Permit Amendment
Source Analysis & Technical Review

Company	**Rio Grande LNG LLC**	Permit Numbers	**140792, GHGPSDTX158 and PSDTX1498**
City	**Brownsville**	Project Number	**317475**
County	**Cameron**	Regulated Entity Number	**RN109222851**
Project Type	**Amendment**	Customer Reference Number	**CN605153907**
Project Reviewer	**Ge Song**	Received Date	**July 1, 2020**
Site Name	**Rio Grande LNG**		

Project Overview

Rio Grande LNG, LLC (RG LNG) owns a natural gas liquefaction facility in Cameron County along the north embankment of the Brownsville Ship Channel. The primary change in the proposed as-built amendment is to remove LNG Train 6 (this removes two turbines and one thermal oxidizer), keeping the overall throughput and LNG production the same.

Other changes in the amendment include improved performance guarantees for the remaining turbines (particularly for NO_X and CO). The five remaining thermal oxidizers (TOs) will process the same amount of gas as the previous six trains, hence the individual TO units have increased emissions in comparison to the previous application. The Ship BOG Vent (EPN VENTIG) has changed to add an enclosure, as per public comment on visible flaring on the prior permit application. With this change, the design added a continuously lit pilot and updated the calculations for gassing-up an LNG vessel. Two essential generators (EPNs DGEN5 and DGEN6) were removed from plant as a result of design optimization. The other units that were removed from the plant were related to the Rio Bravo pipeline, which has been sold to Enbridge. All of these sources (pigging and fugitive emissions) will be included by Enbridge in a future filing. No new process or emission units were added as a part of this amendment.

Emission Summary

Air Contaminant	Current Allowable Emission Rates (tpy)	Proposed Allowable Emission Rates (tpy)	Change in Allowable Emission Rates (tpy)	Project Changes at Major Sources (Baseline Actual to Allowable) *
PM	381.94	257.42	-124.52	257.42
PM_{10}	381.94	257.42	-124.52	257.42
$PM_{2.5}$	381.94	257.42	-124.52	257.42
VOC	609.07	481.81	-127.26	481.81
NO_X	2058.72	1112.30	-946.42	1112.30
CO	3142.30	1723.74	-1418.56	1723.74
SO_2	30.23	19.51	-10.72	19.51
H_2SO_4	2.36	1.55	-0.81	1.55
H_2S	0.31	0.26	-0.05	0.26
CO_2	8130664.65	6414557.43	-1716107.22	6411552
CH_4	870.31	318.26	-552.05	318.26
N_2O	153.89	8.62	-145.27	8.62
CO_2e	8198227	6425399.94	-1772827.06	6425399.94

*Baseline Actuals Emissions are considered zero. The potential to emit (PTE) represents the initially proposed emissions as adjusted by this as-built application. A PSD review was previously triggered for the original project and a PSD permit was issued on December 17, 2018.

Federal Rules Applicability

Requirement	
Subject to NSPS?	**Yes**
Subparts **A, Kb, IIII & KKKK**	
Subject to NESHAP?	**No**
Subparts &	
Subject to NESHAP (MACT) for source categories?	**Yes**
Subparts **A, YYYY & ZZZZ**	
Nonattainment review applicability: No. This facility is located in Cameron Country, which is designated as either in attainment or unclassifiable for all pollutants. Therefore, nonattainment review is not applicable.	
PSD review applicability: No. The site is a major source, but proposed emission changes do not trigger PSD review because annual criteria pollutant emission rates are decreased in comparison to the originally proposed project. This is a retrospective correction to the original PSD project issued in 2018. This project is making corrections to the original analysis which reduces the annual emissions. The originally authorized facilities have not yet been operated. Although the project increases represented in the PI-1 appear greater than the major source modification threshold, this project is considered as an as-built amendment and does not trigger a new PSD review.	

Title V Applicability - 30 TAC Chapter 122 Rules

Requirement
Title V applicability: The site is subject to Title V permitting because the proposed sitewide emission rates are above applicable thresholds for at least one pollutant. A Federal Operating Permit application will be submitted under separate cover.
Periodic Monitoring (PM) applicability: Periodic monitoring is applicable because the site is a major source subject to 30 TAC Chapter 122. Turbines will have NO_x and CO CEMS. Thermal oxidizers will have outlet exhaust temperature monitors and oxygen monitors. Visibility / opacity observations are required for the turbines and thermal oxidizers' exhaust. Quarterly sulfur content analysis of the gas stream prior to the first acid gas treatment device is required, as well as gas sulfur content determination after the last acid gas treatment device. Engines will have run-time meters.
Compliance Assurance Monitoring (CAM) applicability: CAM is applicable because a control device is used on facilities with a pre-control emission rate greater than or equal to a major source threshold. Turbines will have NO_x and CO CEMS or PEMS or CPMS. Thermal oxidizers will have outlet exhaust temperature monitors and oxygen monitors.

Process Description/Project Scope

The Terminal will have five liquefaction trains capable of producing approximately 27 million tons per annum (MTPA) of liquefied natural gas (LNG) or approximately 5.4 MTPA per train, four LNG tanks (each with a capacity of 180,000 cubic meters), two marine jetties for ocean-going LNG vessels (ranging from 125,000 m^3 up to 216,000 m^3 in capacity), one turning basin, and four LNG and two natural gas liquids (NGLs) truck loading bays. The Terminal will receive natural gas feedstock from the Pipeline System within the State of Texas. The Pipeline System will include two parallel 42-inch-diameter pipelines approximately 137.3 miles in length, one compressor station, an approximately 2.4-mile-long header system ("Header System") to interconnect with a network of existing natural gas transmission pipelines, associated metering stations, mainline valve sites, access roads, and temporary contractor/pipe yards. The pipelines will run north to south from a starting point to the Terminal fence line. The Pipeline System will have a Header System at the upstream end and will have multiple interconnects to the existing natural gas pipeline grid located in the Agua Dulce Market Area, Nueces County, Texas.

This RG LNG permit amendment application proposes to perform a retrospective correction to the original PSD permit (Project No. 252949). The PSD permit was issued on December 17, 2018, and this project is simply making corrections to the original analysis, including a reduction in annual emissions.

Changes to the Special Conditions

- Removed Federal Applicability Special Condition No. 2. E and F, Special Condition No. 3.C, and Special Condition No. 6 because Compressor Station 3 natural gas generators were removed from the plant design. These generators were related to the Rio Bravo pipeline, which was sold to Enbridge. The generators are no longer authorized by this permit.
- Removed Train 6 combustion turbine, Emission Point Number (EPN) GT6, from Special Condition Nos. 10, 16, 17 and 23.
- Removed Train 6 TO (EPN TO6) from Special Condition Nos. 11, 16, and18.
- Added NOx and CO limits (as proposed by RG LNG) for Combustion Turbines to SC No. 10 B.
- Updated recordkeeping in SC No. 22 B.

Changes to the MAERT

- Removed sources Thermal Oxidizer (EPN TO6), Train 6 GT Driver A (EPN GT6-A), Train 6 GT Driver B (EPN GT6-B), Train 5 and 6 Essential Service Diesel Generator (EPNs DGEN5 and DGEN6), VENT (Unignited) (EPN VENT), Compressor Station Backup Natural Gas Generator A, B (EPNs CSGENA and CSGENB), Compressor Station Condensate Tank (EPN CSCT), Compressor Station 3 Fugitive Emissions (EPN FUG-CS) and Compressor Station Pigging Emissions (EPN PIG-CS).
- Updated emission rates for Train 1 Thermal Oxidizer through Train 5 Thermal Oxidizer (EPNs TO1 thru TO5).
- Updated emission rates for Train 1 GT Driver A (EPN GT1-A), Train 1 GT Driver B (EPN GT1-B), Train 2 GT Driver A (EPN GT2-A), Train 2 GT Driver B (EPN GT2-B), Train 3 GT Driver A (EPN GT3-A), Train 3 GT Driver B (EPN GT3-B), Train 4 GT Driver A (EPN GT4-A), Train 4 GT Driver B (EPN GT4-B), Train 5 GT Driver A (EPN GT5-A), Train 5 GT Driver B (EPN GT5-B).
- Updated emission rates for Essential Service Diesel Generator 1 through 4 (EPNs DGEN1 thru 4).
- Updated emission rates Seawater Firepump A and B (EPNs SWFP-A and SWFP-B), Wet Gas Flare A and B (EPNs WGFLR-A and WGFLR-B), Dry Gas Flare A and B (EPNs DGFLR-A and DGFLR-B).
- Updated emission rates for VENT (ignited) (EPN VENTIG).
- Updated emission rates Terminal Fugitive Emission (EPN FUG-T).

Best Available Control Technology

RG LNG performed BACT analysis in accordance with EPA guidance, which outlines a “top-down” five-step process to determine the appropriate emission control technologies/limitations. The determination of BACT for the Terminal is addressed separately by emission source and pollutant. The company used the following methods to identify potential technologies:

- Researching the Reasonably Available Control Technology (RACT)/BACT/LAER Clearinghouse (RBLC) database;
- Drawing from previous engineering experience;
- Surveying air pollution control equipment vendors; and/or
- Surveying available literature.

The summary of BACT selected for each source and the proposed emission limits are presented in the Table below:

Source Name	Pollutant	BACT	Proposed Limit, per Each Piece of Equipment	Current Limit, per Each Piece of Equipment
Refrigeration Compressor Turbines	NOx	Dry low NOx combustion, good combustion practices. The proposed controls emission limits are consistent with the lowest levels of control for Refrigeration Compressor Turbines; therefore, BACT is satisfied.	5 ppmvd at 15% O_2	9 ppmvd at 15% O_2
	CO	Good combustion practices. The proposed controls Emission limits are consistent with the lowest levels of control for Refrigeration Compressor Turbines; therefore, BACT is satisfied.	15 ppmvd at 15% O_2	25 ppmvd at 15%O_2
	$PM_{10}/PM_{2.5}$	Natural gas/clean fuel and good combustion practices are selected as BACT for all turbines to limit $PM_{10}/PM_{2.5}$ emissions. This meet BACT.	5.75 lb/hr	7.0 lb/hr
	VOC	Good combustion practices. BACT is satisfied.	2 ppmvd at 15% O_2	2 ppmvd at 15% O_2
	GHG	Low-Carbon Fuel, turbine design/efficiency, good combustion practices, Waste Heat Recovery (WHR), process design. BACT is satisfied.	433,270 tpy	506,674 tpy
Thermal Oxidizers[1]	NOx	Low NOx Burners (TO1 and TO2), Ultra Low NOx Burners (TO3 thru 5), Good combustion practices. These meet BACT.	0.14 lb/MMBtu (TO1 and 2) 0.10 lb/MMBtu (TO3 thru 5)	0.14 lb/MMBtu (TO1 and 2) 0.10 lb/MMBtu (TO3 thru 5)
	CO	Good combustion practices. This meets BACT.	0.082 lb/MMBtu	N/A
	$PM_{10}/PM_{2.5}$	Natural Gas/Clean Fuel, Good combustion practices are selected as BACT.	7.6 lb/MMscf	N/A
	GHG	Low-Carbon Fuel, Good combustion practices The low-carbon fuel will consist of natural gas and boil off gas, which is the lowest carbon fuel available for use at the	390,598 tpy (TO1 and 2); 381,954 tpy (TO3 thru 5)	244,003 tpy (TO1 and 2); 384,883 tpy (TO3 thru 5)

		Terminal. The proposed low carbon fuel and good combustion practices are accepted as BACT.		
Flares[1]	NOx	Comply with 40 CFR 60.18, good combustion practices. These are BACT.	0.064 lb/MMBtu	0.064 lb/MMBtu
	CO	Comply with 40 CFR 60.18, good combustion practices. These are BACT.	0.55 lb/MMBtu	0.55 lb/MMBtu
	GHG	Comply with 40 CFR 60.18, low carbon fuel, process design has reduced required flaring by recovering and directing BOG to the high-pressure fuel gas system. These are BACT.	1,484 tpy (normal operation)	18,282 tpy (normal operation)
Diesel Engines	NOx	Turbochargers and Aftercoolers, Good combustion practices. These are selected as BACT.	NSPS Subpart IIII Compliance	NSPS Subpart IIII Compliance
	CO	Turbochargers and Aftercoolers, Good combustion practices. These are selected as BACT.	NSPS Subpart IIII Compliance	NSPS Subpart IIII Compliance
	$PM_{10}/PM_{2.5}$	Good combustion practices, Clean Fuel/Low Sulfur Fuel. These are selected as BACT.	NSPS Subpart IIII Compliance	NSPS Subpart IIII Compliance
	VOC	Good combustion practices are selected as BACT for all standby diesel generators and firewater pump engines to minimize VOC emission rates.	NSPS Subpart IIII Compliance	NSPS Subpart IIII Compliance
	GHG	Good combustion practices are selected as BACT for all standby diesel generators and firewater pump engines to minimize GHG emission rates.	215 tpy (essential generators), 29 tpy (firewater pump engines)	215 tpy (essential generators), 91 tpy (firewater pump engines)
Condensate Tanks	VOC	The fixed roof tank routing emissions to a control device has been selected as BACT for the condensate tanks to minimize VOC emission rates.	N/A	N/A
Condensate Loading Operations	VOC	Routing emissions to Thermal Oxidizer for control. This meets BACT.	N/A	N/A
Diesel Tanks	VOC	Submerged Loading has been selected as BACT for the	N/A	N/A

		diesel tanks to minimize VOC emission rates. Uninsulated exterior surfaces are also required to be painted white or aluminum.		
Component Fugitives	VOC&GHG	The 28VHP LDAR program has been selected as BACT for component fugitives to minimize VOC and GHG emission rates at the Terminal.	97% for valves, 85% for pumps and compressors	N/A

Note:
[1] The Thermal Oxidizers and Flares are considered control devices for VOC emissions. The thermal oxidizers will achieve 99.9% destruction and removal efficiency (DRE) for VOCs and sulfur compounds. Therefore, VOC was not included in the BACT analysis for these sources.

Permits Incorporation

N/A

Impacts Evaluation

Was modeling conducted?	**Yes**	Type of Modeling:	**AERMOD**
Is the site within 3,000 feet of any school?			**No**
Additional site/land use information: **None**			

Summary of Modeling Results

The applicant provided an analysis to demonstrate that the facility, as retrospectively amended, will not cause or contribute to an exceedance of any applicable standards. The analysis evaluated updates to emission rates and source parameters for all applicable pollutants. Please see the discussion below on information regarding the analysis on the updated emissions rates and source parameters.

For the CO, PM_{10}, SO_2, and H_2SO_4 analyses, the applicant provided an analysis to determine a conservative predicted concentration of the emission increases from all applicable sources. The applicant determined that the conservative predicted concentrations, when added independent of time and space to the 2017 impacts, will not cause the total predicted concentrations to exceed the SILs and State Property Line Standards. In conjunction with the applicant's analysis, the ADMT conducted test modeling for the emission increases and verified that the respective SILs would not be exceeded.

For the $PM_{2.5}$ analysis, the applicant provided an analysis to determine a conservative predicted concentration of the emission increases and decreases from all sources. The applicant determined that the conservative predicted concentrations, when added independent of time and space to the 2017 impacts, will not cause the total predicted concentrations to exceed the respective SILs. In conjunction with the applicant's analysis, the ADMT conducted test modeling for the emission increases and decreases and verified that the SILs would not be exceeded.

For the NO_2 analysis, the applicant provided an analysis to determine a conservative predicted concentration of the emission increases and decreases from all sources. The applicant determined that the conservative predicted concentrations, when added independent of time and space to the 2017 impacts, will not cause the total predicted concentrations to exceed the annual NO_2 SIL. The total predicted concentration for 1-hr NO_2 is predicted to exceed the 1-hr interim SIL and was also previously predicted to exceed the 1-hr interim SIL in the 2017 modeling analysis. The applicant determined that the 1-hr NO_2 full NAAQS standard would not be exceeded by providing an analysis that added, independent of time and space, the 2017 1-hr NO_2 full NAAQS predictions, updated background monitor concentrations from 2017-2019, and new off-property inventory since the 2017 modeling analysis. The applicant did not consider the updated source emissions in the full NAAQS analysis. According to the applicant, this is conservative. The ADMT verified that it is conservative to exclude the updated source emissions because the total predicted concentration determined to compare against the 1-hr NO_2 interim SIL was less than the modeled predictions from the 2017 modeling analysis. Therefore, the updated source emissions associated with this amendment would result in a decrease in impacts.

For the health effects analysis, the applicant provided the emission increases and decreases for all health effect pollutants and determined that additional site-wide modeling would not be needed and ESLs would not be exceeded. In conjunction with the applicant's determination, the ADMT conducted test modeling for the emission changes and verified that additional site-wide modeling would not be needed and ESLs would not be exceeded.

The applicant addressed the source parameter changes associated with the amendment by reviewing the location of the GLCmax for all pollutants and averaging times and compared it to where sources are physically moving to. In conjunction with the applicant's analysis, the ADMT conducted test modeling to model the sources in their new proposed locations and verified that all pollutants and averaging times would not exceed the respective De Minimis, NAAQS, and ESL thresholds.

The applicant also provided additional analyses consistent with current guidance to demonstrate that De Minimis and NAAQS standards would not be exceeded: all background monitors were updated to reflect the most recent three years of monitoring data, MERPs analyses for secondary formation of $PM_{2.5}$ and ozone, an updated full NAAQS analysis for ozone, an evaluation of changes in nearby off-property inventory since the 2017 modeling analysis for the 1-hr and annual NO_2 PSD NAAQS analysis, and justification for the use of the $PM_{2.5}$ SILs. The ADMT has determined that the analyses are sufficient and when added to the appropriate NAAQS pollutants, the overall concentrations would not exceed the respective SILs and NAAQS standards.

Ge Song	October 29, 2020		November 2, 2020
Project Reviewer Ge Song	Date	Team Leader Lyndon Poole, P.E.	Date