El Paso Natural Gas Company, L.L.C.
a Kinder Morgan company

November 1, 2019

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Ms. Liz Bisbey-Kuehn
Chief, Air Quality Bureau
New Mexico Environment Department
525 Camino de los Marquez, Suite 1
Santa Fe, New Mexico 87505

Re: Submittal of Four-Factor Analysis on Control Measures under the Clean Air Act Regional Haze Program
El Paso Natural Gas Company, L.L.C.
Blanco Compressor Station A

Dear Ms. Bisbey-Kuehn,

On July 18, 2019 El Paso Natural Gas Company, L.L.C. (EPNG) received notification from New Mexico Environment Department (NMED) that the Blanco Compressor Station A in San Juan County, New Mexico is a facility subject to a four-factor reasonable progress analysis under the federal Clean Air Act, 42 U.S.C. § 7491, and implementing regulations at 40 CFR §§ 51.300 to 51.309 (Regional Haze Rule).

EPNG evaluated three technically feasible options for controls of nitrogen oxides (NOx) for the fourteen (14) Cooper Bessemer GMV10-TF reciprocating internal combustion engines that are located at the compressor station. The control options are listed in Table 1 of the enclosed four-factor analysis. Table 2 outlines the cost effectiveness (dollars per ton of pollutant reduction) of these control options based on 2016 emissions inventory data.

As requested by NMED, this four-factor analysis is being submitted no later than November 1, 2019. If you have any questions, please contact me at (719) 520-3786 or via email at Travis_Ray@kindermorgan.com.

Sincerely,
El Paso Natural Gas Company, L.L.C.

Travis Ray
EHS Specialist

Cc: Mark Jones, NMED
Kerwin Singleton, NMED

Enclosure

El Paso Natural Gas Company, L.L.C.
Blanco Compressor Station A
San Juan County, New Mexico

Four-Factor Analysis for Regional Haze Planning in New Mexico

November 2019

Prepared for:

El Paso Natural Gas Company, L.L.C.
2 North Nevada Avenue
Colorado Springs, CO 80903

El Paso Natural Gas Company, L.L.C.
a Kinder Morgan company

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ACRONYMS AND ABREVIATIONS

BACT	Best Available Control Technology
CAA	Clean Air Act
CIA	Class I Area
EFI	Electronic Fuel Injection
EPA	Environmental Protection Agency
gr/dscf	Grains per Dry Standard Cubic Foot
HAP	Hazardous Air Pollutant
lb/hr	Pounds per Hour
MACT	Maximum Achievable Control Technology
MID	Most Impaired Days
MMBtu/hr	Million British Thermal Units per Hour
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NMAC	New Mexico Administrative Code
NMED	New Mexico Environment Department
NO_X	Nitrogen Oxides
NSPS	New Source Performance Standards
PTE	Potential to Emit
PSD	Prevention of Significant Deterioration
RICE	Reciprocating Internal Combustion Engine
SO_2	Sulfur Dioxide
tpy	Tons per Year
WRAP	Western Regional Air Partnership

EXECTUTIVE SUMMARY

The Blanco Compressor Station A, owned and operated by El Paso Natural Gas Company, L.L.C. (EPNG), is located near Bloomfield in San Juan County, New Mexico. The Blanco Compressor Station A is a natural gas compressor station that compresses natural gas for the purpose of transportation to another facility or a major transportation pipeline.

The New Mexico Environment Department (NMED) has requested a report containing a complete Four-Factor Analysis for the Blanco Compressor Station A. The analysis has identified possible NO_x and SO_2 control options for the fourteen (14) compressor engines operating at the Blanco Compressor Station A and followed the Western Regional Air Partnership (WRAP) assessment protocol by assessing the following four factors:

Factor 1: Cost of compliance;
Factor 2: Time necessary for compliance;
Factor 3: Energy and non-air quality environmental impacts; and
Factor 4: Remaining useful life of the source.

NMED is requiring that a separate analysis be performed for each pollutant (nitrogen oxide and sulfur dioxide) with a potential to emit (PTE) greater than ten (10) pounds per hour (lb/hr). As sulfur dioxide (SO_2) emissions from the Blanco Compressor Station A are less than the 10 lb/hr threshold, an analysis of control options was not completed.

The evaluation concluded that there are no technically feasible options to reduce nitrogen oxide (NO_x) emissions for the engines at the Blanco Compressor Station A. Taking into account the age of the engines, the costs associated with the installation of controls or engine modifications, possible loss in engine efficiency, and the timeframes in which the modifications would be completed, any changes to reduce the NO_x emissions from the engines is not practicable at this time. NO_x control strategy options that are evaluated as part of the Four-Factor Analysis for the engines are included in Table 1. The table also shows the estimated NO_x emission rate for each control option.

TABLE 1: NO_X CONTROL OPTIONS FOR ENGINES

	Option 1	Option 2	Option 3
NO_x Target	3 g/bhp-hr	1 g/bhp-hr	Alt. low-NO_x Option to get 0.5 g/bhp-hr
Scope Summary	High-pressure EFI & electric blower	Same as Option 1 + Exhaust manifold replacement & catalytic silencer	High-pressure EFI with engine uprate of 9-units & retire 5-units
HyperFuel	X	X	X
Engine Auxiliary Cooling System	X	X	
Wet to Dry Manifold Conversion		X	
Muffler with Oxidation Catalyst		X	
Cylinder Heads with PCC		X	
Turbocharger			X
Compressor Cylinder Upgrade			X
Power Cylinder Upgrade			X
Cost per engine	$784,014	$1,624,286	$1,334,282
Subtotal	$10,976,196	$22,740,004	$12,008,538
Off-Engine Fuel System	$500,000	$500,000	$500,000
Automation Panels	$3,500,000	$3,500,000	$2,250,000
New Ignition System	$910,000	$910,000	$585,000
Pulsation Bottles	$0	$0	$900,000
Construction, Inspection, Commissioning, & Company Labor	$10,500,000	$14,000,000	$9,000,000
TOTAL COST	**$26,386,196**	**$41,650,004**	**$25,243,538**
Cost per Unit	$1,884,728.29	$2,975,000.29	$2,804,837.56
Cost Effectiveness ($/ton reduced, per engine)	See Table 2	See Table 2	See Table 2
Compliance Timeframe (after NSR permit issuance)	12 months	36 months	36 months
Energy and Non-Air Impacts	Waste generation and disposal, water consumption, electrical power use, combustion emissions from project equipment, potential decrease in engine efficiency	Waste generation and disposal, water consumption, electrical power use, combustion emissions from project equipment, potential decrease in engine efficiency	Waste generation and disposal, water consumption, electrical power use, combustion emissions from project equipment, potential decrease in engine efficiency
Remaining Useful Life	20 years (maximum)	20 years (maximum)	20 years (maximum)

TABLE 2: COST EFFECTIVENESS BASED ON 2016 EMISSIONS INVENTORY

		Option 1			Option 2			Option 3		
Unit ID	2016 NOx Emissions (TPY)	2016 NOx Emissions Based on 3.0 g/bhp-hr (TPY)	NOx Reduction (TPY)	Cost Effectiveness ($/ton reduced)	2016 NOx Emissions Based on 1.0 g/bhp-hr (TPY)	NOx Reduction (TPY)	Cost Effectiveness ($/ton reduced)	2016 NOx Emissions Based on 0.5 g/bhp-hr (TPY)	NOx Reduction (TPY)	Cost Effectiveness ($/ton reduced)
A01	73.711	20.993	52.718	$ 35,751.27	6.998	66.713	$ 44,593.96	3.499	70.212	$ 39,948.18
A02	0.025	0.007	0.018	$ 1,851,502.89	0.002	0.022	$ 2,908,631.75	0.001	0.023	$ 2,738,983.48
A03	54.915	15.640	39.275	$ 47,988.12	5.213	49.701	$ 59,857.46	2.607	52.308	$ 53,621.53
A04	1.093	0.311	0.782	$ 411,735.39	0.104	0.989	$ 32,661.78	0.052	1.041	$ 2,694,649.96
A05	3.081	0.878	2.204	$ 855,297.53	0.293	2.789	$ 1,066,846.07	0.146	2.935	$ 955,702.52
A06	0.613	0.175	0.439	$ 1,057,784.91	0.058	0.555	$ 1,323,161.13	0.029	0.584	$ 1,165,802.68
A07	65.341	18.609	46.732	$ 40,330.69	6.203	59.138	$ 50,306.05	3.102	62.240	$ 45,065.19
A08	0.019	0.005	0.014	$ 1,858,886.31	0.002	0.017	$ 2,923,380.32	0.001	0.018	$ 2,753,617.72
A09	27.382	7.798	19.584	$ 96,240.22	2.599	24.783	$ 120,044.19	1.300	26.082	$ 107,538.04
A10	0.019	0.005	0.014	$ 1,858,886.31	0.002	0.017	$ 2,923,380.32	0.001	0.018	$ 2,753,617.72
A11	48.253	13.743	34.511	$ 54,612.79	4.581	43.673	$ 68,120.68	2.290	45.963	$ 61,023.89
A12	0.016	0.005	0.012	$ 1,862,578.02	0.002	0.015	$ 2,930,754.60	0.001	0.016	$ 2,760,934.84
A13	82.061	23.371	58.690	$ 32,113.26	7.790	74.271	$ 40,056.13	3.895	78.166	$ 35,883.10
A14	0.019	0.005	0.014	$ 1,858,886.31	0.002	0.017	$ 2,923,380.32	0.001	0.018	$ 2,753,617.72
		Average Cost Effectiveness ($/ton reduced)		$ 851,613.86	Average Cost Effectiveness ($/ton reduced)		$ 1,243,941.05	Average Cost Effectiveness ($/ton reduced)		$ 1,351,429.04

SECTION 1.0 INTRODUCTION

In 1977, serious degradation of scenic views at national parks and wilderness areas prompted Congress to require the U.S. Environmental Protection Agency (EPA) to take action. Initial work was conducted to identify specific facilities whose emissions clearly caused regional haze in these nationally treasured places, and the eventual result was the 1999 Regional Haze Rule. This rule mandates gradual progress toward restoring "natural" visibility conditions by the year 2064 at designated national parks, wilderness areas, monuments, forests, seashores, and wildlife refuges, collectively referred to as Class I areas (CIA). The rule was revised in 2017 to strengthen visibility protection, emphasizing that states must reduce human-caused emissions of air pollutants that impair visibility at these special places held in the public trust.

On July 1, 1999, the EPA published regulations implementing Section 169A of the Clean Air Act (CAA), establishing a comprehensive visibility protection program for Federal Class I areas (the Regional Haze Rule). The Regional Haze Rule requires each state to develop, and submit for approval by EPA, a state implementation plan (SIP) detailing the state's plan to protect visibility in Class I areas. The Regional Haze Rule established a schedule setting forth deadlines by which the States must submit their initial regional haze SIPs and subsequent revisions to the SIPs. Regional Haze SIPs for the initial planning period were due in 2007, with subsequent SIP updates due in 2018 and every 10 years thereafter. The second planning period Regional Haze SIPs must be submitted to EPA for review by July 31, 2021.

For the second planning period, EPA guidance recommends that each state should evaluate about 80 percent of emissions impact at each CIA from major and minor stationary sources along with area sources to ensure a reasonably large fraction of emissions potentially impacting CIA visibility deterioration. The over-arching goal in assessing emissions is to ensure states identify anthropogenic sources that are most likely impacting the 20 percent most impaired days (MID) at one or more Class I areas.

NMED identified twenty-four (24) Title V permitted facilities across New Mexico that may potentially have an impact on visibility at Federal Class I Areas protected by the Regional Haze Rule. This determination was based on a screening analysis, the Q/d evaluation, developed by the Western Regional Air Partnership (WRAP), along with guidance from the U.S. Environmental Protection Agency (EPA).

EPNG has prepared a Four-Factor Analysis for the control of nitrogen oxides (NO_x) emissions from the Blanco Compressor Station A. The evaluation is in response to the NMED letter dated July 18, 2019. The evaluation includes an assessment of potentially available emission reduction measures for the four statutory factors listed in 40 CFR 51.308(f)(2), and takes into consideration EPA's *Air Pollution Control Cost Manual, Assessment of Non-EGU NO_x Emission Controls, Cost of Controls, and Time for Compliance Final TSD,* and the EPA's RACT/BACT/LAER Clearinghouse. Technically feasible NO_x emission reduction measures are evaluated for the following four factors:

• Factor 1: The cost of compliance;
• Factor 2: The time necessary to achieve compliance;

• Factor 3: The energy and non-air quality environmental impacts; and
• Factor 4: The remaining useful life of any existing source subject to such requirements.

The Four-Factor Analysis for the Blanco Compressor Station A is presented in the following sections.

SECTION 2.0 SOURCE CATEGORY ANALYSIS

2.1 FACILITY DESCRIPTION

The Blanco Compressor Station A is a natural gas compressor station that compresses natural gas for the purpose of transportation to another facility or a major transportation pipeline. Emission sources located at the Blanco Compressor Station include fourteen (14) Cooper Bessemer GMV10-TF natural gas-fired reciprocating internal combustion engines (RICE).

The Blanco Compressor Station A currently operates under Title V permit number P048-R3 and New Source Review (NSR) permit number 0613-M10. NSR permit number 0613-M10 was issued jointly to three (3) companies as part of an NMED and EPA agreement that established common control between the three (3) companies and three (3) of their adjacent facilities. These companies include: EPNG, Harvest Midstream and Enterprise Products Operating, L.L.C.

2.2 CLEAN AIR ACT AND STATE REGULATIONS REQUIRING CONTROL

This Four-Factor Analysis is being requested by NMED and the EPA under the Federal Clean Air Act, 42 USC §7401; and the Code of Federal Regulations, 40 CFR §51.300 to §51.309 (regional Haze Rule).

There are currently no air pollution controls installed on the compressor engines evaluated in this report. The compressor engines at the Blanco Compressor Station A were constructed in 1953 and do not have any Federal or State regulatory requirements to control emissions. An air permit for the Blanco Compressor Station A is required under 20.2.74 NMAC (PSD construction permits) and 20.2.70 NMAC (operating permits) as the site is a major source of air pollutants.

2.3 NO_X AND SO_2 EMISSIONS FROM THE SOURCE CATEGORY

NO_x and SO_2 emissions are generated by the engines from the combustion of natural gas, which is used as fuel. Engine manufacturer emission factors, EPA developed emission factors (AP-42), engine manufacturer rated horsepower, and other engine manufacturer rated capacities are used to estimate emissions for RICE. As these engines are fired with natural gas and SO_2 emissions are based on the grains of Sulfur per dry standard cubic foot of gas (gr/dscf), there are negligible SO_2 emissions. The estimated and permitted value of NO_x emissions for the engines at the Blanco Compressor Station A are 21.9 lb/hr (each) and SO_2 emissions from the engines are estimated to be less than 1.0 lb/hr (each).

2.3.1 NO_X CONTROL OPTIONS

The engines do not currently have controls installed and operate under the original manufacturer design. The potential control options that were analyzed include:

- Option 1: High pressure electronic fuel injection to achieve a NOx target of 3 g/hp-hr
- Option 2: High-pressure electronic fuel injection plus exhaust manifold replacement and catalytic silencer to achieve a NOx target of 1 g/hp-hr

- Option 3: alternate option including high-pressure electronic fuel injection, engine uprate of 9 units and potential retirement of 5 units.

See Table 1 for more information. Selective Catalytic Reduction (SCR) was evaluated but eliminated due to technical infeasibility for this engine type.

SECTION 3.0 FOUR-FACTOR ANALYSIS

3.1 FACTOR 1: COST OF COMPLIANCE

Control costs include both the capital costs associated with the purchase and installation of retrofit and new control systems, as well as the net annual costs (annual recurring costs) associated with system operation. The basic components of total capital costs are direct capital costs, which includes purchased equipment and installation costs, and indirect capital expenses.

Direct capital costs consist of such items as purchased equipment, instrumentation and process controls, ductwork and piping, electrical components, and structural and foundation costs. Labor costs associated with construction and installation are also included in this category.

Indirect capital expenses are comprised of engineering and design costs, contractor fees, supervisory expenses, and startup and performance testing. Contingency costs – which represent such costs as construction delays, increased labor and equipment costs, and design modifications – are an additional component of indirect capital expenses. Capital costs also include the cost of process modifications. Annual costs include amortized costs of capital investment, as well as costs of operating labor, utilities, and waste disposal.

Only control options that are appropriate to the engines at the Blanco Compressor Station A were analyzed. See Table 1 for a list of the potential control costs.

3.2 FACTOR 2: TIME NECESSARY FOR COMPLIANCE

The time necessary for compliance is separate from the other three factors. The time necessary for compliance depends on reasonable installation times and compliance deadlines for selected control measures. Combustion modifications and post-combustion NO_x controls may require significant time for engineering, construction, and facility preparedness. As an exact timeframe cannot be projected for the analyzed control options, an estimate was made for each option. Furthermore, not all engines would be able to be modified simultaneously as pressure must be maintained within the transmission pipeline at all times. Estimates were made between 1 and 3 years, after the issuance of the revised construction permit from NMED, depending on the control selected. See Table 1 for the estimated time frames to fully implement each control option.

3.3 FACTOR 3: ENERGY AND NON-AIR QUALITY ENVIRONMENTAL IMPACTS

Various controls may impact energy use; equipment efficiency; fuel usage; non-air impacts such as noise pollution, odor, climate impacts, and solid, liquid, or hazardous waste generation; and deposition of atmospheric pollutants on land or water. The analyzed controls may impact waste generation and disposal, water consumption, electrical power use, and potentially decrease engine efficiency.

3.4 FACTOR 4: REMAINING USEFUL LIFE OF THE SOURCE

The remaining useful life of individual emissions units (engines) can vary greatly depending on the age of the unit, size of the unit, maintenance frequency, and other factors. As the engines at the Blanco Compressor Station A are over 60 years old, it is difficult to estimate the remaining useful life of these sources. The EPA's Air Pollution Control Cost Manual suggests the remaining useful life should be based on the control method and not the emissions source itself; therefore, it is assumed that the remaining useful life of any chosen control or modification is 20 years.

SECTION 4.0 REFFERENCES

1. Western Regional Air Partnership and Western States Air Resources Council. *Overview of Regional Haze Planning.* May 7, 2019.

2. Western Regional Air Partnership and Western States Air Resources Council. *WRAP Reasonable Progress Source Identification and Analysis Protocol for Second 10-Year Regional Haze State Implementation Plans.* February 27, 2019.

3. U.S. EPA Office of Air Quality Planning and Standards. *EPA Air Pollution Control Cost Manual, Sixth Edition.* EPA/452/B-02-001. January 2002.

4. U.S. EPA Office of Air and Radiation. *Assessment of Non-EGU* NO_x *Emission Controls, Cost of Controls, and Time for Compliance Final TSD.* August 2016.

5. EPA's RACT/BACT/LAER Clearinghouse. https://www.epa.gov/catc/ractbactlaer-clearinghouse-rblc-basic-information