is also possible to calculate a negative amount for the release of sulfuric acid, particularly in circumstances where ammonia alone is used for FGC, or where relatively low-sulfur coals are burned, for instance PRB. Since the release of sulfuric acid from combustion, SCR, and FGC are all additive, any negative values calculated as a result of these circumstances will be accounted for in the total release equation.

Examples 1 through 4 detail these calculations.

MULTIPLE FUELED BOILERS

Likewise, the approach of the proposed method for sources with multiple fuels is a stepwise calculation. For this case, the sequence of calculations for combustion manufacture and release is performed for the first fuel, followed by the calculations for SCR and FGC, if applicable, for the first fuel. The sequence is repeated for each of the subsequent fuels. At the end, the total manufacture of sulfuric acid is calculated by adding all of the manufacture totals for all fuels from all processes. Likewise, the release is summed over all processes and fuels. For example, if a unit with a SCR and FGC burns mostly coal, but uses natural gas in a NOx reburn process

and also disposes of used oil by combustion in the furnace, then the following sequence of calculations would be required:

1. Coal fuel
   a. Combustion manufacture
   b. Combustion release
   c. SCR manufacture
   d. SCR release
   e. FGC manufacture
   f. FGC release
2. Natural gas
   a. Combustion manufacture
   b. Combustion release
   c. SCR manufacture
   d. SCR release
   e. FGC manufacture
   f. FGC release
3. Used oil
   a. Combustion manufacture
   b. Combustion release
   c. SCR manufacture
   d. SCR release
   e. FGC manufacture
   f. FGC release
4. Sum manufacture and releases
   a. Manufacture
      $= 1a + 1c + 1e + 2a + 2c + 2e + 3a + 3c + 3e$
   b. Release
      $= 1b + 1d + 1f + 2b + 2d + 2f + 3b + 3d + 3f$

All of the manufactured results would be summed together and the releases summed also to give the final result. Example 5 details this calculation procedure.

NATURAL GAS TURBINE AND COMBINED CYCLE CALCULATIONS

Natural gas-fired sources typically have so little sulfur input that the sulfuric acid formed is negligible. However, natural gas-fired sources that are co-located with coal units will need to be included in the total release estimates for the site. Additionally, these calculations are convenient to estimate sulfuric acid emissions for PSD review of new gas generation sites.

The structure of the calculations for gas-fired units is very much the same as for coal and oil-fired sources. For simple cycle combustion turbines, the only source of sulfuric acid is the sulfur in the natural gas. A generic value of 2000 grains of sulfur per million cubic feet of natural gas is used as a default value of sulfur content. This value is from EPA's AP-42 emissions factor document. This is equivalent to around 3.5 ppm of sulfur in the raw natural gas.

The ***manufactured*** equations for formation of sulfuric acid from natural gas combustion are:

$$E1_{comb} = K \bullet F1 \bullet E2_{NG}$$

where, $E1_{comb}$ = total H_2SO_4 *manufactured* from combustion, lbs/yr
K = Molecular weight and units conversion constant = 98.07 / 64.04 • 2000 = 3,063
98.07 = Molecular weight of H_2SO_4; 64.04 = Molecular weight of SO_2
Conversion from tons per year to pounds per year – multiply by 2000.
F1 = Fuel Impact Factor for NG
$E2_{NG}$ = Sulfur dioxide (SO_2) emissions either: (1) recorded by a continuous emissions monitor, tons/yr, or (2) calculated from fuel burn data, tons/yr.

SO_2 emissions can be obtained through a calculation using the heat input of natural gas.

$$E2_{NG} = K_b \bullet B_{NG} \bullet S$$

where, $E2_{NG}$ = total SO_2 production from NG combustion, tons/yr
K_b = Molecular weight and units conversion constant = 0.0001359
B_{NG} = Burn of NG in TBtu/yr
S = NG sulfur content in grains per million standard cubic feet (Mscf), use EPA's value of 2000 gr/10^6 scf as default

K_b is determined from the following analysis of the equation.
($K_b \bullet B_{NG} \bullet S$) = tons SO_2 per yr =

B_{NG} TBtu	S gr S	1 scf nat gas	10^{12} Btu	lb S
Year	10^6 scf nat gas	1050 Btu	TBtu	7000 gr S

1 ton S	1 ton mol S	1 ton mole SO_2	64 tons SO_2
2000 lbs S	32 tons S	1 ton mol S	1 ton mole SO_2

Grouping terms,

= ($B_{NG} \bullet S$) • 64 / (1050 • 32 • 14) = ($B_{NG} \bullet S$) • 0.0001359

Therefore, the value of K_b is equal to 0.0001359 tons SO_2/(TBtu • grains S/million scf NG).

The SO_2 emissions can also be calculated from the volume of natural gas burned:

$$E2_{NG} = K_{NG} \bullet N1 \bullet S$$

where, $E2_{NG}$ = total SO_2 production from NG combustion, tons/yr
K_{NG} = Molecular weight and units conversion constant = $1.427 \bullet 10^{-7}$
N1 = NG burn in million standard cubic feet (Mscf) per year
S = NG sulfur content in grains per million standard cubic feet, use EPA's value of 2000 gr/10^6 scf as default

$(K_{NG} \bullet N1 \bullet S)$ = tons SO_2 per yr =

N1 10^6 scf	*S* gr S	lb S
Year	10^6 scf nat gas	7000 gr S

1 ton S	1 ton mol S	1 ton mole SO_2	64 tons SO_2
2000 lbs S	32 tons S	1 ton mol S	1 ton mole SO_2

Grouping terms,

$(N1 \bullet S) \bullet 64 / (7000 \bullet 2000 \bullet 32) = (N1 \bullet S) \bullet 1.427 \bullet 10^{-7}$

Therefore, the value of K_{NG} is equal to $1.427 \bullet 10^{-7}$ tons SO_2/(grains S).

The ***release*** of sulfuric acid is estimated in a similar method to other fuels:

$$E1' = K \bullet F1 \bullet F2 \bullet E2_{NG}$$

where, E1' = total H_2SO_4 *released* from combustion, lbs/yr
K = Molecular weight and units conversion constant = 98.07 / 64.04 • 2000 = 3,063
98.07 = Molecular weight of H_2SO_4; 64.04 = Molecular weight of SO_2
Conversion from tons per year to pounds per year – multiply by 2000.
F1 = Fuel Impact Factor
$E2_{NG}$ = Sulfur dioxide (SO_2) emissions either: (1) recorded by a continuous emissions monitor, tons/yr, or (2) calculated from fuel burn data, tons/yr.
F2 = Technology Impact Factor(s)

It should be noted that for gas-fired combined cycle plants that exhaust at low temperatures, say less than 200°F, an F2 factor equal to 0.5 should be used to account for any removal in the heat transfer sections.

Example 6 illustrates a gas-fired combined cycle plant calculation.

EXAMPLE CALCULATIONS

Example 1: Comparison of Previous and Current Method

A 500-MW pulverized coal-fired (PC) boiler equipped with a cold-side electrostatic precipitator burns an Eastern bituminous coal. The coal used in the reporting year is 1,126,938 tons with a weighted average sulfur concentration of 2.0% and a heating value of 12,000 Btu/lb.

Solution

Manufactured

$E2 = K1 \bullet K2 \bullet C1 \bullet S1$

$E2 = 0.02 \bullet 0.95 \bullet 1{,}126{,}938 \bullet 2.0 = 42{,}824$ tons SO_2/yr

$E1 = K \bullet F1 \bullet E2$

$E1 = 3063 \bullet 0.008 \bullet 42{,}824 = 1{,}049{,}359$ lbs H_2SO_4/yr

The 25,000 lbs/yr threshold has been exceeded, therefore a release estimate must be made and the result reported on Form R.

Released

$E1'_{comb} = K \bullet F1 \bullet F2 \bullet E2$

$E1'_{comb} = 3063 \bullet 0.008 \bullet (0.5 \bullet 0.5) \bullet 42{,}824 = 262{,}340$ lbs H_2SO_4/yr

Where F2 = Air Heater • Cold-Side ESP

$F2 = 0.5 \bullet 0.5 = 0.25$

Example 1A: Comparison of Previous and Current Method – (Old Method)
In the previous method, the cold-side ESP would have used F2 = 0.75 instead of 0.5. For that case, the emissions would be:

$E1'_{comb} = K \bullet F1 \bullet F2 \bullet E2$
$E1'_{comb} = 3063 \bullet 0.008 \bullet (0.5 \bullet 0.75) \bullet 42{,}824 = 393{,}506$ lbs H_2SO_4/yr (old method)

Where F2 = Air Heater • Cold-Side ESP
F2 = 0.5 • 0.75 = 0.375 (old method)

Example 2: SCR Added to Example 1
A 500-MW PC boiler equipped with a cold-side electrostatic precipitator burns an Eastern bituminous coal. The plant is equipped with a SCR process that operates during the ozone season only, so that 0.5 of the coal burn occurred with the SCR operating. The SCR catalyst SO_2 oxidation rate specified in the design is 0.75%, and the ammonia slip is estimated to be 0.75 ppmv. The coal used in the reporting year is 1,126,938 tons with a weighted average sulfur concentration of 2.0% and a heating value of 12,000 Btu/lb.

Solution

Manufactured

$E2 = K1 \bullet K2 \bullet C1 \bullet S1$
$E2 = 0.02 \bullet 0.95 \bullet 1{,}126{,}938 \bullet 2.0 = 42{,}824$ tons SO_2/yr

Combustion

$E1_{comb} = K \bullet F1 \bullet E2$
$E1_{comb} = 3063 \bullet 0.008 \bullet 42{,}824 = 1{,}049{,}359$ lbs H_2SO_4/yr

SCR

$E1_{SCR} = K \bullet S2 \bullet f_s \bullet E2$
$E1_{SCR} = 3063 \bullet 0.0075 \bullet 0.5 \bullet 42{,}824 = 491{,}887$ lbs H_2SO_4/yr

Total

$E1_{total} = E1_{comb} + E1_{SCR}$
$E1_{total} = 1{,}049{,}359 + 491{,}887$ lbs H_2SO_4/yr
$E2_{total} = 1{,}541{,}246$ lbs H_2SO_4/yr

The 25,000 lbs/yr threshold has been exceeded, therefore a release estimate must be made and the result reported on Form R.

Released

Combustion

$E1'_{comb} = K \bullet F1 \bullet F2 \bullet E2$
$E1'_{comb} = 3063 \bullet 0.008 \bullet (0.5 \bullet 0.5) \bullet 42{,}824 = 262{,}340$ lbs H_2SO_4/yr

Where F2 = Air Heater • Cold-Side ESP
$F2 = 0.5 \bullet 0.5 = 0.25$

SCR
$B = 1{,}126{,}938$ tons/yr • 2000 lbs/ton • 12,000 Btu/lb • 1 TBtu/10^{12} Btu
$B = 27.05$ TBtu/yr

$E1'_{SCR} = [E1_{SCR} - (K_s \bullet B \bullet f_s \bullet S_{NH3})] \bullet F2 \bullet F2$
$E1'_{SCR} = [491{,}887 - (3799 \bullet 27.05 \bullet 0.5 \bullet 0.75)] \bullet 0.5 \bullet 0.5$
$E1'_{SCR} = 113{,}337$ lbs H_2SO_4/yr

Total
$E1'_{total} = E1'_{comb} + E1'_{SCR}$
$E1'_{total} = 262{,}340 + 113{,}337$ lbs H_2SO_4/yr
$E1'_{total} = 375{,}677$ lbs H_2SO_4/yr

Example 3: FGC Added to Example 1

A 500-MW PC boiler equipped with a cold-side electrostatic precipitator burns an Eastern bituminous coal. The plant is equipped with a FGC process that injects both SO_3 and NH_3, with the SO_3 injected upstream of the air preheater. The SO_3 is injected at 7 ppmv at 6% O_2 wet, and the ammonia at 3 ppmv also at 6% O_2 wet. The FGC system operates whenever the plant is on, except during startup and shutdown, with an operating factor estimated at 0.9. The coal used in the reporting year is 1,126,938 tons with a weighted average sulfur concentration of 2.0% and a heating value of 12,000 Btu/lb.

Solution

Manufactured

$E2 = K1 \bullet K2 \bullet C1 \bullet S1$

$E2 = 0.02 \bullet 0.95 \bullet 1{,}126{,}938 \bullet 2.0 = 42{,}824$ tons SO_2/yr

Combustion

$E1_{comb} = K \bullet F1 \bullet E2$

$E1_{comb} = 3063 \bullet 0.008 \bullet 42{,}824 = 1{,}049{,}359$ lbs H_2SO_4/yr

FGC

$B = 1{,}126{,}938$ tons/yr $\bullet$ 2000 lbs/ton $\bullet$ 12000 Btu/lb $\bullet$ 1 TBtu/10^{12} Btu

$B = 27.05$ TBtu/yr

$E1_{FGC} = K_e \bullet B \bullet f_e \bullet I_s$

$E1_{FGC} = 3799 \bullet 27.05 \bullet 0.9 \bullet 7 = 647{,}407$ lbs H_2SO_4/yr

Total

$E1_{total} = E1_{comb} + E1_{FGC}$

$E1_{total} = 1{,}049{,}359 + 647{,}407$ lbs H_2SO_4/yr

$E2_{total} = 1{,}696{,}766$ lbs H_2SO_4/yr

The 25,000 lbs/yr threshold has been exceeded, therefore a release estimate must be made and the result reported on Form R.

Released

Combustion

$E1'_{comb} = K \bullet F1 \bullet F2 \bullet E2$

$E1'_{comb} = 3063 \bullet 0.008 \bullet (0.5 \bullet 0.5) \bullet 42{,}824 = 262{,}340$ lbs H_2SO_4/yr

Where F2 = Air Heater $\bullet$ Cold-Side ESP

$F2 = 0.5 \bullet 0.5 = 0.25$

FGC

$B = 1{,}126{,}938$ tons/yr $\bullet$ 2000 lbs/ton $\bullet$ 12000 Btu/lb $\bullet$ 1 TBtu/10^{12} Btu

B = 27.05 TBtu/yr

$E1'_{FGC} = [E1_{FGC} - (K_E \bullet B \bullet f_E \bullet I_{NH3})] \bullet F3 \bullet F2$
$E1'_{FGC} = [647,407 - (3799 \bullet 27.05 \bullet 0.9 \bullet 3.0)] \bullet 0.25 \bullet 1.0$
$E1'_{FGC} = 92,487$ lbs H_2SO_4/yr

Since there are no other control devices after the ESP, then F2 = 1.0.

Total
$E1'_{total} = E1'_{comb} + E1'_{FGC}$
$E1'_{total} = 262,340 + 92,487$ lbs H_2SO_4/yr
$E1'_{total} = 354,827$ lbs H_2SO_4/yr

Example 4: SCR and FGC Added to Example 1

A 500-MW PC boiler equipped with a cold-side electrostatic precipitator burns an Eastern bituminous coal. The plant is equipped with a SCR process that operates during the ozone season only, so that 0.5 of the coal burn occurred with the SCR operating. The SCR catalyst SO_2 oxidation rate specified in the design is 0.75%, and the ammonia slip is estimated to be 0.75 ppmv. The plant is also equipped with a FGC process that injects both SO_3 and NH_3, with the SO_3 injected upstream of the air preheater. The SO_3 is injected at 7 ppmv at 6% O_2 wet, and the ammonia at 3 ppmv also at 6% O_2 wet. The FGC system operates whenever the plant is on, except during startup and shutdown, with an operating factor estimated at 0.9. The coal used in the reporting year is 1,126,938 tons with a weighted average sulfur concentration of 2.0% and a heating value of 12,000 Btu/lb.

Solution

From previous examples,

Manufactured

Total

$E1_{total} = E1_{comb} + E1_{SCR} + E1_{FGC}$

$E1_{total} = 1{,}049{,}359 + 491{,}887 + 647{,}407$ lbs H_2SO_4/yr

$E1_{total} = 2{,}188{,}653$ lbs H_2SO_4/yr

The 25,000 lbs/yr threshold has been exceeded, therefore a release estimate must be made and the result reported on Form R.

Released

Combustion

$E1'_{comb} = K \bullet F1 \bullet F2 \bullet E2$

$E1'_{comb} = 3063 \bullet 0.008 \bullet (0.5 \bullet 0.5) \bullet 42{,}824 = 262{,}340$ lbs H_2SO_4/yr

SCR

$E1'_{SCR} = [E1_{SCR} - (K_s \bullet B \bullet f_s \bullet S_{NH3})] \bullet F2 \bullet F2$

$E1'_{SCR} = [491{,}887 - (3799 \bullet 27.05 \bullet 0.5 \bullet 0.75)] \bullet 0.5 \bullet 0.5$

$E1'_{SCR} = 113{,}337$ lbs H_2SO_4/yr

FGC

$E1'_{FGC} = [E1_{FGC} - (K_E \bullet B \bullet f_E \bullet I_{NH3})] \bullet F3 \bullet F2$

$E1'_{FGC} = [647{,}407 - (3799 \bullet 27.05 \bullet 0.9 \bullet 3.0)] \bullet 0.25 \bullet 1.0$

$E1'_{FGC} = 92{,}487$ lbs H_2SO_4/yr

Total

$E1'_{total} = E1'_{comb} + E1'_{SCR} + E1'_{FGC}$
$E1_{total} = 262,340 + 113,337 + 92,487$ lbs H_2SO_4/yr
$E1_{total} = 468,164$ lbs H_2SO_4/yr

Example 5: Coal-Fired Boiler with FGC, NG Startup Fuel, and Used Oil Co-Firing

A 500-MW PC boiler equipped with a cold-side electrostatic precipitator burns an Eastern bituminous coal as the main fuel. The plant is equipped with a SCR process that operates during the ozone season only, so that 0.5 of the coal burn occurred with the SCR operating. The ammonia slip is estimated to be 0.75 ppmv. The plant is also equipped with a FGC process that injects both SO_3 and NH_3, with the SO_3 injected upstream of the air preheater. The SO_3 is injected at 7 ppmv at 6% O_2 wet, and the ammonia at 3 ppmv also at 6% O_2 wet. The FGC system operates whenever the plant is on, except during startup and shutdown, with an operating factor estimated at 0.9. The coal used in the reporting year is 1,126,938 tons with a weighted average sulfur concentration of 2.0% and a heating value of 12,000 Btu/lb. Natural gas is used as a startup fuel, with 0.5 TBtu per year. During startup, neither the SCR nor the FGC system is used. Used oil is also burned, with 483.2 tons burned (0.0185 TBtu/yr) in the year. Since the used oil is burned when the unit is at full load, it is burned while the SCR and FGC are both operating. The used oil has a sulfur content of 0.1% from analysis.

Solution

Coal fuel calculations

Manufactured from coal, from previous examples

Total

$E1_{total} = E1_{comb} + E1_{SCR} + E1_{FGC}$

$E1_{total} = 1{,}049{,}359 + 491{,}887 + 647{,}407$ lbs H_2SO_4/yr

$E1_{total} = 2{,}188{,}653$ lbs H_2SO_4/yr

Released from coal, from previous examples

Total

$E1'_{total} = E1'_{comb} + E1'_{SCR} + E1'_{FGC}$

$E1'_{total} = 262{,}340 + 113{,}337 + 92{,}487$ lbs H_2SO_4/yr

$E1'_{total} = 468{,}164$ lbs H_2SO_4/yr

Natural gas fuel calculations

Manufactured from natural gas

Combustion

$E2_{NG} = K_b \bullet B_{NG} \bullet S$

$E2_{NG} = 0.0001359 \bullet 0.5$ TBtu/yr $\bullet$ 2000 gr/10^6 scf

$E2_{NG} = 0.136$ tons SO_2/year

$E1_{comb} = K \bullet F1 \bullet E2_{NG}$

$E1_{comb} = 3063 \bullet 0.01 \bullet 0.136$

$E1_{comb}$ = 4.16 lbs H_2SO_4 manufactured

None manufactured in either the SCR or FGC

Released from natural gas

Combustion

$E1' = K \bullet F1 \bullet F2 \bullet E2_{NG}$
$E1' = 3063 \bullet 0.01 \bullet 0.5 \bullet 0.5 \bullet 0.136$
$E1' = 1.04$ lbs H_2SO_4 released

F2 is taken to be equal to 0.5 for the air heater and 0.5 for the ESP.

Used oil fuel calculations

Manufactured from used oil

Combustion

$E2 = K1 \bullet K2 \bullet C1 \bullet S1$
$E2 = 0.02 \bullet 1.0 \bullet 483.2 \bullet 0.1$
$E2 = 0.966$ tons SO_2/year

$E1_{comb} = K \bullet F1 \bullet E2$
$E1_{comb} = 3063 \bullet 0.0175 \bullet 0.966$
$E1_{comb} = 51.8$ lbs H_2SO_4 manufactured

SCR

$E1_{SCR} = K \bullet S2 \bullet f_s \bullet E2$
$E1_{SCR} = 3063 \bullet 0.0075 \bullet 1.0 \bullet 0.966$
$E1_{SCR} = 22.2$ lbs H_2SO_4 manufactured

FGC

$E1_{FGC} = K_e \bullet B \bullet f_e \bullet I_s$
$E1_{FCG} = 3799 \bullet 0.0185 \bullet 1.0 \bullet 7.0$
$E1_{FCG} = 492$ lbs H_2SO_4 manufactured

Total

$E1_{total} = E1_{comb} + E1_{SCR} + E1_{FGC}$
$E1_{total} = 51.8 + 22.2 + 492$ lbs H_2SO_4/yr
$E1_{total} = 566$ lbs H_2SO_4/yr

Released from used oil

Combustion

$E1'_{comb} = K \bullet F1 \bullet F2 \bullet E2$

$E1'_{comb} = 3063 \bullet 0.0175 \bullet 0.5 \bullet 0.5 \bullet 0.966$

$E1'_{comb} = 12.95$ lbs H_2SO_4 released

SCR

$E1'_{SCR} = [E1_{SCR} - (K_s \bullet B \bullet f_s \bullet S_{NH3})] \bullet F2 \bullet F2$

$E1'_{SCR} = [22.2 - (3799 \bullet 0.0185 \bullet 1.0 \bullet 0.75)] \bullet 0.5 \bullet 0.5$

$E1'_{SCR} = -7.63$ lbs H_2SO_4/yr

F2 is taken to be equal to 0.5 for the air heater and 0.5 for the ESP.

FGC

$E1'_{FGC} = [E1_{FGC} - (K_e \bullet B \bullet f_e \bullet I_{NH3})] \bullet F3 \bullet F2$

$E1'_{FGC} = [492 - (3799 \bullet 0.0185 \bullet 1.0 \bullet 3.0)] \bullet 0.25 \bullet 1.0$

$E1'_{FGC} = 70.3$ lbs H_2SO_4/yr

Total

$E1'_{total} = E1'_{comb} + E1'_{SCR} + E1'_{FGC}$

$E1'_{total} = 12.95 - 7.63 + 70.3$ lbs H_2SO_4/yr

$E2'_{total} = 75.6$ lbs H_2SO_4/yr

Grand totals for all fuels

Manufactured

$E1_{total} = E1_{coal} + E1_{NG} + E1_{oil}$

$E1_{total} = 2{,}188{,}653 + 4.16 + 566$ lbs H_2SO_4/yr

$E1_{total} = 2{,}189{,}223$ lbs H_2SO_4/yr

Released

$E1'_{total} = E1'_{coal} + E1'_{NG} + E1'_{oil}$

$E1'_{total} = 468{,}164 + 1.04 + 75.6$ lbs H_2SO_4/yr

$E2'_{total} = 468{,}241$ lbs H_2SO_4/yr

Example 6: Natural Gas Combined Cycle Plant

This is a natural gas fired combined cycle unit that used 12.3 TBtu of natural gas, with the standard sulfur content.

Solution

Manufactured

$E2_{NG} = K_b \bullet B_{NG} \bullet S$

$= 0.0001359 \bullet 12.3 \bullet 2000$

$= 3.343$ tons SO_2/yr

$E1_{comb} = K \bullet F1 \bullet E2_{NG}$

$= 3063 \bullet 0.0555 \bullet 3.343$

$= 568$ lbs H_2SO_4 manufactured

Released

$E1' = K \bullet F1 \bullet F2 \bullet E2_{NG}$

$= 3063 \bullet 0.0555 \bullet 0.5 \bullet 3.343$

$= 284.5$ lbs H_2SO_4 released

(F2= 0.5 because of the low temperature of the back-end tubes of the HRSG, like an air heater.)

REFERENCES

1 EPA. 1995. Sulfuric Acid: Toxic Chemical Release Reporting: Community Right-To-Know. Final Rule. 60 FR 34182. June 30, 1995.

2 EPA. Emergency Planning and Community Right-to-Know Act - Section 313. Guidance for Reporting Sulfuric Acid (acid aerosols including mists vapors, gas, fog, and other airborne forms of any particle size). EPA-745-R-97-007. November 1997.

3 Hardman, R., Stacy R., Dismukes, E. *Estimating Total Sulfuric Acid Emissions from Coal-Fired Power Plants.* Internal report of Research & Environmental Affairs Department, Southern Company Services, March 1998.

4 Hardman, R., Stacy, R., Dismukes, E., Harrison, K., Monroe, L. *Estimating Total Sulfuric Acid Emissions from Coal-Fired Power Plants.* Revised Internal report of Research & Environmental Affairs Department, Southern Company Services, February 1999.

5 EPA. 1995. Compilation of Air Pollutant Emission Factors AP-42, Fifth Edition, Volume I: Stationary Point and Area Sources. http://www.epa.gov/ttnchie1/ap42pdf/c01s01.pdf.

Table 1.3-8. EMISSION FACTORS FOR NITROUS OXIDE (N_2O), POLYCYCLIC ORGANIC MATTER (POM), AND FORMALDEHYDE (HCOH) FROM FUEL OIL COMBUSTION[a]

EMISSION FACTOR RATING: E

Firing Configuration (SCC)	Emission Factor (lb/10^3 gal)		
	N_2O[b]	POM[c]	HCOH[c]
Utility/industrial/commercial boilers			
No. 6 oil fired (1-01-004-01, 1-02-004-01, 1-03-004-01)	0.53	0.0011 - 0.0013[d]	0.024 - 0.061
Distillate oil fired (1-01-005-01, 1-02-005-01, 1-03-005-01)	0.26	0.0033[e]	0.035 - 0.061
Residential furnaces (A2104004/A2104011)	0.05	ND	ND

[a] To convert from lb/10^3 gal to kg/10^3 L, multiply by 0.12. SCC = Source Classification Code. ND = no data.
[b] References 45-46. EMISSION FACTOR RATING = B.
[c] References 29-32.
[d] Particulate and gaseous POM.
[e] Particulate POM only.

Table 1.3-10. EMISSION FACTORS FOR TRACE ELEMENTS FROM DISTILLATE FUEL OIL COMBUSTION SOURCES[a]

EMISSION FACTOR RATING: E

Firing Configuration (SCC)	Emission Factor (lb/10^{12} Btu)										
	As	Be	Cd	Cr	Cu	Pb	Hg	Mn	Ni	Se	Zn
Distillate oil fired (1-01-005-01, 1-02-005-01, 1-03-005-01)	4	3	3	3	6	9	3	6	3	15	4

[a] Data are for distillate oil fired boilers, SCC codes 1-01-005-01, 1-02-005-01, and 1-03-005-01. References 29-32, 40-44 and 83. To convert from lb/10^{12} Btu to pg/J, multiply by 0.43.

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
91-57-6	2-Methylnaphthalene[b, c]	2.4E-05	D
56-49-5	3-Methylchloranthrene[b, c]	<1.8E-06	E
	7,12-Dimethylbenz(a)anthracene[b,c]	<1.6E-05	E
83-32-9	Acenaphthene[b,c]	<1.8E-06	E
203-96-8	Acenaphthylene[b,c]	<1.8E-06	E
120-12-7	Anthracene[b,c]	<2.4E-06	E
56-55-3	Benz(a)anthracene[b,c]	<1.8E-06	E
71-43-2	Benzene[b]	2.1E-03	B
50-32-8	Benzo(a)pyrene[b,c]	<1.2E-06	E
205-99-2	Benzo(b)fluoranthene[b,c]	<1.8E-06	E
191-24-2	Benzo(g,h,i)perylene[b,c]	<1.2E-06	E
207-08-9	Benzo(k)fluoranthene[b,c]	<1.8E-06	E
106-97-8	Butane	2.1E+00	E
218-01-9	Chrysene[b,c]	<1.8E-06	E
53-70-3	Dibenzo(a,h)anthracene[b,c]	<1.2E-06	E
25321-22-6	Dichlorobenzene[b]	1.2E-03	E
74-84-0	Ethane	3.1E+00	E
206-44-0	Fluoranthene[b,c]	3.0E-06	E
86-73-7	Fluorene[b,c]	2.8E-06	E
50-00-0	Formaldehyde[b]	7.5E-02	B
110-54-3	Hexane[b]	1.8E+00	E
193-39-5	Indeno(1,2,3-cd)pyrene[b,c]	<1.8E-06	E
91-20-3	Naphthalene[b]	6.1E-04	E
109-66-0	Pentane	2.6E+00	E
85-01-8	Phenanathrene[b,c]	1.7E-05	D
74-98-6	Propane	1.6E+00	E

TABLE 1.4-3. EMISSION FACTORS FOR SPECIATED ORGANIC COMPOUNDS FROM NATURAL GAS COMBUSTION (Continued)

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
129-00-0	Pyrene[b, c]	5.0E-06	E
108-88-3	Toluene[b]	3.4E-03	C

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by 16. To convert from $1b/10^6$ scf to lb/MMBtu, divide by 1,020. Emission Factors preceeded with a less-than symbol are based on method detection limits.

[b] Hazardous Air Pollutant (HAP) as defined by Section 112(b) of the Clean Air Act.

[c] HAP because it is Polycyclic Organic Matter (POM). POM is a HAP as defined by Section 112(b) of the Clean Air Act.

[d] The sum of individual organic compounds may exceed the VOC and TOC emission factors due to differences in test methods and the availability of test data for each pollutant.

TABLE 1.4-4. EMISSION FACTORS FOR METALS FROM NATURAL GAS COMBUSTION[a]

CAS No.	Pollutant	Emission Factor ($lb/10^6$ scf)	Emission Factor Rating
7440-38-2	Arsenic[b]	2.0E-04	E
7440-39-3	Barium	4.4E-03	D
7440-41-7	Beryllium[b]	<1.2E-05	E
7440-43-9	Cadmium[b]	1.1E-03	D
7440-47-3	Chromium[b]	1.4E-03	D
7440-48-4	Cobalt[b]	8.4E-05	D
7440-50-8	Copper	8.5E-04	C
7439-96-5	Manganese[b]	3.8E-04	D
7439-97-6	Mercury[b]	2.6E-04	D
7439-98-7	Molybdenum	1.1E-03	D
7440-02-0	Nickel[b]	2.1E-03	C
7782-49-2	Selenium[b]	<2.4E-05	E
7440-62-2	Vanadium	2.3E-03	D
7440-66-6	Zinc	2.9E-02	E

[a] Reference 11. Units are in pounds of pollutant per million standard cubic feet of natural gas fired. Data are for all natural gas combustion sources. Emission factors preceeded by a less-than symbol are based on method detection limits. To convert from $lb/10^6$ scf to $kg/10^6$ m^3, multiply by l6. To convert from $lb/10^6$ scf to 1b/MMBtu, divide by 1,020.

[b] Hazardous Air Pollutant as defined by Section 112(b) of the Clean Air Act.

Table 3.1-3. EMISSION FACTORS FOR HAZARDOUS AIR POLLUTANTS FROM NATURAL GAS-FIRED STATIONARY GAS TURBINES[a]

Emission Factors[b] - Uncontrolled		
Pollutant	Emission Factor (lb/MMBtu)[c]	Emission Factor Rating
1,3-Butadiene[d]	< 4.3 E-07	D
Acetaldehyde	4.0 E-05	C
Acrolein	6.4 E-06	C
Benzene[e]	1.2 E-05	A
Ethylbenzene	3.2 E-05	C
Formaldehyde[f]	7.1 E-04	A
Naphthalene	1.3 E-06	C
PAH	2.2 E-06	C
Propylene Oxide[d]	< 2.9 E-05	D
Toluene	1.3 E-04	C
Xylenes	6.4 E-05	C

[a] SCC for natural gas-fired turbines include 2-01-002-01, 2-02-002-01, 2-02-002-03, 2-03-002-02, and 2-03-002-03. Hazardous Air Pollutants as defined in Section 112 (b) of the *Clean Air Act*.

[b] Factors are derived from units operating at high loads (≥ 80 percent load) only. For information on units operating at other loads, consult the background report for this chapter (Reference 16), available at "www.epa.gov/ttn/chief".

[c] Emission factors based on an average natural gas heating value (HHV) of 1020 Btu/scf at 60°F. To convert from (lb/MMBtu) to ($lb/10^6$ scf), multiply by 1020. These emission factors can be converted to other natural gas heating values by multiplying the given emission factor by the ratio of the specified heating value to this heating value.

[d] Compound was not detected. The presented emission value is based on one-half of the detection limit.

[e] Benzene with SCONOX catalyst is 9.1 E-07, rating of D.

[f] Formaldehyde with SCONOX catalyst is 2.0 E-05, rating of D.

ELECTRONIC CODE OF FEDERAL REGULATIONS

e-CFR data is current as of August 24, 2017

Title 40: Protection of Environment
PART 98—MANDATORY GREENHOUSE GAS REPORTING
Subpart C—General Stationary Fuel Combustion Sources

TABLE C-1 TO SUBPART C OF PART 98—DEFAULT CO_2 EMISSION FACTORS AND HIGH HEAT VALUES FOR VARIOUS TYPES OF FUEL

Link to an amendment published at 81 FR 89252, Dec. 9, 2016.

DEFAULT CO_2 EMISSION FACTORS AND HIGH HEAT VALUES FOR VARIOUS TYPES OF FUEL

Fuel type	Default high heat value	Default CO_2 emission factor
Coal and coke	mmBtu/short ton	kg CO_2/mmBtu
Anthracite	25.09	103.69
Bituminous	24.93	93.28
Subbituminous	17.25	97.17
Lignite	14.21	97.72
Coal Coke	24.80	113.67
Mixed (Commercial sector)	21.39	94.27
Mixed (Industrial coking)	26.28	93.90
Mixed (Industrial sector)	22.35	94.67
Mixed (Electric Power sector)	19.73	95.52
Natural gas	mmBtu/scf	kg CO_2/mmBtu
(Weighted U.S. Average)	1.026×10^{-3}	53.06
Petroleum products	mmBtu/gallon	kg CO_2/mmBtu
Distillate Fuel Oil No. 1	0.139	73.25
Distillate Fuel Oil No. 2	0.138	73.96
Distillate Fuel Oil No. 4	0.146	75.04
Residual Fuel Oil No. 5	0.140	72.93
Residual Fuel Oil No. 6	0.150	75.10
Used Oil	0.138	74.00
Kerosene	0.135	75.20
Liquefied petroleum gases (LPG)[1]	0.092	61.71
Propane[1]	0.091	62.87
Propylene[2]	0.091	67.77
Ethane[1]	0.068	59.60
Ethanol	0.084	68.44
Ethylene[2]	0.058	65.96
Isobutane[1]	0.099	64.94
Isobutylene[1]	0.103	68.86
Butane[1]	0.103	64.77
Butylene[1]	0.105	68.72
Naphtha (<401 deg F)	0.125	68.02
Natural Gasoline	0.110	66.88
Other Oil (>401 deg F)	0.139	76.22
Pentanes Plus	0.110	70.02
Petrochemical Feedstocks	0.125	71.02
Petroleum Coke	0.143	102.41
Special Naphtha	0.125	72.34
Unfinished Oils	0.139	74.54
Heavy Gas Oils	0.148	74.92
Lubricants	0.144	74.27
Motor Gasoline	0.125	70.22
Aviation Gasoline	0.120	69.25

Kerosene-Type Jet Fuel	0.135	72.22
Asphalt and Road Oil	0.158	75.36
Crude Oil	0.138	74.54
Other fuels—solid	mmBtu/short ton	kg CO_2/mmBtu
Municipal Solid Waste	9.95[3]	90.7
Tires	28.00	85.97
Plastics	38.00	75.00
Petroleum Coke	30.00	102.41
Other fuels—gaseous	mmBtu/scf	kg CO_2/mmBtu
Blast Furnace Gas	0.092×10^{-3}	274.32
Coke Oven Gas	0.599×10^{-3}	46.85
Propane Gas	2.516×10^{-3}	61.46
Fuel Gas[4]	1.388×10^{-3}	59.00
Biomass fuels—solid	mmBtu/short ton	kg CO_2/mmBtu
Wood and Wood Residuals (dry basis)[5]	17.48	93.80
Agricultural Byproducts	8.25	118.17
Peat	8.00	111.84
Solid Byproducts	10.39	105.51
Biomass fuels—gaseous	mmBtu/scf	kg CO_2/mmBtu
Landfill Gas	0.485×10^{-3}	52.07
Other Biomass Gases	0.655×10^{-3}	52.07
Biomass Fuels—Liquid	mmBtu/gallon	kg CO_2/mmBtu
Ethanol	0.084	68.44
Biodiesel (100%)	0.128	73.84
Rendered Animal Fat	0.125	71.06
Vegetable Oil	0.120	81.55

[1]The HHV for components of LPG determined at 60 °F and saturation pressure with the exception of ethylene.

[2]Ethylene HHV determined at 41 °F (5 °C) and saturation pressure.

[3]Use of this default HHV is allowed only for: (a) Units that combust MSW, do not generate steam, and are allowed to use Tier 1; (b) units that derive no more than 10 percent of their annual heat input from MSW and/or tires; and (c) small batch incinerators that combust no more than 1,000 tons of MSW per year.

[4]Reporters subject to subpart X of this part that are complying with §98.243(d) or subpart Y of this part may only use the default HHV and the default CO_2 emission factor for fuel gas combustion under the conditions prescribed in §98.243(d)(2)(i) and (d)(2)(ii) and §98.252(a)(1) and (a)(2), respectively. Otherwise, reporters subject to subpart X or subpart Y shall use either Tier 3 (Equation C-5) or Tier 4.

[5]Use the following formula to calculate a wet basis HHV for use in Equation C-1: $HHV_w = ((100 - M)/100)*HHV_d$ where HHV_w = wet basis HHV, M = moisture content (percent) and HHV_d = dry basis HHV from Table C-1.

[78 FR 71950, Nov. 29, 2013]

TABLE C-2 TO SUBPART C OF PART 98—DEFAULT CH_4 AND N_2O EMISSION FACTORS FOR VARIOUS TYPES OF FUEL

Link to an amendment published at 81 FR 89252, Dec. 9, 2016.

Fuel type	Default CH_4 emission factor (kg CH_4/mmBtu)	Default N_2O emission factor (kg N_2O/mmBtu)
Coal and Coke (All fuel types in Table C-1)	1.1×10^{-02}	1.6×10^{-03}
Natural Gas	1.0×10^{-03}	1.0×10^{-04}
Petroleum (All fuel types in Table C-1)	3.0×10^{-03}	6.0×10^{-04}
Fuel Gas	3.0×10^{-03}	6.0×10^{-04}
Municipal Solid Waste	3.2×10^{-02}	4.2×10^{-03}
Tires	3.2×10^{-02}	4.2×10^{-03}
Blast Furnace Gas	2.2×10^{-05}	1.0×10^{-04}
Coke Oven Gas	4.8×10^{-04}	1.0×10^{-04}
Biomass Fuels—Solid (All fuel types in Table C-1, except wood and wood residuals)	3.2×10^{-02}	4.2×10^{-03}
Wood and wood residuals	7.2×10^{-03}	3.6×10^{-03}
Biomass Fuels—Gaseous (All fuel types in Table C-1)	3.2×10^{-03}	6.3×10^{-04}
Biomass Fuels—Liquid (All fuel types in Table C-1)	1.1×10^{-03}	1.1×10^{-04}

Note: Those employing this table are assumed to fall under the IPCC definitions of the “Energy Industry” or “Manufacturing Industries and Construction”. In all fuels except for coal the values for these two categories are identical. For coal combustion, those who fall within the IPCC “Energy Industry” category may employ a value of 1g of CH_4/mmBtu.

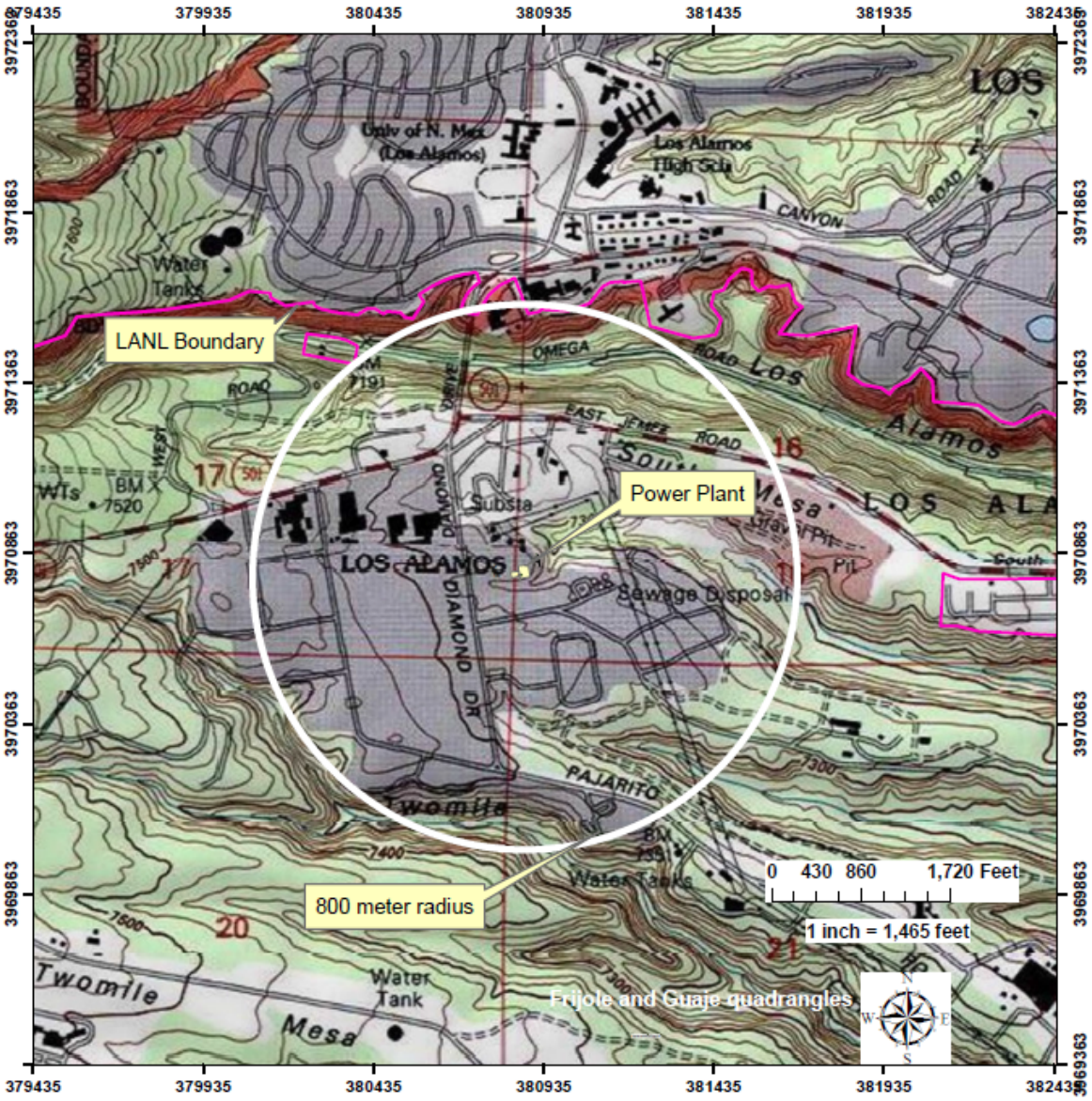
[78 FR 71952, Nov. 29, 2013]

Section 8

Map(s)

A map such as a 7.5 minute topographic quadrangle showing the exact location of the source. The map shall also include the following:

The UTM or Longitudinal coordinate system on both axes	An indicator showing which direction is north
A minimum radius around the plant of 0.8km (0.5 miles)	Access and haul roads
Topographic features of the area	Facility property boundaries
The name of the map	The area which will be restricted to public access
A graphical scale	



Section 9

Proof of Public Notice

(for NSR applications submitting under 20.2.72 or 20.2.74 NMAC)
(This proof is required by: 20.2.72.203.A.14 NMAC "Documentary Proof of applicant's public notice")

√ **I have read the AQB "Guidelines for Public Notification for Air Quality Permit Applications"**
This document provides detailed instructions about public notice requirements for various permitting actions. It also provides public notice examples and certification forms. Material mistakes in the public notice will require a re-notice before issuance of the permit.

Unless otherwise allowed elsewhere in this document, the following items document proof of the applicant's Public Notification. Please include this page in your proof of public notice submittal with checkmarks indicating which documents are being submitted with the application.

New Permit and **Significant Permit Revision** public notices must include all items in this list.

Technical Revision public notices require only items 1, 5, 9, and 10.

Per the Guidelines for Public Notification document mentioned above, include:

1. √ A copy of the certified letter receipts with post marks (20.2.72.203.B NMAC)
2. √ A list of the places where the public notice has been posted in at least four publicly accessible and conspicuous places, including the proposed or existing facility entrance. (e.g: post office, library, grocery, etc.)
3. √ A copy of the property tax record (20.2.72.203.B NMAC).
4. n/a A sample of the letters sent to the owners of record.
5. √ A sample of the letters sent to counties, municipalities, and Indian tribes.
6. √ A sample of the public notice posted and a verification of the local postings.
7. √ A table of the noticed citizens, counties, municipalities and tribes and to whom the notices were sent in each group.
8. √ A copy of the public service announcement (PSA) sent to a local radio station and documentary proof of submittal.
9. √ A copy of the classified or legal ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
10. √ A copy of the display ad including the page header (date and newspaper title) or its affidavit of publication stating the ad date, and a copy of the ad. When appropriate, this ad shall be printed in both English and Spanish.
11. n/a A map with a graphic scale showing the facility boundary and the surrounding area in which owners of record were notified by mail. This is necessary for verification that the correct facility boundary was used in determining distance for notifying land owners of record.

Per the NMED 02/24/2017 Guideline for Public Notification for Air Quality Permit Applications and confirmation of 4/19/2011 from NMED, facilities with large geographical areas such as LANL apply the distances to provide public notice to nearby property owners to the boundary of the restricted area surrounding the new or modified activity and not the facility property boundary. There are no property owners within 100 feet of the restricted area of the TA-3 Power Plant.

List of local governments provided certified notification.

Municipalities & Counties

Naomi D. Maestas
Los Alamos County Clerk
1000 Central Ave., Suite 350
Los Alamos, New Mexico 87544

Eileen Garbagni
Sandoval County Clerk
1500 Idalia Rd., Bldg. D
Bernalillo, New Mexico 87004

Geraldine Salazar
Santa Fe County Clerk
102 Grant Ave.
Santa Fe, New Mexico 87501

Mark Trujillo
Espanola City Manager
405 North Paseo De Onate
Espanola, New Mexico 87532

Linda Padilla
Rio Arriba County Clerk
149 State Rd. 162
Tierra Amarilla, New Mexico 87575

Tribal Contacts

Adam Duran
Director, Environmental Department, Pojoaque Pueblo
39 Camino del Rincon
Santa Fe, NM 87506

Jacob Pecos
Director, Environmental Department, Cochiti Pueblo
PO Box 70
Cochiti Pueblo, NM 87072

Dino Chavarria
Director, Office of Environmental Affairs, Santa Clara Pueblo
PO Box 580
Espanola, NM 87532

Raymond Martinez
Director, Department of Environmental & Cultural Protection, San Ildefonso Pueblo
02 Tunyo Po
Santa Fe, NM 87506

Paul Clarke
Director, Natural Resources (Resource Protection), Jemez Pueblo
PO Box 100
Pueblo of Jemez, NM 87024

Governor Joseph M. Talachy
Pueblo of Pojoaque
78 Cities of Gold Road
Santa Fe, NM 87506

Governor Eugene Herrera
P.O. Box 70
Cochiti Pueblo, NM 87072

Governor J. Michael Chavarria
P.O. Box 580
Espanola, NM 87532

Governor James R. Mountain
02 Tunyo Po
Santa Fe, NM 87506

Governor Joseph A. Toya
P.O. Box 100
Jemez Pueblo, NM 87024

Example Letter to Nearby Tribal, City & County Govts

Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

Date:
Symbol:
LA-UR:
Locates Action No.:

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018**.** This application was planned to be submitted on September 25th, 2017, but the project was delayed.

The exact location for the proposed facility known as Technical Area 3 Power Plant is at TA-3, SM-22 on Diamond Drive in the Los Alamos National Laboratory. The approximate location of this facility is 1 mile south of the intersection of Diamond Drive and Trinity Drive in Los Alamos County.

The proposed modification consists of:

- The construction and installation of a Heat Recovery Steam Generator (HRSG), which will be installed on the exhaust stack of the existing Combustion Gas Turbine Generator.

- The permanent shut down of three existing boilers that were installed in the 1950's each rated at a capacity of 178.5 MMBtu/hr and the construction and installation of two new auxiliary boilers each rated at a capacity of 72.3 MMBtu/hr.

- The project will be constructed using a three phased approach. Phase 1 consists of the construction of the two new auxiliary boilers while the existing boilers continue to operate. Once the auxiliary boilers become operational, two of the three existing boilers will be permanently shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the

site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

The estimated maximum quantities of any regulated air contaminant will be as follows in pound per hour (pph) and tons per year (tpy) and could change slightly during the course of the Department's review:

Phase 1

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	9.5 pph*	7.9 tpy*
PM_{10}	8.2 pph*	7.7 tpy*
$PM_{2.5}$	7.2 pph*	7.6 tpy*
Sulfur Dioxide (SO_2)	18.0 pph*	6.9 tpy*
Nitrogen Oxides (NO_x)	47.6 pph*	66.1 tpy*
Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
$PM_{2.5}$	13.4 pph*	34.7 tpy*
Sulfur Dioxide (SO_2)	7.7 pph*	5.7 tpy*
Nitrogen Oxides (NO_x)	37.7 pph*	69.5 tpy*
Carbon Monoxide (CO)	318.1 pph*	71.4 tpy*
Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

* Estimated hourly and annual start up, shut down and maintenance emissions have been added per public notice requirements.

The standard and maximum operating schedules will be from 24 hours per day, 7 days a week and a maximum of 52 weeks per year.

Phase 3 emissions will replace Phase 1 emissions once Phase 3 becomes operational.

Owners and operator of the facility include: Los Alamos National Security, LLC, P.O. Box 1663, MS J978, Los Alamos, New Mexico, 87545, Los Alamos National Laboratory for the U.S. Department of Energy, 3747 West Jemez Road, Los Alamos, NM 87544. Point of contact: Peter Hyde, Environmental Communication & Public Involvement, P.O. Box 1163, MS K491, Los Alamos, New Mexico 87545, Phone: 505-667-3792. E-mail: envoutreach@lanl.gov.

If you have any comments about the construction or operation of this facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to this address: Air Quality Bureau; Attention: Kirby Olson, 525 Camino de los Marquez, Suite 1; Santa Fe, New Mexico; 87505-1816; (505) 476-4322; 1-800-224-7009; https://www.env.nm.gov/aqb/permit/aqb_draft_permits.html. If you do not want to submit written comments, but have questions about the application, please contact Kirby Olson.

Please refer to the company name and site name, or send a copy of this notice along with your comments, since the Department may have not yet received the permit application. Please include a legible return mailing address with your comments. Once the Department has performed a preliminary review of the application and its air quality impacts, the Department's notice will be published in the legal section of a newspaper circulated near the facility location.

Attención

Este es un aviso de la Agencia de Calidad de Aire del Departamento de Medio Ambiente de Nuevo México, acerca de las emisiones producidas por un establecimiento en esta área. Si usted desea información en español, por favor de comunicarse con la oficina de Calidad de Aire al teléfono 505-476-5557.

Sincerely,

Taunia S. Van Valkenburg
Group Leader

HW:am

Copy: Stephen C. Fong, NA-LA, (E-File)
Adrienne L. Nash, NA-LA, (E-File)
Richard M. Kacich, DIR, (E-File)
Craig S. Leasure, PADOPS, (E-File)
William R. Mairson, ADESH, (E-File)
John C. Bretzke ADESH, (E-File)
Andrew W. Erickson, UI-DO, (E-File)
Karen G. Borovina, MPD-PO, (E-File)
Steven L. Story, EPC-CP, (E-File)
Margie B. Stockton, EPC-CP, (E-File)
Harvey J. Wiscovitch, EPC-CP, (E-File)
Timothy A. Dolan, LC-ESH, (E-File)
Patrick D. Woehrle, GAP, (E-File)
Rosemary Maestas, GAP, (E-File)
Richard A. Ulibarri, GAP, (E-File)
locatesteam@lanl.gov, (E-File)
adesh@lanl.gov, (E-File)
epc-correspondence@lanl.gov, (E-File)
ENV-ES Permit File

Notice of Non-Discrimination

NMED does not discriminate on the basis of race, color, national origin, disability, age or sex in the administration of its programs or activities, as required by applicable laws and regulations. NMED is responsible for coordination of compliance efforts and receipt of inquiries concerning non-discrimination requirements implemented by 40 C.F.R. Part 7, including Title VI of the Civil Rights Act of 1964, as amended; Section 504 of the Rehabilitation Act of 1973; the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and Section 13 of the Federal Water Pollution Control Act Amendments of 1972. If you have any questions about this notice or any of NMED's non- discrimination programs, policies or procedures, you may contact: Kristine Pintado, Non-Discrimination Coordinator, New Mexico Environment Department, 1190 St. Francis Dr., Suite N4050, P.O. Box 5469, Santa Fe, NM 87502, (505) 827-2855, nd.coordinator@state.nm.us. If you believe that you have been discriminated against with respect to a NMED program or activity, you may contact the Non-Discrimination Coordinator identified above or visit our website at https://www.env.nm.gov/NMED/EJ/index.html to learn how and where to file a complaint of discrimination.

Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

Date: MAR 2 1 2018
Symbol: EPC-DO: 18-102
LA-UR: 18-22068
Locates Action No.: N/A

Ms. Naomi D. Maestas
Los Alamos County Clerk
1000 Central Ave., Suite 350
Los Alamos, New Mexico 87544

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Ms. Maestas:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

The exact location for the proposed facility known as Technical Area 3 Power Plant is at TA-3, SM-22 on Diamond Drive in the Los Alamos National Laboratory. The approximate location of this facility is 1 mile south of the intersection of Diamond Drive and Trinity Drive in Los Alamos County.

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- The construction and installation of a Heat Recovery Steam Generator (HRSG), which will be installed on the exhaust stack of the existing Combustion Gas Turbine Generator.

- The permanent shut down of three existing boilers that were installed in the 1950's each rated at a capacity of 178.5 MMBtu/hr and the construction and installation of two new auxiliary boilers each rated at a capacity of 72.3 MMBtu/hr.

- The project will be constructed using a three phased approach. Phase 1 consists of the construction of the two new auxiliary boilers while the existing boilers continue to operate. Once

the auxiliary boilers become operational, two of the three existing boilers will be permanently shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

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Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	9.5 pph*	7.9 tpy*
PM_{10}	8.2 pph*	7.7 tpy*
$PM_{2.5}$	7.2 pph*	7.6 tpy*
Sulfur Dioxide (SO_2)	18.0 pph*	6.9 tpy*
Nitrogen Oxides (NO_x)	47.6 pph*	66.1 tpy*
Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
$PM_{2.5}$	13.4 pph*	34.7 tpy*
Sulfur Dioxide (SO_2)	7.7 pph*	5.7 tpy*
Nitrogen Oxides (NO_x)	37.7 pph*	69.5 tpy*
Carbon Monoxide (CO)	318.1 pph*	71.4 tpy*
Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

* Estimated hourly and annual start up, shut down and maintenance emissions have been added per public notice requirements.

The standard and maximum operating schedules will be from 24 hours per day, 7 days a week and a maximum of 52 weeks per year.

Phase 3 emissions will replace Phase 1 emissions once Phase 3 becomes operational.

Owners and operator of the facility include: Los Alamos National Security, LLC, P.O. Box 1663, MS J978, Los Alamos, New Mexico, 87545, Los Alamos National Laboratory for the U.S. Department of Energy, 3747 West Jemez Road, Los Alamos, NM 87544. Point of contact: Peter Hyde, Environmental Communication & Public Involvement, P.O. Box 1163, MS K491, Los Alamos, New Mexico 87545, Phone: 505-667-3792. E-mail: envoutreach@lanl.gov.

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Sincerely,

Taunia S. Van Valkenburg
Group Leader

HW:am

Copy: Stephen C. Fong, NA-LA, (E-File)
Adrienne L. Nash, NA-LA, (E-File)
Richard M. Kacich, DIR, (E-File)
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Andrew W. Erickson, UI-DO, (E-File)
Karen G. Borovina, MPD-PO, (E-File)
Benjamin B. Roberts, EPC-DO, (E-File)
Steven L. Story, EPC-CP, (E-File)
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Timothy A. Dolan, LC-ESH, (E-File)
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locatesteam@lanl.gov, (E-File)
adesh-records@lanl.gov, (E-File)
epc-correspondence@lanl.gov, (E-File)
ENV-ES Permit File

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

Date: MAR 2 1 2018
Symbol: EPC-DO: 18-103
LA-UR: 18-22068
Locates Action No.: N/A

Ms. Eileen Garbagni
Sandoval County Clerk
1500 Idalia Rd., Bldg. D
Bernalillo, New Mexico 87004

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Ms. Garbagni:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

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$PM_{2.5}$	7.2 pph*	7.6 tpy*
Sulfur Dioxide (SO_2)	18.0 pph*	6.9 tpy*
Nitrogen Oxides (NO_x)	47.6 pph*	66.1 tpy*
Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
$PM_{2.5}$	13.4 pph*	34.7 tpy*
Sulfur Dioxide (SO_2)	7.7 pph*	5.7 tpy*
Nitrogen Oxides (NO_x)	37.7 pph*	69.5 tpy*
Carbon Monoxide (CO)	318.1 pph*	71.4 tpy*
Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

* Estimated hourly and annual start up, shut down and maintenance emissions have been added per public notice requirements.

Phase 3 emissions will replace Phase 1 emissions once Phase 3 becomes operational.

The standard and maximum operating schedules will be from 24 hours per day, 7 days a week and a maximum of 52 weeks per year.

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Sincerely,

Taunia S. Van Valkenburg
Group Leader

HW:am

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ENV-ES Permit File

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Environmental Protection & Compliance Division (EPC-DO)
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

Date: MAR 2 1 2018
Symbol: EPC-DO: 18-114
LA-UR: 18-22068
Locates Action No.: N/A

Mr. Mark Trujillo
Espanola City Manager
405 North Paseo De Onate
Espanola, New Mexico 87532

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Mr. Trujillo:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

The exact location for the proposed facility known as Technical Area 3 Power Plant is at TA-3, SM-22 on Diamond Drive in the Los Alamos National Laboratory. The approximate location of this facility is 1 mile south of the intersection of Diamond Drive and Trinity Drive in Los Alamos County.

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- The permanent shut down of three existing boilers that were installed in the 1950's each rated at a capacity of 178.5 MMBtu/hr and the construction and installation of two new auxiliary boilers each rated at a capacity of 72.3 MMBtu/hr.

- The project will be constructed using a three phased approach. Phase 1 consists of the construction of the two new auxiliary boilers while the existing boilers continue to operate. Once the auxiliary boilers become operational, two of the three existing boilers will be permanently shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

The estimated maximum quantities of any regulated air contaminant will be as follows in pound per hour (pph) and tons per year (tpy) and could change slightly during the course of the Department's review:

Phase 1

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	9.5 pph*	7.9 tpy*
PM_{10}	8.2 pph*	7.7 tpy*
$PM_{2.5}$	7.2 pph*	7.6 tpy*
Sulfur Dioxide (SO_2)	18.0 pph*	6.9 tpy*
Nitrogen Oxides (NO_x)	47.6 pph*	66.1 tpy*
Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
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Sulfur Dioxide (SO_2)	7.7 pph*	5.7 tpy*
Nitrogen Oxides (NO_x)	37.7 pph*	69.5 tpy*
Carbon Monoxide (CO)	318.1 pph*	71.4 tpy*
Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a

Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

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Phase 3 emissions will replace Phase 1 emissions once Phase 3 becomes operational.

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

MAR 2 1 2018

Date:
Symbol: EPC-DO: 18-115
LA-UR: 18-22068
Locates Action No.: N/A

Ms. Linda Padilla
Rio Arriba County Clerk
149 State Rd. 162
Tierra Amarilla, New Mexico 87575

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Ms. Padilla:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

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the auxiliary boilers become operational, two of the three existing boilers will be permanently shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

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Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
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Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

Date: MAR 2 1 2018
Symbol: EPC-DO: 18-116
LA-UR: 18-22068
Locates Action No.: N/A

Mr. Jacob Pecos
Director, Environmental Department, Cochiti Pueblo
PO Box 70
Pueblo of Cochiti, NM 87072

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Mr. Pecos:

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Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
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ENV-ES Permit File

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

Date: MAR 2 1 2018
Symbol: EPC-DO: 18-117
LA-UR: 18-22068
Locates Action No.: N/A

Mr. Adam Duran
Director, Environmental Department, Pojoaque Pueblo
39 Camino del Rincon
Santa Fe, NM 87506

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Mr. Duran:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

The exact location for the proposed facility known as Technical Area 3 Power Plant is at TA-3, SM-22 on Diamond Drive in the Los Alamos National Laboratory. The approximate location of this facility is 1 mile south of the intersection of Diamond Drive and Trinity Drive in Los Alamos County.

The proposed modification consists of:

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- The permanent shut down of three existing boilers that were installed in the 1950's each rated at a capacity of 178.5 MMBtu/hr and the construction and installation of two new auxiliary boilers each rated at a capacity of 72.3 MMBtu/hr.

- The project will be constructed using a three phased approach. Phase 1 consists of the construction of the two new auxiliary boilers while the existing boilers continue to operate. Once

the auxiliary boilers become operational, two of the three existing boilers will be permanently shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

The estimated maximum quantities of any regulated air contaminant will be as follows in pound per hour (pph) and tons per year (tpy) and could change slightly during the course of the Department's review:

Phase 1

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	9.5 pph*	7.9 tpy*
PM_{10}	8.2 pph*	7.7 tpy*
$PM_{2.5}$	7.2 pph*	7.6 tpy*
Sulfur Dioxide (SO_2)	18.0 pph*	6.9 tpy*
Nitrogen Oxides (NO_x)	47.6 pph*	66.1 tpy*
Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
$PM_{2.5}$	13.4 pph*	34.7 tpy*
Sulfur Dioxide (SO_2)	7.7 pph*	5.7 tpy*
Nitrogen Oxides (NO_x)	37.7 pph*	69.5 tpy*
Carbon Monoxide (CO)	318.1 pph*	71.4 tpy*
Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

* Estimated hourly and annual start up, shut down and maintenance emissions have been added per public notice requirements.

The standard and maximum operating schedules will be from 24 hours per day, 7 days a week and a maximum of 52 weeks per year.

Phase 3 emissions will replace Phase 1 emissions once Phase 3 becomes operational.

Owners and operator of the facility include: Los Alamos National Security, LLC, P.O. Box 1663, MS J978, Los Alamos, New Mexico, 87545, Los Alamos National Laboratory for the U.S. Department of Energy, 3747 West Jemez Road, Los Alamos, NM 87544. Point of contact: Peter Hyde, Environmental Communication & Public Involvement, P.O. Box 1163, MS K491, Los Alamos, New Mexico 87545, Phone: 505-667-3792. E-mail: envoutreach@lanl.gov.

If you have any comments about the construction or operation of this facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to this address: Air Quality Bureau; Attention: Kirby Olson, 525 Camino de los Marquez, Suite 1; Santa Fe, New Mexico; 87505-1816; (505) 476-4322; 1-800-224-7009; https://www.env.nm.gov/aqb/permit/aqb_draft_permits.html. If you do not want to submit written comments, but have questions about the application, please contact Kirby Olson.

Please refer to the company name and site name, or send a copy of this notice along with your comments, since the Department may have not yet received the permit application. Please include a legible return mailing address with your comments. Once the Department has performed a preliminary review of the application and its air quality impacts, the Department's notice will be published in the legal section of a newspaper circulated near the facility location.

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Sincerely,

Taunia S. Van Valkenburg
Group Leader

HW:am

Copy: Stephen C. Fong, NA-LA, (E-File)
Adrienne L. Nash, NA-LA, (E-File)
Richard M. Kacich, DIR, (E-File)
Craig S. Leasure, PADOPS, (E-File)
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epc-correspondence@lanl.gov, (E-File)
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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

MAR 2 1 2018

Date:
Symbol: EPC-DO: 18-118
LA-UR: 18-22068
Locates Action No.: N/A

Mr. Dino Chavarria
Director, Office of Environmental Affairs, Santa Clara Pueblo
PO Box 580
Espanola, NM 87532

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Mr. Chavarria:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

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the auxiliary boilers become operational, two of the three existing boilers will be permanently shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

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Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
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Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

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Sincerely,

Taunia S. Van Valkenburg
Group Leader

HW:am

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

Date: MAR 2 1 2018
Symbol: EPC-DO: 18-119
LA-UR: 18-22068
Locates Action No.: N/A

Mr. Raymond Martinez
Director, Department of Environmental & Cultural Protection, San Ildefonso Pueblo
02 Tunyo Po
Santa Fe, NM 87506

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Mr. Martinez:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

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shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

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Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
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Sincerely,

Taunia S. Van Valkenburg
Group Leader

HW:am

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PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

MAR 2 1 2018

Date:
Symbol: EPC-DO: 18-120
LA-UR: 18-22068
Locates Action No.: N/A

Mr. Paul Clarke
Director, Natural Resources (Resource Protection), Jemez Pueblo
PO Box 100
Pueblo of Jemez, NM 87024

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Mr. Clarke:

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Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	9.5 pph*	7.9 tpy*
PM_{10}	8.2 pph*	7.7 tpy*
$PM_{2.5}$	7.2 pph*	7.6 tpy*
Sulfur Dioxide (SO_2)	18.0 pph*	6.9 tpy*
Nitrogen Oxides (NO_x)	47.6 pph*	66.1 tpy*
Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
$PM_{2.5}$	13.4 pph*	34.7 tpy*
Sulfur Dioxide (SO_2)	7.7 pph*	5.7 tpy*
Nitrogen Oxides (NO_x)	37.7 pph*	69.5 tpy*
Carbon Monoxide (CO)	318.1 pph*	71.4 tpy*
Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

* Estimated hourly and annual start up, shut down and maintenance emissions have been added per public notice requirements.

The standard and maximum operating schedules will be from 24 hours per day, 7 days a week and a maximum of 52 weeks per year.

Phase 3 emissions will replace Phase 1 emissions once Phase 3 becomes operational.

Owners and operator of the facility include: Los Alamos National Security, LLC, P.O. Box 1663, MS J978, Los Alamos, New Mexico, 87545, Los Alamos National Laboratory for the U.S. Department of Energy, 3747 West Jemez Road, Los Alamos, NM 87544. Point of contact: Peter Hyde, Environmental Communication & Public Involvement, P.O. Box 1163, MS K491, Los Alamos, New Mexico 87545, Phone: 505-667-3792. E-mail: envoutreach@lanl.gov.

If you have any comments about the construction or operation of this facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to this address: Air Quality Bureau; Attention: Kirby Olson, 525 Camino de los Marquez, Suite 1; Santa Fe, New Mexico; 87505-1816; (505) 476-4322; 1-800-224-7009; https://www.env.nm.gov/aqb/permit/aqb_draft_permits.html. If you do not want to submit written comments, but have questions about the application, please contact Kirby Olson.

Please refer to the company name and site name, or send a copy of this notice along with your comments, since the Department may have not yet received the permit application. Please include a legible return mailing address with your comments. Once the Department has performed a preliminary review of the application and its air quality impacts, the Department's notice will be published in the legal section of a newspaper circulated near the facility location.

Attención

Este es un aviso de la Agencia de Calidad de Aire del Departamento de Medio Ambiente de Nuevo México, acerca de las emisiones producidas por un establecimiento en esta área. Si usted desea información en español, por favor de comunicarse con la oficina de Calidad de Aire al teléfono 505-476-5557.

Sincerely,

Taunia S. Van Valkenburg
Group Leader

HW:am

Copy: Stephen C. Fong, NA-LA, (E-File)
Adrienne L. Nash, NA-LA, (E-File)
Richard M. Kacich, DIR, (E-File)
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adesh-records@lanl.gov, (E-File)
epc-correspondence@lanl.gov, (E-File)
ENV-ES Permit File

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

MAR 2 1 2018

Date:
Symbol: EPC-DO: 18-122
LA-UR: 18-22068
Locates Action No.: N/A

Governor Eugene Herrera
Pueblo of Cochiti
P.O. Box 70
Cochiti Pueblo, NM 87072

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Governor Herrera:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

The exact location for the proposed facility known as Technical Area 3 Power Plant is at TA-3, SM-22 on Diamond Drive in the Los Alamos National Laboratory. The approximate location of this facility is 1 mile south of the intersection of Diamond Drive and Trinity Drive in Los Alamos County.

The proposed modification consists of:

- The construction and installation of a Heat Recovery Steam Generator (HRSG), which will be installed on the exhaust stack of the existing Combustion Gas Turbine Generator.
- The permanent shut down of three existing boilers that were installed in the 1950's each rated at a capacity of 178.5 MMBtu/hr and the construction and installation of two new auxiliary boilers each rated at a capacity of 72.3 MMBtu/hr.
- The project will be constructed using a three phased approach. Phase 1 consists of the construction of the two new auxiliary boilers while the existing boilers continue to operate. Once the auxiliary boilers become operational, two of the three existing boilers will be permanently

shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

The estimated maximum quantities of any regulated air contaminant will be as follows in pound per hour (pph) and tons per year (tpy) and could change slightly during the course of the Department's review:

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Pollutant	Pounds per hour	Tons per year
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Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
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Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

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Sincerely,

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HW:am

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

MAR 2 1 2018

Date:
Symbol: EPC-DO: 18-123
LA-UR: 18-22068
Locates Action No.: N/A

Governor J. Michael Chavarria
Pueblo of Santa Clara
P.O. Box 580
Espanola, NM 87532

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Governor Chavarria:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

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shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

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PM_{10}	8.2 pph*	7.7 tpy*
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Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
$PM_{2.5}$	13.4 pph*	34.7 tpy*
Sulfur Dioxide (SO_2)	7.7 pph*	5.7 tpy*
Nitrogen Oxides (NO_x)	37.7 pph*	69.5 tpy*
Carbon Monoxide (CO)	318.1 pph*	71.4 tpy*
Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

* Estimated hourly and annual start up, shut down and maintenance emissions have been added per public notice requirements.

The standard and maximum operating schedules will be from 24 hours per day, 7 days a week and a maximum of 52 weeks per year.

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Sincerely,

Taunia S. Van Valkenburg
Group Leader

HW:am

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

MAR 2 1 2018

Date:
Symbol: EPC-DO: 18-124
LA-UR: 18-22068
Locates Action No.: N/A

Governor James R. Mountain
Pueblo of San Ildefonso
02 Tunyo Po
Santa Fe, NM 87506

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Governor Mountain:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

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Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
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Sincerely,

Taunia S. Van Valkenburg
Group Leader

HW:am

Copy: Stephen C. Fong, NA-LA, (E-File)
Adrienne L. Nash, NA-LA, (E-File)
Richard M. Kacich, DIR, (E-File)
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epc-correspondence@lanl.gov, (E-File)
ENV-ES Permit File

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

MAR 2 1 2018

Date:
Symbol: EPC-DO: 18-125
LA-UR: 18-22068
Locates Action No.: N/A

Governor Joseph A. Toya
Pueblo of Jemez
P.O. Box 100
Jemez Pueblo, NM 87024

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Governor Toya:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

The exact location for the proposed facility known as Technical Area 3 Power Plant is at TA-3, SM-22 on Diamond Drive in the Los Alamos National Laboratory. The approximate location of this facility is 1 mile south of the intersection of Diamond Drive and Trinity Drive in Los Alamos County.

The proposed modification consists of:

- The construction and installation of a Heat Recovery Steam Generator (HRSG), which will be installed on the exhaust stack of the existing Combustion Gas Turbine Generator.
- The permanent shut down of three existing boilers that were installed in the 1950's each rated at a capacity of 178.5 MMBtu/hr and the construction and installation of two new auxiliary boilers each rated at a capacity of 72.3 MMBtu/hr.
- The project will be constructed using a three phased approach. Phase 1 consists of the construction of the two new auxiliary boilers while the existing boilers continue to operate. Once the auxiliary boilers become operational, two of the three existing boilers will be permanently

shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

The estimated maximum quantities of any regulated air contaminant will be as follows in pound per hour (pph) and tons per year (tpy) and could change slightly during the course of the Department's review:

Phase 1

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	9.5 pph*	7.9 tpy*
PM_{10}	8.2 pph*	7.7 tpy*
$PM_{2.5}$	7.2 pph*	7.6 tpy*
Sulfur Dioxide (SO_2)	18.0 pph*	6.9 tpy*
Nitrogen Oxides (NO_x)	47.6 pph*	66.1 tpy*
Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
$PM_{2.5}$	13.4 pph*	34.7 tpy*
Sulfur Dioxide (SO_2)	7.7 pph*	5.7 tpy*
Nitrogen Oxides (NO_x)	37.7 pph*	69.5 tpy*
Carbon Monoxide (CO)	318.1 pph*	71.4 tpy*
Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

* Estimated hourly and annual start up, shut down and maintenance emissions have been added per public notice requirements.

The standard and maximum operating schedules will be from 24 hours per day, 7 days a week and a maximum of 52 weeks per year.

Phase 3 emissions will replace Phase 1 emissions once Phase 3 becomes operational.

Owners and operator of the facility include: Los Alamos National Security, LLC, P.O. Box 1663, MS J978, Los Alamos, New Mexico, 87545, Los Alamos National Laboratory for the U.S. Department of Energy, 3747 West Jemez Road, Los Alamos, NM 87544. Point of contact: Peter Hyde, Environmental Communication & Public Involvement, P.O. Box 1163, MS K491, Los Alamos, New Mexico 87545, Phone: 505-667-3792. E-mail: envoutreach@lanl.gov.

If you have any comments about the construction or operation of this facility, and you want your comments to be made as part of the permit review process, you must submit your comments in writing to this address: Air Quality Bureau; Attention: Kirby Olson, 525 Camino de los Marquez, Suite 1; Santa Fe, New Mexico; 87505-1816; (505) 476-4322; 1-800-224-7009; https://www.env.nm.gov/aqb/permit/aqb_draft_permits.html. If you do not want to submit written comments, but have questions about the application, please contact Kirby Olson.

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Sincerely,

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Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

MAR 2 1 2018

Date:
Symbol: EPC-DO: 18-121
LA-UR: 18-22068
Locates Action No.: N/A

Governor Joseph M. Talachy
Pueblo of Pojoaque
78 Cities of Gold Road
Santa Fe, NM 87506

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Governor Talachy:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

The exact location for the proposed facility known as Technical Area 3 Power Plant is at TA-3, SM-22 on Diamond Drive in the Los Alamos National Laboratory. The approximate location of this facility is 1 mile south of the intersection of Diamond Drive and Trinity Drive in Los Alamos County.

The proposed modification consists of:

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- The project will be constructed using a three phased approach. Phase 1 consists of the construction of the two new auxiliary boilers while the existing boilers continue to operate. Once

the auxiliary boilers become operational, two of the three existing boilers will be permanently shut down. One existing boiler will be kept as a hot standby to the auxiliary boilers. Phase 2 consists of upgrading steam and condensate lines throughout TA-3. It is anticipated that there will be no air emissions generated from this phase. Phase 3 consists of the conversion of the site's existing combustion turbine to a combined heat and power system capable of generating both steam and electricity. The existing boiler being used as a hot standby will be permanently shut down at this point. The TA-3 Power Plant will be used to generate electricity and steam for the Los Alamos National Laboratory. No electricity or steam generated from the plant will be sold commercially.

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Sulfur Dioxide (SO_2)	18.0 pph*	6.9 tpy*
Nitrogen Oxides (NO_x)	47.6 pph*	66.1 tpy*
Carbon Monoxide (CO)	41.5 pph*	85.4 tpy*
Volatile Organic Compounds (VOC)	2.1 pph*	2.7 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
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Nitrogen Oxides (NO_x)	37.7 pph*	69.5 tpy*
Carbon Monoxide (CO)	318.1 pph*	71.4 tpy*
Volatile Organic Compounds (VOC)	38.4 pph*	16.1 tpy*
Total sum of all Hazardous Air Pollutants (HAPs)	0.5 pph	2.1 tpy
Ammonia (New Mexico Toxic Air Pollutant (TAP))	5.3 pph	n/a
Sulfuric Acid (TAP)	0.4 pph	n/a

Green House Gas Emissions as Total CO_2e	n/a	264450 tpy

* Estimated hourly and annual start up, shut down and maintenance emissions have been added per public notice requirements.

The standard and maximum operating schedules will be from 24 hours per day, 7 days a week and a maximum of 52 weeks per year.

Phase 3 emissions will replace Phase 1 emissions once Phase 3 becomes operational.

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Sincerely,

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Los Alamos
NATIONAL LABORATORY
EST. 1943

Environmental Protection & Compliance Division
Los Alamos National Laboratory
PO Box 1663, K491
Los Alamos, New Mexico 87545
(505) 667-2211

Date: MAR 2 1 2018
Symbol: EPC-DO: 18-127
LA-UR: 18-22068
Locates Action No.: N/A

Ms. Geraldine Salazar
Santa Fe County Clerk
102 Grant Ave.
Santa Fe, New Mexico 87501

Subject: Public Notice Certified Letters to Municipalities, Counties and Local Tribes

Dear Ms. Salazar:

Los Alamos National Laboratory announces its application submittal to the New Mexico Environment Department for an air quality permit for the modification of its Technical Area 3 Power Plant facility. The permit number associated with the TA-3 Power Plant facility is 2195B-M2. The expected date of application submittal to the Air Quality Bureau is March 30th, 2018. This application was planned to be submitted on September 25th, 2017, but the project was delayed.

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Total sum of all Hazardous Air Pollutants (HAPs)	1.0 pph	1.3 tpy
Sulfuric Acid (TAP)	0.2 pph	n/a
Green House Gas Emissions as Total CO_2e	n/a	312584 tpy

Phase 3

Pollutant	Pounds per hour	Tons per year
Total Suspended Particulates (TSP)	13.4 pph*	34.7 tpy*
PM_{10}	13.4 pph*	34.7 tpy*
$PM_{2.5}$	13.4 pph*	34.7 tpy*
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