0OKLAHOMA DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

MEMORANDUM **December 4, 2017**

TO: Phillip Fielder, P.E., Permits and Engineering Group Manager

THROUGH: Phil Martin, P.E., Engineering Manager, Existing Source Permits Section

THROUGH: Amalia Talty, P.E., Existing Source Permits Section

FROM: Sharon Alder, E.I., New Source Permits Section

SUBJECT: Evaluation of Permit Application No. **2015-1373-C (M-1) PSD**
Oklahoma Gas & Electric Company
McClain Generating Station (SIC 4911/NAICS 221112)
Facility ID: 3694
Section 35, Township 10N, Range 4W, McClain County
Latitude: 34.9705°N; Longitude: 96.7335°W
Directions: From Newcastle, go east on HW 37 to I-44. Proceed under I-44 and turn north to SW 175th Street. Go east on SW 175th about ¼ mile to site.

SECTION I. INTRODUCTION

Oklahoma Gas & Electric Company (OG&E) has requested a modification to Permit No. 99-213-C PSD issued January 19, 2000, to authorize emissions associated with Startup, Shutdown, and Maintenance (MSS) events. OG&E is requesting alternative, short-term emission limits for MSS events associated with operation of the combustion turbines (CT) located at the McClain Generating Station. The CTs are designed to operate in the dry low NOx (DLN) mode at loads from approximately 50% up to base load rating. Operation at lower loads occurs during startup and shutdown. During MSS the DLN system must cycle through four stages to safely bring the burner online in its final low NOx configuration or to shut down. At startup the mixture of air and gas is adjusted to increase the fuel to air ratio to maintain combustion to prevent flameout. The fuel rich mixture results in elevated NOx levels due to higher flame temperatures. The turbines can take up to four (4) hours to reach normal operation parameters. Once the burner is online and combustion stability is established the NOx emissions meet the normal BACT limit. OG&E will utilize the currently installed continuous emissions monitoring system (CEMS) to monitor emissions associated with MSS events.

SECTION II. FACILITY DESCRIPTION

The facility includes two 182.5 MW natural gas-fired CTs operating in combined-cycle mode with two heat recovery steam generators (HRSGs) and a common steam turbine. The HRSGs are of unfired, natural circulation, three-pressure reheat design. The two CT generators are each equipped with dry low NOx burners for control of emissions of NOx. The CTs are fueled exclusively with pipeline natural gas. Each HRSG produces high-pressure steam at approximately 1,800 psig for introduction into a steam turbine. The steam turbine drives an additional generator with an output of about 180 MW.

The combined-cycle combustion turbine power plant consists of six point sources: two turbine unit stacks, an auxiliary boiler stack, an emergency 400-hp fire-water pump engine stack, a 438-hp emergency generator, and a cooling tower. In addition, the facility includes two 500-gallon diesel storage tanks.

The facility also includes a 20-kW Generac Model QT025A generator powered by a 40-hp 2.4-L propane-fired spark-ignition engine. The engine driver is certified by the manufacturer to meet the requirements of New Source Performance Standards (NSPS), Subpart JJJJ. The engine is EU 4-3. The facility installed it to provide emergency power to a radio tower placed at the plant in support of OG&E's Smart Grid Program. The generator will be limited to 100 hours per calendar year for maintenance and readiness testing and unlimited use for emergencies.

Since the facility exceeded the 100 TPY threshold for NOx, CO, and PM_{10}, the initial construction was subject to full Prevention of Significant Deterioration (PSD) review and Tier III public review.

The facility constructed under Permit No. 99-213-C PSD issued January 19, 2000. The full PSD review from Permit No. 99-213-TV consisted of the following:

- Determination of best available control technology (BACT)
- Evaluation of existing air quality and determination of monitoring requirements
- Analysis of compliance with National Ambient Air Quality Standards (NAAQS)
- Evaluation of source-related impacts on growth, soils, vegetation, and visibility
- Evaluation of Class I area impact

A top-down BACT analysis consists of the following 5-step process:

Step 1. – Identify all control technologies
Step 2. – Eliminate technically infeasible options
Step 3. – Rank remaining control technologies by control effectiveness
Step 4. – Evaluate most effective controls and document results
Step 5. – Select BACT

This BACT determination resulted in NOx emission limits of 9 ppmdv based on an annual average, corrected to 15% oxygen.

This permit modification will authorize increasing the lb/hr NOx limit from the normal operations limit of 83 lb/hr, 3-hour rolling average, to a limit of 195 lb/hr, 3-hour rolling average, during periods of startup with a maximum period of four (4) hours allowed for startup. This permit modification will not affect the permitted NOx limits for TPY, ppmvd, or lb/MMBtu. This permit modification will also authorize extended startups, which are defined as startups immediately following major maintenance events on the turbines. The NOx limit for extended startups will also be 195 lb/hr, 3-hour rolling average, for a maximum period of fourteen (14) hours.

SECTION III. EQUIPMENT

Facility-Wide Equipment

EU ID#	Point ID#	EU Name/Model	Construction Date
1	HRSG-1	Combustion Turbine No. 1/General Electric 7FA	1999
2	HRSG-2	Combustion Turbine No. 2/General Electric 7FA	1999
3	FWP-1	400-hp Fire Water Pump Engine Caterpillar 3208 s/n 03Z17562	2000
4	B-1	Auxiliary Boiler	1999
4-2	4-2	438-hp Emergency Generator Caterpillar 3406 s/n 1LS01263	2000
4-3	4-3	40-hp Generac QT025A Emergency Generator w/2.4-L Engine s/n 6216669	2010
5	CTV1	Cooling Tower	1999

SECTION IV. EMISSIONS

Emissions and Limits

Maintenance / Startup / Shutdown Limits

OG&E has proposed additional limits for two MSS type events. A limitation of 4 hours for regular startups and 14 hours for extended startups associated with major maintenance events. The determination of NOx emissions at 195 lb/hr is based on a maximum 3-hour rolling average of 194 lb/hr that occurred during a startup of Unit 1 in March 2008. After further review of available emissions data, typical emissions occurring during a shutdown do not exceed the normal operation limit established for NOx at 83 lb/hr, 3-hour rolling average. Therefore, a new NOx limit for shutdown is not proposed. Additionally, warm and/or cold startups fit within the proposed startup emission limit for NOx of 195 lb/hr, 3-hour rolling average, for a maximum duration of 4 hours.

Higher NOx emissions were requested for the 14 hours following a major maintenance activity. OG&E has determined that during a major maintenance activity, such as "green rotor run-in", the manufacturer-required testing is estimated to be 6 to 14 hours to prove the reliability of the unit before returning it to service. OG&E has requested 14 hours due to the uncertainty of passing the initial test runs. This type of maintenance activity occurs routinely every 144,000 hours (approximately 15 years) or if the unit has been unexpectedly damaged.

Short-Term Limits

Turbine emissions are based on manufacturer's data. Short-term emissions, lb/hr, were reviewed at five ambient temperatures, including the historical low and high temperatures, and at 50%, 75%, and 100% load. SO_2 emissions are conservatively based on 100% conversion of H_2S to SO_2 and a maximum of 0.02 grains/SCF (32 ppm) H_2S concentration. Maximum short term emissions were determined to be highest at the historical low temperature of -8° F and 100% load. At these conditions the turbines heat input rate of 1,683.3 MMBtu/hr results in NOx, CO, VOC, SO_2, and PM_{10} emission rates of 0.049 lb/MMBtu, 0.04 lb/MMBtu, 0.002 lb/MMBtu, 0.006 lb/MMBtu, and 0.01 lb/MMBtu, respectively.

Long-Term Limits

Although the plant will not continuously operate at a 100% capacity factor, nominal long term emissions for the turbines are based on an average ambient temperature of 60° F and 100% load since this results in the highest emissions from manufacturer's guaranteed data and on a continuous operating period. At these conditions, PM_{10} emissions were based on an equivalent fuel ash content of 0.075 grains/SCF. SO_2 emissions are conservatively based on 100% conversion of H_2S to SO_2 and a maximum of 0.02 grain/SCF (32 ppmv) H_2S concentration in the fuel. NO_X, CO, and VOC emissions are based on 9 ppmvd at 15% O_2, 20 ppmvd, and 1.4 ppmvw, respectively. Lead emissions are based on AP-42 (5/98, Draft), Table 3.1-4 with sulfuric acid mist emissions based on AP-42 (9/98), Section 1.3.3.2 with 3% annually converted to sulfuric acid mist.

The 22-MMBtu/hr auxiliary gas-fired boiler emissions are based on manufacturer's data of 0.036 lb/MMBtu NOx, 0.036 lb/MMBtu CO, 0.018 lb/MMBtu VOC, 0.001 lb/MMBtu SO_2, and 0.009 lb/MMBtu PM_{10} and operating 7,000 hours annually. Emissions for the diesel-fired emergency fire-water pump engine are based on the design rating of 400-hp, a maximum of 500 hrs/yr, and AP-42 (10/96), Section 3.3 emission factors.

The following table shows emissions for the two (2) emergency generators (4-2 and 4-3) based on 500 hours of operation per year and manufacturer's data.

Emergency Engine Emissions

Pollutant	Emission Factor (g/hp-hr)	Emissions	
		lb/hr	TPY
Emergency Generator Caterpillar 3406 (438 hp)			
NO_X	14.00	13.519	3.380
CO	3.00	2.897	0.724
VOC	---	1.393	0.348
Generac QT025A Emergency Generator w/2.4-L Engine (40-hp)			
NO_X	7.66	0.675	0.169
CO	42.12	3.714	0.929
VOC	0.90	0.079	0.020

Fugitive emissions at the facility are insignificant.

Cooling tower emissions are based on the method in AP-42 (1/95), Section 13.4, 130,000 GPM total water circulation rate, PM_{10} generated by 0.643% of total drift, and with the application of drift eliminators, which will control total liquid drift to 0.001% of water circulation.

Facility-Wide Emissions

EU ID#	Source	PM_{10}		SO_2		NO_x		VOC		CO	
		lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
1	Turbine #1*	18.00	79.00	9.60	40.00	83.00	254.00	2.90	12.00	68.00	280.00
2	Turbine #2*	18.00	79.00	9.60	40.00	83.00	254.00	2.90	12.00	68.00	280.00
3	Fire Pump	0.88	0.22	0.82	0.20	12.40	3.10	0.99	0.25	2.67	0.67
4	Aux. Boiler	0.20	0.70	0.02	0.07	0.80	2.80	0.40	1.40	0.80	2.80
4-2	Emer. Generator	--	--	--	--	13.52	3.38	1.39	0.35	2.90	0.72
4-3	Emer. Generator	--	--	--	--	0.68	0.17	0.08	0.02	3.71	0.93
5	Cooling Tower	0.02	0.08	--	--	--	--	--	--	--	--
	Total	**37.10**	**159.00**	**20.04**	**80.27**	**193.40**	**517.45**	**8.66**	**26.02**	**146.08**	**565.12**

* Combustion turbines will also emit lead at 0.22 TPY and H_2SO_4 at 2.41 TPY combined.

SECTION V. PSD REVIEW

There are no emission increases with the proposed MSS for normal operations or to increase annual emissions. Normal operations BACT was done in Permit No. 99-213-C PSD. This PSD review is for MSS, and these MSS emissions will be included in the annual emissions. The MSS short-term emission increases can be accomplished while complying with current annual limits. Since alternative short-term limits are being proposed, a NAAQS and BACT review was completed.

Best Available Control Technology (BACT)

Any major stationary source or major modification subject to PSD review must conduct an analysis to ensure the implementation of BACT. The requirement to conduct a BACT analysis is set forth in the federal PSD regulations (40 CFR 52.21), and in Oklahoma regulations. The State of Oklahoma defines BACT in OAC 252:100-8-31, as follows:

> "...means an emissions limitation (including a visible emissions standard) based on the maximum degree of reduction for each regulated NSR pollutant which would be emitted from any proposed major stationary source or major modification which the Director, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combination techniques for control of such pollutant."

Although BACT is determined by evaluating control technologies to determine which are technically and economically feasible, BACT is an emission limit, not the use of a specific technology. A BACT analysis is required to assess the appropriate level of control for each new or physically modified emissions unit for each pollutant that exceeds an applicable PSD significant emission rate (SER). For the proposed Startup/Shutdown/Maintenance emission limits on the Low-NO_X burners at the McClain generating station, only NOx hourly emissions will be considered.

In a 1987 policy memorandum, EPA stated its preference for a top-down approach to BACT analyses. Under the top-down approach, the most stringent control available for a similar or identical source or source category is identified and a determination of feasibility is made. If the top level of control is determined to be infeasible because of technical, economic, environmental, or energy related reasons, then the next most stringent control option is evaluated. This process continues until the BACT level under consideration cannot be eliminated. Presented below are the five basic steps of a top-down BACT review procedure according to the *New Source Review Workshop Manual (Draft)*:

Step 1. *Identify all control technologies.* The first step in the BACT analysis is to identify all control technologies for each pollutant.

Step 2. *Eliminate technically infeasible options.* The second step in the BACT analysis is to eliminate any technically infeasible control technologies. Each control technology for each pollutant is considered, and those that are clearly technically infeasible are eliminated. EPA states the following with regard to technical feasibility:

> "A demonstration of technical infeasibility should be clearly documented and should show, based on physical, chemical and engineering principles, that technical difficulties would preclude the successful use of the control option on the emissions unit under review."

Step 3. *Rank remaining control technologies by control effectiveness.* The control technologies are then ranked in order of effectiveness. If only one option remains or if all remaining options are equivalent, then ranking is not required.

Step 4. *Evaluate most effective controls and document results.* The remaining control technologies are evaluated on the basis of economic, energy, and environmental considerations.

Step 5. *Select BACT.* The first four steps involve the evaluation of control technologies, but the selection of BACT involves an evaluation of achievable emission rates. The selected BACT emission rate is enforced as a standard unless technological or economic limitations would make the imposition of an emission standard infeasible, in which case a design, equipment, work practice, or operational standard can be imposed.

The EPA has consistently interpreted the statutory and regulatory BACT definitions as containing three core requirements, which the agency believes must be met by any BACT determination, irrespective of whether or not it is conducted in a "top-down" manner. First, the BACT analysis must include consideration of the most stringent available technologies (i.e., those which provide the "maximum degree of emissions reduction"). Second, any decision to require a lesser degree of emissions reduction must be justified by an objective analysis of "energy, environmental, and economic impacts" contained in the record of the permit decision. Thirdly, in no event shall application of BACT result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR Parts 60 and 61.

NOx is produced through two mechanisms: thermal NOx and fuel NOx. Thermal NOx is created by high temperature processes where nitrogen and oxygen gases in the air react. Fuel NO_x is created by combustion of nitrogen-containing materials. Small changes in temperature can cause large changes in NOx emissions. Thus, NOx formation can be reduced by lowering the flame temperature.

Step 1 – Identify All Control Technologies

As part of the original review for normal operations, dry-low NOx burners were proposed and installed as BACT.

The control technologies for this analysis are:

1. Selective Catalytic Reduction (SCR)
2. Selective Non-Catalytic Reduction (SNCR)
3. Water Injection
4. Dry Low NOx (DLN) Burners

The applicant proposed a limit of 195 lbs/hr for four (4) hours during startup and 195 lb/hr for fourteen (14) hours during extended startup, which is during a major maintenance activity.

Step 2 – Eliminate Technically Infeasible Options

The NSR Workshop Manual describes two key criteria for determining whether an alternative control technology is technically feasible. According to the NSR Workshop Manual, a technology must be "available" and "applicable" in order to be considered technically feasible. A technology is available "if it has reached the licensing and commercial sales stage of development." An identified alternative control technique may be considered applicable if "it has been or is soon to be deployed (e.g., is specified in a permit) on the same or similar source type."

Since the gas stream temperatures are constantly changing during startup and shutdown, and below the minimum temperature for part of each cycle, SCR and SNCR are both technologically infeasible.

Water or steam injection is used after normal operations occur and could quench the flame completely, which would prolong MSS events rather than controlling emissions. Therefore, these options are infeasible during startup.

By design during MSS DLN system must cycle through distinct stages to safely bring the burner on line in its final low NOx configuration. During start-up the mixture of air and gas is adjusted to increase the fuel to air ratio to maintain combustion to prevent flameout. The fuel rich mixture results in elevated NOx levels due to higher flame temperatures. Therefore, DLN is not feasible during MSS.

Step 3 – Rank Control Technologies by Control Effectiveness

Because the alternative NOx control technologies were identified to be technically infeasible during MSS Steps 3 and 4 will not be evaluated further.

Step 4 – Evaluate Most Effective Controls Based on Impacts

Because the alternative NOx control technologies were identified to be technically infeasible during MSS Steps 3 and 4 will not be evaluated further.

Step 5 – Select BACT

At the time of construction dry low NOx burners (DLN) was selected as BACT. This evaluation will further address available options considering the baseline configuration of DLN currently in operation, since the BACT determination for the PSD construction permit was based on normal continuous operations. The emissions from MSS are included in the annual emission limits, however, the peak hourly emission rates for MSS periods will increase relative to normal operating rates (as shown in the following tables).

Proposed Cycling Operation Emission Summary

Event	Maximum Duration (hr)	NOx Emissions (lb/hr)[1]
Startup	4	195
Extended Startup[2]	14	195

[1] – The lb/hr NOx limit is based on a 3-hour rolling average.

[2] – Extended Startup occurring after major overhaul event.

Annual Emission Comparison

	NOx Emissions (TPY)
Estimated Annual Cycling Operations[1]	221.9
Permit Limits[2]	254

1 – Estimated highest annual turbine operation using emission inventory 2010-2015
2 – Annual emission limits from Permit No. 2015-1373-TVR2

A review of combined-cycle turbines from EPA website RACT/BACT/LEAR Clearinghouse (RBLC) and the National Combustion Turbine Spreadsheet by Region 4, indicates that there is no known technology that would significantly reduce MSS emissions and be economically justified. However, some restricted MSS operating procedures have been identified through a review of the RBLC. These operating procedures limit the startup and shutdown periods for NO_x emissions from the combined-cycle turbines.

The RBLC search was conducted for large combustion combined-cycle turbines with an output of 25MW or more, fueled with natural gas. The search also includes sources with SNCR and SCR since these technologies would not be operational during periods of MSS. One hundred fifty sources were evaluated, but only twelve sources have limited MSS operating procedures. The evaluations of each limited startup/shutdown operating procedures are listed following.

RBLC Results for NOx BACT Analysis

RBLC ID	NOx/NO_2 Limitations
CO-0056	NOx limited to max. of 100 ppm @15% O_2 during startup and shutdown.
LA-0192	NOx is limited to 220 lb/hr during startup. Facility-Wide emissions of NO_x (from two (2) turbines and two (2) duct burners) are also limited to 74.33 TPY.
LA-0224	During startup/shutdown complete events as quickly as possible according to manufacturer's recommended procedures. NOx limit is 400 lb/hr maximum.
OH-0252	The total number of startups and shutdowns shall be limited to 260 cycles (each cycle is one startup and shutdown). Startup/Shutdown for each turbine is 121.2 TPY of NOx, 12-month rolling total.
AZ-0047	Emissions of NOx from each turbine may not exceed 166.7 lb/hr averaged over the period of each startup or shutdown event.
UT-0066	Startup and shutdown limits: 1000 hr/yr and 8 hr in any day short term excursions: 160 hr/yr and no more than 4 consecutive periods NOx 25ppmvd at 15% O_2.
AZ-0049	NOx is not to exceed 2 ppm on a 3-hr average. The facility is limited to 100 lb/hr averaged over each startup and shutdown event.
OH-0254	Limited to 260 cycles (each cycle is one startup and shutdown).
IN-0115	During startup and shutdown, duct burners shall not be used. One event is 1 startup and 1 shutdown, lasting < 6.5 hours. Each turbine < 583 hours/12 months in startup and shutdown mode.
IN-0158	Startup/shutdown NO_x limit 443 lb
CA-1213	Turbines are NOx limited to 70 lb/shutdown event and 160 lb/hour during startup 3-hr average.
OK-0129	During startup and shutdown, NOx limited to 568 lb/event 4-hour startup, NOx limited to 142 lb/event 1-hour shutdown.

McClain has proposed that BACT for startup emissions of NOx is a limitation of 4 hours for startup, 14 hours for extended startup, and 195 lb/hr, 3-hour rolling average. Different limits for warm or cold startup and shutdown have not been specifically proposed. After further review of available emissions data, typical emissions occurring during a shutdown do not exceed the normal operation limit established for NOx at 83 lb/hr 3-hour rolling average. Additionally, warm and/or cold startups fit within the proposed startup emission limit for NOx of 195 lb/hr 3-hour rolling average for a maximum duration of 4 hours.

BACT for MSS is selected as limiting time for startup to four (4) hours at an emission rate for NOx of 195 lb/hr, 3-hour rolling average. BACT for MSS is selected as limiting time for extended startup after major overhaul events to fourteen (14) hours at an emission rate for NOx of 195 lb/hr, 3-hour rolling average.

SECTION VI. AIR DISPERSION MODELING REVIEW

A significance analysis for NO_2 was performed to determine if the emission increase during a turbine startup would have a significant impact upon the area surrounding the McClain Generating Station.

Modeling for NOx was completed in accordance with EPA and ODEQ guidance, which outlines a two-step procedure, consisting of a significance analysis and a full impact analysis, for pollutants triggering PSD review. OGE has elected to forego the significance analysis and begin at the full impact analysis. A summary of the NAAQS and PSD Increment model results is provided below.

NAAQS Modeled Concentrations ($\mu g/m^3$)

	NO_2 1-Hour ($\mu g/m^3$)[2]	NO_X Annual ($\mu g/m^3$)	NO_2 Annual ($\mu g/m^3$)[3,4]
Maximum Modeled Concentration	95.49	6.12	4.59
Background Concentration[1]	68.98	11.08	11.08
Total Concentration	164.47	17.20	15.67
NAAQS	188	--	100
Cause/Contribute Analysis Required?	**No**	--	**No**

1) Monitored background concentrations obtained from EPA's Air Data website: https://www.epa.gov/outdoor-air-quality-data/monitor-values-report (Station No. 401091037).
2) 5-year average of the 98th percentile of the annual distribution of the daily maximum 1-hour concentrations.
3) Highest annual average concentration over 5 years.
4) Per Ambient Ratio Method, 75% of ambient NO_X is considered NO_2.

Class II PSD Increment Modeled Concentrations (μg/m^3)

	NO_X Annual (μg/m^3)	NO_2 Annual (μg/m^3)[1,2]
Maximum Modeled Concentration	5.80	4.35
PSD Increment	--	25
Cause/Contribute Analysis Required?	--	No

1)Highest annual average concentration over 5 years.

2)Per Ambient Ratio Method, 75% of ambient NO_X is considered NO_2.

Model Selection

EPA's American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) (version 16216r) was used. The AERMOD model, a steady-state plume dispersion model used for assessment of pollutant concentrations from a variety of sources, has become the primary model used for conducting refined modeling analyses. AERMOD incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, including treatment of both surface and elevated sources, and both simple and complex terrain.

Terrain

Modeling with elevated terrain was used for this analysis. AERMAP (version 11103), a terrain preprocessor that incorporates complex terrain using USGS Digital Elevation Data was used to determine stack, building, and receptor elevations/hill heights. One-third (1/3) arc second National Elevation Dataset (NED) files were used to determine the receptor and source elevations used in the model.

Stack GEP Analysis & Building Downwash

Building wake effects on each emission point source were incorporated through the use of the BPIP-PRIME (version 04274) algorithm. BPIP-PRIME calculates all direction specific building data required by the air dispersion model to enable it to include the appropriate building downwash algorithm into the calculations. The structure dimensions are then imported into AERMOD on an emission point-specific basis.

Meteorological Data

Pre-processed meteorological data (AERMET version 15181) obtained from the ODEQ was used for the modeling analysis. Integrated Surface Hourly (ISH) meteorological data from the Will Rogers World Airport (KOKC – Station # 13967) was provided for years 2011 through 2015. For all meteorological years (2011 to 2015), upper air data from the OU Max Westheimer Airport, (KOUN - Station # 3948) was used. A copy of the meteorological data is included with the model files in Appendix A.

Receptor Grid

The receptor grid used in this analysis reflects ODEQ's current guidance. Ground-level concentrations are calculated for receptors located on five Cartesian grids covering a region that extends at least 10 km from all facility emission sources. The grids are defined as follows:

- A fence line grid containing 50 meter-spaced receptors located along the facility fence line.
- A 100-meter grid containing 100 meter-spaced receptors, extending approximately 1.0 km from the fence line, exclusive of the fence line grid.
- A 250-meter grid containing 250 meter-spaced receptors, extending approximately 2.5 km from the fence line, exclusive of the 100 meter grid.
- A 500-meter grid containing 500 meter-spaced receptors, extending approximately 5.0 km from the fence line, exclusive of the 250 meter grid.
- A 750-meter grid containing 750 meter-spaced receptors, extending approximately 7.5 km from the fence line, exclusive of the 500 meter grid.
- A 1,000-meter grid containing 1,000 meter-spaced receptors, extending approximately 24 km from the fence line, exclusive of the 750 meter grid.

Significance Analysis

A significant impact analysis is the first level of modeling performed in a PSD evaluation. For each applicable pollutant, the analysis must include all increases in stack emissions and quantifiable fugitive emissions resulting only from the Project.

EPA has confirmed that the primary purpose of the SIL is to serve as a screening tool to identify a level of ambient impact that is sufficiently low relative to the NAAQS or PSD increments such that the impact can be considered trivial or de minimis. Accordingly, a source that demonstrates that the projected ambient impact of its proposed emissions increase does not exceed the SIL is expected to have a de minimis impact on air quality and will not cause or contribute to a violation of a NAAQS or PSD increment.

Modeled impacts from the significant impact analysis are compared to the significant impact levels (SILs) as defined in the *New Source Review Workshop Manual* and OAC 252:100-8-35(a)(2). If the highest modeled concentration over five years of meteorological data is less than or equal to the applicable SIL, then it is presumed that impacts from the project do not cause or contribute to a violation of any applicable standards. Additional refined modeling is required for any pollutant and averaging period combination whose highest modeled concentration is greater than a SIL. In this model report, OGE has elected to forego the significance analysis and proceed to the full impacts analysis.

Full Impact Analysis

If a pollutant exceeds its respective SIL, a full impact analysis is performed to determine compliance with NAAQS and PSD increment standards. The first step in the Full Impact Analysis is to determine the Radius of Impact (ROI). The ROI is the distance from the facility to the farthest receptor that shows an impact at or above the SIL for each pollutant and averaging period. Rather than complete the significance analysis necessary to determine the ROI, OGE requested ODEQ provide a suitable and conservative inventory of off-property sources for the surrounding area. The full impact analysis was performed using the full receptor grid.

NAAQS Analysis

To complete the NAAQS Analysis, the facility wide post-project emissions are modeled simultaneously with the emissions from the NAAQS sources identified in the inventory provided by the ODEQ. The background concentrations for the respective averaging periods are added to the modeled concentration for comparison with the NAAQS. The appropriate modeled concentration plus the calculated monitored background is compared to the corresponding NAAQS to predict if the post-project emissions will cause or contribute to a violation of the NAAQS.

Ambient Ratio Method 2

Modeling of NO_X emissions in AERMOD can follow one of several application methods, each outlined in an EPA clarification memorandum. The Tier 2 method Ambient Ratio Method 2 (ARM2) was used in conducting the NO_2 1-hour NAAQS analysis. ARM2 is available as a non-default beta option in AERMOD, similar to the current OLM and PVMRM Tier 3 NO_2 screening options. EPA believes that the results from ARM2 are generally more conservative relative to the Tier 3 methods of Ozone Limiting Method (OLM) and Plume Volume Molar Ratio Method (PVMRM) which are consistent with the tier screening approach currently recommended in Appendix W for NO_2. PVMRM considers the conversion of NO_X emissions to NO_2 in the atmosphere on an hour-by-hour basis. ARM2 is a sixth-order polynomial regression based on the 98th percentile ratios generated from each bin (AQS data was binned into 10 ppb increments for NO_X values less than 200 ppb and into bins of 20 ppb for NO_X values between 200 and 600 ppb). The ARM2 equation is then used to compute an NO_2/NO_X ratio based on the total NO_X levels.

PSD Increment Analysis

The PSD increment is the maximum increase in concentration that is allowed to occur above a baseline concentration for a pollutant. The baseline concentration is defined (for each pollutant and averaging time) as the ambient concentration that existed at the time the first PSD application affecting an area was submitted. The baseline date depends upon the county in which the facility is located and on the pollutant in question. Sources that contribute to emissions increases (or decreases) after the baseline date are obtained from the ODEQ and are modeled along with total facility-wide potential emissions to determine if the proposed project will cause or contribute to a PSD increment exceedance.

The pollutant evaluated in the modeling analysis is NO_2. Modeling conducted for the MSS events is conservatively based on the assumption that all hours in each year are at the full MSS emission rate. A summary of the modeled emissions as well as modeled parameters are provided in the modeling report submitted to ODEQ.

Inventory source emissions were provided by ODEQ for inclusion in this modeling analysis. Modeled emissions and parameters are provided in the modeling report submitted to ODEQ.

SECTION VIII. OKLAHOMA AIR POLLUTION CONTROL RULES

OAC 252:100-1 (General Provisions) [Applicable]
Subchapter 1 includes definitions but there are no regulatory requirements.

OAC 252:100-2 (Incorporation by Reference) [Applicable]
This subchapter incorporates by reference applicable provisions of Title 40 of the Code of Federal Regulations. These requirements are addressed in the "Federal Regulations" section.

OAC 252:100-3 (Air Quality Standards and Increments) [Applicable]
Primary Standards are in Appendix E and Secondary Standards are in Appendix F of the Air Pollution Control Rules. At this time, all of Oklahoma is in attainment of these standards.

OAC 252:100-5 (Registration, Emission Inventory, and Annual Fees) [Applicable]
The owner or operator of any facility that is a source of air emissions shall submit a complete emission inventory annually on forms obtained from the Air Quality Division. Emission inventories have been submitted and fees paid for the past years.

OAC 252:100-8 (Permits for Part 70 Sources) [Applicable]
Part 5 includes the general administrative requirements for part 70 permits. Any planned changes in the operation of the facility which result in emissions not authorized in the permit and which exceed the "Insignificant Activities" or "Trivial Activities" thresholds require prior notification to AQD and may require a permit modification. Insignificant activities mean individual emission units that either are on the list in Appendix I (OAC 252:100) or whose actual calendar year emissions do not exceed the following limits:

- 5 TPY of any one criteria pollutant
- 2 TPY of any one hazardous air pollutant (HAP) or 5 TPY of multiple HAPs or 20% of any threshold less than 10 TPY for single HAP that the EPA may establish by rule

OAC 252:100-9 (Excess Emission Reporting Requirements) [Applicable]
Except as provided in OAC 252:100-9-7(a)(1), the owner or operator of a source of excess emissions shall notify the Director as soon as possible but no later than 4:30 p.m. the following working day of the first occurrence of excess emissions in each excess emission event. No later than thirty (30) calendar days after the start of any excess emission event, the owner or operator of an air contaminant source from which excess emissions have occurred shall submit a report for each excess emission event describing the extent of the event and the actions taken by the owner or operator of the facility in response to this event. Request for mitigation, as described in

OAC 252:100-9-8, shall be included in the excess emission event report. Additional reporting may be required in the case of ongoing emission events and in the case of excess emissions reporting required by 40 CFR Parts 60, 61, or 63.

OAC 252:100-13 (Open Burning) [Applicable]
Open burning of refuse and other combustible material is prohibited except as authorized in the specific examples and under the conditions listed in this subchapter.

OAC 252:100-19 (Particulate Matter) [Applicable]
This subchapter specifies a particulate matter (PM) emissions limitation of 0.20 lb/MMBtu from new and existing fuel-burning equipment with a rated heat input between 1,000 and 10,000 MMBtu/hr. The turbines, rated at 1,683.3 MMBtu/hr, are required to burn only pipeline quality natural gas with an emission limit of 18 lb/hr. Based on these requirements, the turbines have PM emissions of 0.01 lb/MMBtu, below the Subchapter 19 limit. The auxiliary boiler and emergency diesel fire-water pump engine are limited to 0.35 lb/MMBtu. AP-42, Table 1.4-2 (3/98) lists PM emissions for the auxiliary boiler for natural gas to be 7.6 lb/MMcf or about 0.0076 lb/MMBtu. Based on AP-42 (10/96) Section 3.3, the emergency diesel fire-water pump engine will have emissions of 0.31 lb/MMBtu. Therefore, the turbines, auxiliary boiler, and emergency diesel fire-water pump engine are in compliance with Subchapter 19. According to AP-42 (7/00), the 40-hp propane-fired emergency generator engine will have PM emissions of approximately 0.02 lb/MMBtu which is in compliance with the limit of 0.6 lb/MMBtu fuel-burning equipment with a rated heat input of 10 MMBtu/hr or less set in Subchapter 19.

OAC 252:100-25 (Visible Emissions and Particulates) [Applicable]
No discharge of greater than 20% opacity is allowed except for short-term occurrences which consist of not more than one six-minute period in any consecutive 60 minutes, not to exceed three such periods in any consecutive 24 hours. In no case shall the average of any six-minute period exceed 60% opacity. The turbines and auxiliary boiler use natural gas. The emergency fire-fighting pump and one of the emergency generators use low-sulfur diesel. The second generator uses propane. Therefore, it is not necessary to specify any unique procedures to ensure compliance.

OAC 252:100-29 (Fugitive Dust) [Applicable]
No person shall cause or permit the discharge of any visible fugitive dust emissions beyond the property line on which the emissions originate in such a manner as to damage or to interfere with the use of adjacent properties, or cause air quality standards to be exceeded, or interfere with the maintenance of air quality standards. Under normal operating conditions, this facility will not cause a problem in this area, therefore it is not necessary to require specific precautions to be taken.

OAC 252:100-31 (Sulfur Compounds) [Applicable]
Part 2 limits the ambient air concentration of hydrogen sulfide (H_2S) emissions from any facility to 0.2 ppmv (24-hour average) at standard conditions which is equivalent to 283 $\mu g/m^3$. Fuel-burning equipment fired with commercial natural gas will not have the potential to exceed the H_2S ambient air concentration limit.