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

VIA E-MAIL: mark.jones@state.nm.us; kerwin.singleton@state.nm.us

February 14, 2020

Mr. Mark Jones
Mr. Kerwin Singleton
NMED Air Quality Bureau
525 Camino de los Marquez, Suite 1
Santa Fe, NM 87505

RE: Response to the Request for Additional Information for Four-Factor Analyses under the Regional Haze Program

Dear Mr. Jones and Mr. Singleton:

This letter addresses the additional information request for the El Paso Natural Gas Company, L.L.C. (EPNG) – Blanco A Compressor Station Four-Factor Analysis ("Analysis") received on December 23, 2019. For the Blanco A Compressor Station there were a total of fifteen item requests pertaining to the NO_X emissions for the engines. Please see the responses for each item request below.

a. *Please provide a discussion that explains the various control technologies listed in Table 1; why certain technologies are required for each options 1, 2, and 3; and the associated technical information for all of the listed technologies (e.g., HyperFuel, cylinder upgrades, wet to dry manifold conversion).*

   The attached proposal from Hoerbiger Engineered Solutions (HES) provides more details of the options listed in Table 1 of the Analysis. EPNG requested information on technologies to achieve 5 g/hp-hr NOx, 3 g/hp-hr NOx, and less than 1 g/hp-hr NOx. HES concluded that the technologies to achieve 5 g/hp-hr and 3 g/hp-hr NOx are the same so the 3 g/hp-hr option is noted as Option 1, the 1 g/hp-hr option is noted as Option 2, and the <1 g/hp-hr option is noted as Option 3.

   The listed options represent combustion controls that prevent NOx formation rather than an add-on control that reduces post-combustion NOx emissions. The components that are included in these retrofits (Hyperfuel, cylinder upgrades, wet to dry manifold conversion, etc.) work together to provide optimal air-fuel mixture to improve emissions performance.

b. *Oxidation catalysts are listed as a proposed NOx control, but controlling NOx emissions requires a technology that includes a reduction catalyst, such as Selective Catalytic Reduction (SCR). Please explain and clarify the inclusion of oxidation catalyst technology in Table 1.*

   To obtain NOx reduction with clean burn technology, the air-to-fuel ratio must be driven lean. There is a tradeoff relationship between NOx and CO when air fuel ratio is adjusted (i.e., as NOx is reduced, CO may increase). The oxidation catalyst is to prevent the CO from increasing beyond currently permitted levels when the NOx is reduced.

c. *Consider and include an analysis on typical retrofit low-emissions combustion technology (LEC) for internal combustion engines such as, air-fuel ratio controllers, improved combustion chamber design, enhanced air-fuel mixing, and improved ignition system.*

These items were all taken into consideration in the development of the three options. See attached proposal from Hoerbiger.

d. *Explain how engine efficiency is potentially lost due to the controls listed in Table 1 and specify which controls cause a loss in efficiency.*

The technology itself does not cause a loss in engine thermal efficiency; it is a result of the tradeoff between air fuel ratio and heat rate. As mentioned above, the air fuel ratio has to be driven lean to acquire the NOx reduction.

e. *Provide the basis for the costs used in the cost analysis in Table 1.*

Please see the attached Hoerbiger proposal for details of the costs

f. *Consider and include an analysis on CleanBurn™ Technologies (CBT), which are equivalent to LEC technologies, but designed specifically for Cooper Bessemer engines. Please identify any CBT that may be analogous to any of the technologies already listed in Table 1 of the November 2019 four-factor submittal.*

Please see item c above.

g. *Provide the manufacturer's and/or vendor's specifications and cost used for the four-factor analysis.*

Please see attached Hoerbiger proposal.

h. *Include a technical feasibility analysis for selective catalytic reduction (SCR).*

U.S. EPA, Ap-42, Section 3.2 "Natural Gas-Fired Reciprocating Engines" currently states:

> "For engines which typically operate at variable loads, such as engines on gas transmission pipelines, an SCR system may not function effectively, causing either periods of ammonia slip or insufficient ammonia to gain the reductions needed."

A review of the RBLC tables found no examples of SCR being used as a control for 2SLB engines. The lack of availability or comparable use of an SCR on these Cooper-Bessemer engines presents the case that this control technology is considered technically infeasible.

i. *Consider Good Combustion Practice's (GCP) and routine maintenance as controls and provide the details of a maintenance schedule, employee training and operating procedures to achieve emissions reductions.*

EPNG employs GCP at Blanco A via the routine maintenance schedule pursuant to A314.B in NSR Permit No. 0613-M10. In addition, EPNG performs periodic testing on the compressor engines

pursuant to A314.A in order to monitor NO_X, CO, and VOC emissions. Additionally, employees are required to complete training on equipment before they are authorized to operate it, and standard operating procedures and maintenance practices have been developed based on manufacturer's recommendations to keep the equipment in operating condition.

Additionally, each employee has an Operator Qualification (OQ) Checklist that is completed and tracked in the OQ system. Operators are paired with other operators and work as trainees until they are deemed qualified on the piece of equipment and operation at the site. During the training period, they are exposed to station operations, responding to call outs with operators, station shutdowns, and purging and pressurizing stations. This training period lasts on average about one (1) year. A sample qualification checklist used to track employee training is attached.

j. Provide an explanation of why El Paso Natural Gas (EPNG) feels that the time necessary for compliance is too long when it is listed as 12 to 36 months? Are there plans to shut down all or portions of the facility? EPA guidance recommends a compliance time of up to five years from State Implementation Plan (SIP) approval.

In Section 3.2 of the November 1, 2019 submittal, EPNG states that the estimated time frame of 12 to 36 months. Not all engines would be able to be modified simultaneously as pressure must be maintained within the transmission pipeline at all times in order to meet our delivery obligations. EPNG concluded that the options presented are not cost effective but did not conclude that the time for compliance was too long.

There are no plans to shut down all or portions of the facility.

k. Please verify the waste generation and disposal and water consumption are considered in the cost analysis. If not, this should be included in the cost analysis.

Waste generation and disposal and water consumption are included in the cost analysis.

l. In Table 2, provide the basis for calculating the 2016 emissions inventory. For example, is this based on the emission limits and operating hours, or test data and operating hours?

The 2016 emissions inventory is based on the emission limits and operating hours of the engines.

m. Consider and include a discussion on the feasibility and cost of technology that limits engine capacity and reduce NOx emissions. Also evaluate limitations on engine operating hours or shutting down engines that are no longer needed to reduce emissions. Based on the emissions inventory for 2016, it appears that seven of the fourteen engines operated for very few hours during the year and other engines appear to have operated for only a portion of the year.

The compressor units at Blanco operate on a demand basis and full utilization of all of the units may be required at a given time. As such, EPNG is not able to limit operating hours. Because of the nature of storage and compression utilization on the EPNG lines, any operational restrictions could have the potential to have significant disruptions to operations on site as well as to our upstream and downstream customers.

n. *Consider and include a discussion on the feasibility of replacing natural-gas fueled engines with commercial electric powered compressors.*

The cost for replacing with electric compression can vary widely, depending on on-site conditions and the proximity to an existing high-voltage transmission line. A recent analysis for EPNG's Washington Ranch facility concluded replacement with electric compression would be approximately $2,676 per horsepower including additional electric utility line installation Using this assumption, replacement of the fourteen (14) 943-hp units at Blanco would cost approximately $35 million. Although a full four-factor analysis has not been performed for this replacement, this is cost prohibitive. No unit replacements are planned at this time.

o. *Please provide the electronic spreadsheets used for all cost analysis calculations.*

See attached spreadsheets.

If you have questions or need clarification, 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

Budgetary Estimate: HES-EH1213

HOERBIGER

Jon Goss
Kinder Morgan
Houston, Texas

September 20, 2019

Compression Technology

HOERBIGER Service North America Headquarters
3350 Gateway Drive
Pompano Beach, Florida 33069

Engineered Solutions
Houston, Texas

RE: Quote for optimization and emission retrofits for fourteen (14) GMV-10TF units located at the Blanco New Mexico Compressor Station.

Dear Mr. Goss,

HOERBIGER Engineering Services (HES) is pleased to respond to your request for a budgetary estimate concerning engine and compressor optimization retrofits for the Cooper GMV 10TF units located in Blanco New Mexico. This is a ***budgetary estimate*** for the scope of work listed in Section 1. Since no site visit has been made prior to this proposal, certain assumptions where made to be able to offer this estimate. It is not uncommon for final pricing to be within +/- 20% of this estimate after a site visit is conducted.

As a budgetary estimate, this proposal includes *all* of the expected materials and labor efforts required to meet the project guarantees. If the proposal, as written, fails to meet the guarantees, HES will bear the cost of any changes necessary to meet the requirements.

A detailed summary of this estimate can be found below within the Detailed Bid Description. HES reserves the right to correct clerical errors in this proposal. This proposal is valid for 90 days and acceptance is dependent upon reaching acceptable terms.

HES looks forward to the opportunity to work with Kinder Morgan on this project. If there are any questions concerning this estimate, please do not hesitate to call me at (512) 633-4001.

Sincerely,

Justin Spillman

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Justin Spillman
Solutions Specialist
HOERBIGER Engineered Solutions

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TECHNICAL DESCRIPTION

Customer currently has, in operation, fourteen (14) Cooper GMV-10TF units located at their Blanco, New Mexico Compressor Station. This station sits at an elevation of 5,605 ft above sea level and each unit is currently rated at 913 Hp for a station total of 12,782 Hp. The current emissions output for these units are between 12 – 15 g/bhp-hr for NOx and 1.4 g/bhp-hr for CO. The customer has requested solutions, pricing and options to reduce these limits to 5g, 3g and <1 g for NOx and not to exceed their baseline of 1.4 g/bhp-hr output for CO. After an Engineering review, HOERBIGER has put together the following options that will be needed to achieve the customer requests. To achieve the 5 g/bhp-hr or 3 g/bhp-hr emissions limits, the required technology is the same which will give the customer the potential savings and flexibility when considering other engine upgrades. At these levels, we will be able to meet or exceed the NOx requirement and avoid a negative impact on CO which will eliminate those associated expenses.

OPTION 1 - $784,014 per unit

Skid Mounted VFD Electric motor driven blower with Aftercooler
***HyperFuel*™ System**
Engine auxiliary cooling system

If the customer elects to achieve NOx levels of 1 g/bhp-hr or lower, on these units, additional technology will be needed to address the rise in baseline CO.

OPTION 2 - $1,624,286 per unit

Skid Mounted VFD Electric motor driven blower with Aftercooler
***HyperFuel*™ System**
Engine auxiliary cooling system
Wet to Dry Manifold Conversion
Muffler with Oxidation Catalyst
Cylinder Heads with PCC

In addition to the two options listed above, a third option has been discussed which would include uprating 9 units at this station and retiring the remaining 5. In order to maintain the overall station HP level of 12,782 each unit will be uprated to 1,463 Hp.

OPTION 3 - $1,334,282 per unit

Turbocharger
***HyperFuel*™ System**
Compressor Cylinder Upgrade
Power Cylinder Upgrade

1. Detailed Bid Description

HES agrees to provide the customer, Kinder Morgan, with all of the equipment, engineering, installation, and documentation necessary to perform engine and compressor optimization/emissions retrofits for the GMV-10TF at the Blanco New Mexico Compressor Station. This estimate includes the following parts and services but not limited to:

1.1 HES Scope of Work

This bid is provided as a fixed price "turn-key" bid, it includes the following parts and services:

1.1.1. All design and project engineering required for unit specific adaptation and installation of the following systems:
- 1.1.1.1. VFD Electric motor driven blower with Aftercooler
- 1.1.1.2. PCC Ignition System
- 1.1.1.3. *ePCC*™ System
- 1.1.1.4. *HyperFuel*™ System
- 1.1.1.5. Exhaust system
- 1.1.1.6. Dry exhaust manifold
- 1.1.1.7. Engine auxiliary cooling system

1.1.2. All manpower necessary to remove the replaced systems and install the new systems listed in section 1.1.1.

1.1.3. All commissioning and start up services.

1.1.4. All drawings necessary to document modifications and support the installation.

1.1.5. Training for maintenance and operations of the installed systems.

1.1.6. Disposal of removed/retired equipment and HES refuse.

1.2. HES Scope of Supply (On-engine)

HES will supply ALL of the components necessary to complete the installation of the systems listed in section 1.1 above. Following is a list of the primary components of the installed systems. It is not a comprehensive list and does not relieve HES of the obligation to supply unnamed but necessary components.

1.2.1. Electric Motor Driven Blower (Skid Mounted)
- 1.2.1.1. Inlet filter
- 1.2.1.2. Isolation valve
- 1.2.1.3. Check valve
- 1.2.1.4. Blow off silencer
- 1.2.1.5. Blow off valve
- 1.2.1.6. Coupling and guard
- 1.2.1.7. Expansion joint
- 1.2.1.8. Spool pieces
- 1.2.1.9. VFD motor
- 1.2.1.10. 6 stage blower
- 1.2.1.11. Structural base
- 1.2.1.12. Disconnect and/or motor starter

1.2.2. Aftercooler

1.2.2.1. Aftercooler heat exchanger core
1.2.2.2. Aftercooler inlet transitions
1.2.2.3. Aftercooler outlet transitions
1.2.2.4. New 3-way control valve and transitions for AMT control
1.2.2.5. Aftercooler flexible pipe joints
1.2.2.6. Aftercooler inlet automatic air bleeder valve
1.2.2.7. Aftercooler outlet automatic air bleeder valve
1.2.2.8. Aftercooler water inlet/outlet thermowell
1.2.2.9. Aftercooler water inlet/outlet temperature gauge
1.2.2.10. Aftercooler outlet pressure gauge
1.2.2.11. Fittings, flanges, bolts and gaskets for all piping
1.2.2.12. Cooling water inlet and outlet piping modifications

1.2.3. Ignition System (PCC)
1.2.3.1. One Cooper pre-chamber per cylinder or Eco-Jet System
1.2.3.2. One Modified Head (Not Eco-Jet System)
1.2.3.3. All bolts, Gaskets and washers to support installation (Not Eco-Jet System)
1.2.3.4. (For Eco-Jet) One Cooper EcoJet™ pre-chamber per cylinder
1.2.3.5. Coolant Pump (1.5HP, 3Φ, Explosion Proof)
1.2.3.6. Water filter
1.2.3.7. Spark plugs
1.2.3.8. Conduit, wiring, fittings and tubing

1.2.4. The *ePCC* System is a Class I, Division 2, Group D system and is installed according to those guidelines and it includes the following major components:
1.2.4.1. One *ePCC* Controller and HMI for each engine
1.2.4.2. One 110 VAC to 24 VDC power supply for each engine
1.2.4.3. One *ePCC* valve for each PCC
1.2.4.4. One fuel hose for each *ePCC*
1.2.4.5. All necessary tubing and fittings
1.2.4.6. All necessary conduit, wire and fittings

1.2.5. The *HyperFuel* Valve™ System is a Class I, Division 2, Group D system and is installed according to those guidelines and it includes the following major components:
1.2.5.1. One *HyperFuel Valve* for each cylinder
1.2.5.2. One *HyperFuel Valve* Control System for each engine
1.2.5.3. Fuel manifold
1.2.5.4. Excess flow safety valve
1.2.5.5. Pneumatically operated block and bleed valves
1.2.5.6. Unit level fuel filtration
1.2.5.7. Filter DP gauge
1.2.5.8. Unit level fuel pressure regulation
1.2.5.9. 110 Volt AC to 24 DC Volt power supply
1.2.5.10. Magnetic pickups
1.2.5.11. All necessary conduit, wire and fittings
1.2.5.12. All necessary tubing, hoses and fittings

1.2.6. Dry Exhaust Manifold
1.2.6.1. Segmented exhaust manifold

1.2.6.2. Water header
1.2.6.3. Transition outlet spool

1.3. HES Scope of Supply (Off-engine)

1.3.1. Exhaust system
1.3.1.1. Silencer/catalyst combination
1.3.1.2. Removable oxidation catalyst
1.3.1.3. Backfire relief valve
1.3.1.4. Insulation blankets
1.3.1.5. Tail pipe strakes
1.3.1.6. Exhaust pipes and transitions
1.3.1.7. Coating
1.3.2. Engine auxiliary cooling system
1.3.2.1. Air cooled heat exchanger
1.3.2.2. Expansion tank
1.3.2.3. 3 way control valve
1.3.2.4. Valves, pipes and fittings

1.4. Customer Scope of Supply

1.4.1. Unit Fuel Gas System to within 30' of engine (Conditioned and Heated)
1.4.1.1. Metered and Conditioned Fuel Gas to within 30 ft of unit. Provide 1" female NPT port ball valve for HES to connect. Pressure to be regulated to a minimum of 550 (psig)
1.4.1.2. The fuel gas measurement end devices for each unit will require an accuracy of ±1% with a flow rate update frequency of at least 1 Hertz.
1.4.1.3. Filtered to remove 99% of all particles and liquids greater than 1 micron.
1.4.1.4. HES recommends that the fuel gas be heated to a temperature above the highest ambient dew point (~100 °F) to prevent the formation of condensation on the fuel gas piping.
1.4.2. Fuel Gas Custody Transfer Metering and Reporting.
1.4.3. Supply all electrical requirements to station (MCC).
1.4.4. Engine operator to start, stop and operate the unit as necessary for testing and commissioning.
1.4.5. Environmental permitting.
1.4.6. Removal and disposal of Spectra Energy hazardous materials
1.4.6.1. Provide penetrations in transite siding and dispose of hazardous waste if required. At this point in the design phase HES does not expect to disturb any of the existing transite siding.
1.4.7. NDE testing and construction inspection as required.
1.4.8. Bring chromatograph from station to panel.
1.4.9. Supply necessary documentation to HES for engineering and automation changes.
1.4.10. Piping and Installation of the Exhaust system
1.4.11. Piping and Installation of the Aux Cooling system
1.4.12. Installation of pad for the Blower Package skid
1.4.13. Automation systems, hardware or programming required to support these upgrades

1.4.14. Customer will allow HES and it's subcontractors to use plant facilities for accumulation of parts.
1.4.15. The customer will make repairs to the unit or its support equipment if the equipment is not operating as designed.
1.4.15.1. Repair service may be requested of HES. Repairs will be quoted and billed on a time and material basis.
1.4.16. Supply Noise attenuation requirements.
1.4.17. Provide a chromatograph reading at the station.
1.4.18. Provide space for HES office trailers, restrooms, and connex buildings for the duration of the project.

2. Clarifications and Exceptions to HES Proposal

The following items have been identified as Exceptions to the project.

2.1.1. Time spent waiting by HES personnel or its sub-contractors due to delays caused by station problems or station non-preparedness are not included in the base proposal. Should such delays be encountered, HES shall be compensated in accordance with the attached rate sheets and schedule shall be extended by the length of the delay. Additional waiting time will be billed on a time and materials basis.
2.1.2. Price does not include any applicable sales, use, or other regulatory taxes. Such taxes will be calculated and billed at the time of HES invoicing.
2.1.3. Price does not include unit panel , unit panel programming or communication connects to the customer's Station PLC. This can be quoted separately upon request.

3. At Risk Items

The following items have been identified as marginally suitable (at risk) for the project. HES agrees to try and incorporate the existing items into the proposed upgrade to reduce the project cost. However, HES makes no guarantee as to the successful use of the identified items. If the at risk items prove unsuitable at the time of commissioning, the customer will be responsible for paying the cost of replacing the at risk item with components that are suitable for the application.

3.1. The following items are identified as "at risk" for this project:

3.1.1. No identified at risk items at this stage.

4. Minimum Unit Health and Performance Assumptions

4.1. Current Unit Condition

The following assumptions were made during preparation of this budgetary estimate. HES scope will have to be added to the project or the customer scope of supply will be amended if any of the assumptions are not valid.

4.1.1. Current unit hardware and configuration is meeting current emissions requirements.
4.1.2. Units have CPU-2000 or other flywheel referenced ignition system
4.1.3. Unit is in good health, with no mechanical defects.
4.1.4. The compressor building is rated Class I, Division 2, Group D.

4.1.5. Current unit valves and related limit switches are functioning properly.
4.1.6. Gas analysis with periodic updates

5. Compliance Statement and Exceptions to Bid Request

At the completion of this proposal HES has not identified exceptions to the Bid Request.

6. Proposed Installation Schedule

HOERBIGER will work with Kinder Morgan on an acceptable project schedule

7. Project Guarantees and General Warrantees

7.1. Performance Guarantees - TBD

HES guarantees that the addition of the equipment listed in section 1. Detail Bid Description will allow the unit to operate with the following brake specific emissions mass rates.

7.1.1. Emissions

NOx	Options given for 5 g/bhp-hr, 3 g/bhp-hr and < 1 g/bhp-hr
CO	Not to exceed baseline of 1.4 g/bhp-hr

7.2. Warranties

7.2.1. The standard manufacturer's warranties for all third party components are in place at the time of shipment.
7.2.2. The standard warranty for *ePCC* system (Valves and Controller) is 24 months, beginning at the start of commissioning.
7.2.3. The standard warranty for the *HyperFuel* Valve is 12 months, beginning at the start of commissioning.
7.2.4. The standard warranty for the *HyperFuel* Valve System Controller is 24 months, beginning at the start of commissioning.
7.2.5. Any exceptions to these warranties are noted on the cover page.

8. Payment and Invoicing Conditions

HES will invoice the customer directly for all work done in support of the project. HES contractors will invoice HES only, and will not submit invoices directly to the customer.

8.1. Project Invoicing

Invoicing will be agreed upon and detailed in the contract.

8.2. Cancellation

The Customer shall notify HES in writing at least twenty-four (24) hours in advance of termination. The Customer shall compensate HES for all documented costs if the Customer cancels the order. These costs include, but are not limited to, parts, engineering, shipping, down payments, restocking charges, labor and travel expenses.

8.3. Payment Terms

All HES invoices will be for the full amount owed. If the customer has a policy of retaining a percentage of contract price pending completion, the customer will be responsible for calculating the retainage. All retained monies are to be released within 30 days of final acceptance, not to exceed 60 days after completion of commissioning.

Retainages in excess of 10% are generally unacceptable to HES. Withholding in excess of 10% must be agreed to in writing at the time of contract execution.

8.3.1. All invoices are to be paid within 30 days from date of invoice.

9. Indemnification and Limits of Liability (Will be identified in contract)

10. Codes and Standards

All work shall be installed and tested in accordance with all applicable sections of the latest edition of the following codes and standards. Differences in company and code requirements could result in added charges:

NEC (NFPA 70)	National Electric Code
CFR Title 49, Part 192	Minimum Safety Standards for Gas Lines
ANSI 2223.1	National Fuel Gas Code
API 1104	Welding of Pipelines and Related Facilities
ANSI B31.8	Gas Transmission and Distribution Piping Systems
ANSI B31.3	Process Piping Systems
ANSI B16.5	Pipe Flanges and Flange Fittings
ASME Sections VIII & IX	Boiler and Pressure Vessel Code

OPERATOR QUALIFICATION
Appendix G
COVERED TASK ASSIGNMENTS - GAS
Revised 3/23/2017

Employee Name:	EE Number:	Date:
Supervisor's Name:	Region/Location:	
Date Discussed with Employee:	***Supervisor's Signature***	

Submit this form with assigned covered tasks checked in the *Yes* column to your Regional OQ Coordinator.

CT #	Covered Task Title	Yes
01.01.01	Abnormal Operating Conditions	☐
02.01.01	Gas Detection & Alarm System Maintenance & Performance Test	☐
02.02.01	Isolation of Compressor Units	☐
02.03.01	Compressor Station Inspection & Testing of Remote Control Shutdown Devices	☐
03.01.01	Operating Compressor Units: Remote	☐
03.01.02	Operating Compressor Units: Manual	☐
03.02.01	Shutting Down Compressor Units: Remote	☐
03.02.02	Shutting Down Compressor Units: Manual	☐
03.03.01	Starting Compressor Units: Remote	☐
03.03.02	Starting Compressor Units: Manual	☐
04.01.01	Measure Damage on Installed Pipe and Components	☐
04.01.02	Corrosion Monitoring – Atmospheric, External, and Internal: Offshore Pipelines	☐
04.01.03	Visual Inspection of Buried Pipe and Components When Exposed	☐
04.01.04	Visual Inspection of Internal Surface of Pipe	☐
04.01.05	Visual Inspection for External/Atmospheric Corrosion (effective 6/30/17)	☐
04.01.06	Insert and Remove Coupons/Probes for Internal Corrosion Monitoring	☐
04.01.07	Nondestructive Testing – Magnetic Particle Testing of Pipe	☐
04.02.01	Coating Maintenance /Application and Repair – Sprayed, Brushed, or Rolled	☐
04.02.02	Coating Maintenance/Repair – Wrapped	☐

CT #	Covered Task Title	Yes
05.01.01	Cathodic Protection System Maintenance: Rectifiers	☐
05.01.02	Cathodic Protection System Maintenance: Electrical Isolation	☐
05.01.03	Cathodic Protection System Maintenance: Anodes, Anode Ground Beds, & AC Voltage Mitigation (task name change)	☐
05.01.04	Inspect or Test Cathodic Protection Bonds (task name change)	☐
05.01.05	Cathodic Protection System Maintenance: Reverse Current Switches	☐
05.01.06	Cathodic Protection System Maintenance: Automatic Potential Controlled Protection Systems	☐
05.01.07	Cathodic Protection System Maintenance: AC Voltage Mitigation System	☐
05.01.08	Cathodic Protection: Read Rectifier (effective 5/1/17)	☐
05.02.01	Cathodic Protection Systems – Electrical Connections	☐
05.03.01	Cathodic Protection System Testing: Test Stations	☐
05.03.02	Cathodic Protection System Testing: Pipe to Soil	☐
06.01.01	Indirect Inspection: Close Interval Survey	☐
06.01.02	Indirect Inspection: Direct Current Voltage Gradient (DCVG) Survey	☐
06.01.03	Indirect Inspection: Voltage Gradient (ACVG) Survey	☐
06.01.04	Indirect Inspection: AC Current Attenuation (ACCA or PCM) Survey	☐
07.01.01	Locating, Installing & Protecting Customer Meters & Regulators: Residential & Small Commercial	☐
07.01.02	Locating, Installing & Protecting Customer Meters & Regulators: Large Commercial	☐
07.02.01	Customer Pressure Regulating, Limiting & Relief Device: Residential & Small Commercial	☐
07.02.02	Customer Pressure Regulating, Limiting & Relief Device: Large Commercial & Industrial	☐
08.01.01	Locating Pipelines	☐
08.02.01	Damage Prevention During Excavation Activities	☐
09.01.01	System Patrolling	☐
10.01.01	Plastic Pipe – Electrofusion: Couplings	☐
10.01.02	Plastic Pipe – Electrofusion: Sidewall	☐
10.02.01	Plastic Pipe – Butt Heat Fusion	☐
10.03.01	Plastic Pipe – Sidewall Heat Fusion	☐
10.04.01	Mechanical Joints: Stab Fittings	☐

CT #	Covered Task Title	Yes
10.04.02	Mechanical Joints: Compression Couplings 2” & Less	☐
10.04.03	Mechanical Joints: Compression Couplings Greater Than 2”	☐
10.05.01	Joining of Pipe - Flange Assembly	☐
10.05.02	Joining of Pipe/Tubing – Threaded Fittings	☐
10.07.01	Solvent Cement Joints	☐
11.01.01	Direct/Inspect In-service Pipeline Lowering	☐
11.02.01	Detect/Inhibit/Mitigate Pipeline Hydrate Formation in Pipeline	☐
12.01.01	Leakage Survey: Walking	☐
12.01.02	Leakage Survey: Mobile	☐
12.02.01	Outside Leakage Investigation, Pinpointing and Grading	☐
12.03.01	Inside Gas Leakage Investigation	☐
13.01.01	Leak & Strength Test – Service Lines, Mains & Transmission Lines: Gaseous: Test Pressures < = 100 psi	☐
13.01.02	Leak & Strength Test – Service Lines, Mains & Transmission Lines: Gaseous: Test Pressures $\geq$ 100 psi	☐
13.01.03	Leak & Strength Test – Service Lines, Mains & Transmission Lines: Hydrostatic Test	☐
13.01.04	Leak & Strength Test – Service Lines, Mains & Transmission Lines: Test at Operation Pressure	☐
14.01.01	Abandonment or Inactivation of Facilities	☐
14.02.01	Backfilling	☐
14.03.01	Installation of Steel Pipe – Field Bends	☐
14.04.01	Casing Vents and Seals	☐
14.05.01	Underground Clearances	☐
14.06.01	Installation of Plastic Pipe: Direct Burial	☐
14.06.02	Installation of Plastic Pipe: Boring	☐
14.06.03	Installation of Plastic Pipe: Plowing/Planting	☐
14.06.04	Installation of Plastic Pipe: Plowing/Pull-In	☐
14.06.05	Installation of Plastic Pipe: Above Ground	☐
14.06.06	Installation of Plastic Pipe: Insertion	☐
14.07.01	Installation of Steel Pipe: Direct Burial	☐
14.07.02	Installation of Steel Pipe: Boring	☐
14.07.03	Installation of Steel Pipe: Plowing/Pull-In	☐
14.07.04	Installation of Steel Pipe: Above Ground	☐

CT #	Covered Task Title	Yes
14.07.05	Installation of Steel Pipe: Insertion	☐
14.08.01	Cover – Service Lines, Mains & Transmission Lines	☐
14.08.02	Cover – Offshore Pipelines	☐
14.09.01	Inspection: Compliance with Procedures & Standards	☐
14.09.02	Inspection: Inspection of Materials	☐
14.10.01	Line Markers	☐
14.11.02	Pipeline Shutdown, Startup or Pressure Change: Stopple Fitting	☐
14.11.03	Pipeline Shutdown, Startup or Pressure Change: Operating Identified Valve(s)	☐
14.11.04	Pipeline Shutdown, Startup or Pressure Change: Method(s) Required for Other Pipe Materials	☐
14.11.05	Launching and Receiving Internal Devices	☐
14.12.01	Protection from Hazards	☐
14.13.01	Protection When Minimum Cover Not Met	☐
14.14.01	Purging: Large Volume, i.e. Segment of Main or Transmission Line, etc.	☐
14.14.02	Purging: Small Volume, i.e. Service Line, Short Pipeline Segments, Compressor, Component, etc.	☐
14.15.01	Uprating: Reinforce or Anchor Offsets, Bends and Dead Ends – Longitudinal Straps	☐
14.15.02	Uprating: Reinforce or Anchor Offsets, Bends and Dead Ends – Anchoring & Buttressing	☐
14.16.01	Installation of Steel Pipe – Repair of Imperfections or Damage: Grinding	☐
14.18.01	Support, Expansion Joint and Anchor Maintenance – Exposed Pipeline	☐
14.19.01	Tapping Steel and Plastic Pipe: Manual (Self-Tapping)	☐
14.19.02	Tapping Steel and Plastic Pipe: Mechanical Tapping Equipment	☐
14.20.01	DOT Inspection of Valves	☐
14.20.02	Repair Valves	☐
14.21.01	Segment Removal	☐
14.22.01	Leak Clamps & Sleeves: Bolt-On Type	☐
14.22.02	Leak Clamps & Sleeves: Composite Sleeve (Clock Spring)	☐
15.01.01	Odorization – Mains & Transmission Lines: Periodic Sampling	☐
15.01.02	Odorization – Mains & Transmission Lines: Odorizer Maintenance	☐
16.01.01	Gas Quality: Operate/Test/Maintain Carbon Dioxide (CO2) Analyzers	☐
16.01.02	Gas Quality: Maintain/Service Chromatographs	☐
16.01.03	Gas Quality: Operate/Test/Maintain Oxygen (O2) Analyzers	☐
16.01.04	Gas Quality: Operate/Test/Maintain Sulfur Analyzers	☐

CT #	Covered Task Title	Yes
16.01.05	Gas Quality: Operate/Test/Maintain Moisture Analyzers	☐
16.01.07	Gas Quality: Operate & Maintain Gas Samplers	☐
16.01.08	Gas Quality: Troubleshoot/Repair Chromatographs	☐
16.01.09	Gas Quality: Troubleshoot & Repair Sulfur Analyzers	☐
16.01.10	Gas Quality: Troubleshoot/Repair Moisture Analyzers	☐
16.01.11	Gas Quality: Troubleshoot/Repair Carbon Dioxide (CO2) Analyzers	☐
16.01.12	Gas Quality: Troubleshoot/Repair Oxygen (O2) Analyzers	☐
18.01.01	Overpressure Safety Devices – Inspect, Test, and Calibrate Relief Valves	☐
18.01.02	Pressure Limiting Devices – Inspect, Test and Calibrate	☐
18.02.01	Vault Maintenance	☐
20.01.01	Service Line Replacement	☐
20.01.02	Service Line Replacement: Underground Service Entrance (Prerequisite 20.01.01)	☐
20.03.01	Service Lines Not in Use and Service Discontinuance	☐
24.01.01	Welding Process	☐
24.02.01	Visual Inspection of Welds	☐
24.03.01	Nondestructive Testing of Welds	☐
24.04.01	Miter Joints	☐
25.01.01	Dehydration: Operate/Maintain Liquid Knock-out	☐
25.01.02	Dehydration: Maintain/Repair Gas Fired Dehydration System Controls	☐
25.01.03	Dehydration: Operate/Maintain Gas Dehydration System	☐
25.01.04	Dehydration: Start-up/Shutdown of Dehydration System	☐
25.01.05	Dehydration: Troubleshoot/Repair Gas Dehydration System	☐
25.01.06	Gas Treatment: Read/Verify/Maintain Operating Parameters for Gas Processing/Amine System	☐
25.01.07	Gas Treatment: Troubleshoot/Correct Gas Processing/Amine System	☐
25.01.08	Dehydration: Maintain/Repair Gas Fired Mole Sieve Dehydration System Controls	☐
25.01.09	Dehydration: Operate/Maintain Gas Fired Mole Sieve Dehydration System	☐
25.01.10	Dehydration: Start-up/Shutdown of Mole Sieve Dehydration System	☐
25.01.11	Dehydration: Troubleshoot/Repair Mole Sieve Dehydration System	☐
27.01.01	Gas Control	☐