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ENGINEERING EVALUATION / FACT SHEET

BACKGROUND INFORMATION

Application No.:	R13-2791
Plant ID No.:	059-00102
Applicant:	TransGas Development, LLC (TransGas)
Facility Name:	TransGas Coal to Gasoline Plant
Location:	Wharncliffe, Mingo County
SIC Code:	2999
Application Type:	Construction
Received Date:	December 9, 2008
Engineer Assigned:	Joe R. Kessler
Fee Amount:	$2000
Date Received:	December 9, 2008 (Initial Application) December 26, 2008 (First Significant Revision) June 17, 2009 (Second Significant Revision) October 5, 2009 (Final Version)
Complete Date:	October 5, 2009
Due Date:	April 3, 2010 (Pre-Revised 45CSR13 Submittal)
Applicant Ad Date:	January 2, 2009
Newspaper:	*The Williamson Daily News*
UTM's:	417.917 km Easting • 4,162.952 km Northing • Zone 17
Description:	Construction of an approximately 18,000 barrels (756,000 gallons) per day coal-to-gasoline plant. Facility will utilize methanol-to-gas (MtG) process.

On December 9, 2008, TransGas submitted a permit application to construct an approximately 18,000 barrels (756,000 gallons) per day coal-to-gasoline plant near Wharncliffe, Mingo County, WV. The application was re-submitted on December 26, 2008 to primarily address requirements for claiming information as Confidential Business Information (CBI). On June 17, 2009 the application was again significantly revised by addressing additional CBI issues and expanding the emissions calculation section. On October 5, 2009, 2009 the final version of the application, which included several minor revisions from the June 17 version, was submitted. The facility, as proposed, will gasify approximately 346 tons of coal per hour to produce 750 barrels (31,500 gallons) per hour of gasoline. The facility will make methanol as an intermediate product (but will not, as proposed sell methanol) and use the methanol-to-gas (MtG) process to produce gasoline. The facility will control potential emissions from the process by both removing pollutants from the synthesis gas (syngas) prior to release and recycling process off-gases during steady-state operation.

The potential emissions of the facility for Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), Particulate Matter less than 10 microns (PM_{10}), Particulate Matter (PM), Sulfur Dioxide (SO_2), and Volatile Organic Compounds (VOCs) are below the applicability thresholds that would define the proposed facility as "major" under the Prevention of Significant Deterioration (PSD) program administered in WV under 45CSR14. Therefore, the permit application was reviewed as a construction of a synthetic minor source under WV's minor source permitting rule - 45CSR13.

This document will outline the West Virginia Division of Air Quality's (DAQ) preliminary determination that the construction of the TransGas facility will meet the emission limitations and conditions set forth in the draft permit and will comply with all currently applicable state and federal air quality rules and standards.

PUBLIC REVIEW PROCEDURES

Public review procedures for a new minor source construction application reviewed under 45CSR13 require action items at the time of application submission and at the time an engineering evaluation and draft permit are finalized by the DAQ. The following section details compliance with the statutory and accepted procedures for public notification and public review with respect to permit application R13-2791 as required under 45CSR13.

Submission of Confidential Business Information (CBI)

TransGas claimed various data submitted as part of the permit application as CBI. To comply with the requirements of submitting CBI, TransGas submitted a redacted copy (and subsequently revised such as needed) of the application that does not reveal any of the data claimed CBI. This redacted version of the permit application is the version made available to the public for review (pages with redacted information are appropriately labeled and the information redacted is indicated as a blacked out area). Additionally, the applicant is required to submit a CBI cover sheet that provides information concerning the submission of CBI. This cover letter is included in the TransGas application under Attachment Q. The review of information submitted as CBI (including the appropriateness of the claims) is done pursuant to the requirements outlined under 45CSR31 and 45CSR31B (see relevant section REGULATORY APPLICABILITY Section below).

Actions Taken at Application Submission

Pursuant to §45-13-8.3a, TransGas, on January 2, 2009 placed a Class I legal advertisement in *The Williamson Daily News* announcing the submission of a permit application to the DAQ for the proposed facility and listing the then as-calculated potential-to-emit of each criteria pollutant. At the time of application submission, a redacted copy of the permit application was made available at the DAQ Main Office in Charleston for public review (and subsequently updated to reflect revisions to the application). An electronic version of the redacted copy of the permit application was made available for transfer via e-mail upon request.

Actions Taken During Application Review Period

During the period of application review, the DAQ maintained an updated copy of the redacted permit application and a copy of the official file for review at the Main Office in Charleston. The DAQ also made available an electronic copy of each updated and revised iteration of the redacted permit application upon request. Generally, while an application is under review, the DAQ will not formally respond to technical comments received by the public. While the comments are taken into consideration and acted upon if appropriate, prior to the completion of a draft permit and an engineering evaluation, the DAQ generally withholds formal responses to commenters.

Actions To Be Taken at Completion of a Draft Permit and Engineering Evaluation

Pursuant to §45-13-8.5, upon the completion of a draft permit and engineering evaluation, the DAQ will place a Class 1 legal advertisement in *The Williamson Daily News* stating the preliminary determination regarding R13-2791. Further, TransGas will be required to, within a week of the DAQ public notice, place a "commercial display" advertisement in *The Williamson Daily News* and place a sign at the entrance to the site of the proposed source stating that they have applied for a permit with the DAQ. The placement of the advertisement by the DAQ will begin a 30 day comment period during which the DAQ will accept and answer all relevant comments received concerning the proposed facility.

At this time, a copy of the draft permit and engineering evaluation shall be forwarded to EPA Region III. Copies of the application, complete file, preliminary determination and draft permit shall be available for public review during the public comment period at the DAQ Main Office in Charleston. An electronic copy of the draft permit and engineering evaluation will be made available on the DAQ website.

Acceptance of Public Comments

Comments will be accepted at any time during the review process. However, relevant and substantive technical comments shall generally only be answered (if applicable) during the 30 day public comment period after the DAQ places an advertisement stating the preliminary determination regarding R13-2791.

DESCRIPTION OF PROCESS

Basic Description of Coal-to-Gasoline Plants Using Methanol-to-Gas (MTG) Process

Coal is converted to gasoline through three main manufacturing steps - gasification of the coal to produce a synthesis gas (syngas), production of methanol from the syngas, and finally, converting the methanol to gasoline. Many other steps are involved to facilitate these primary processes and to clean impurities from the gas stream.

Gasification is a manufacturing process that converts carbon-containing materials, such as coal, to a synthesis gas consisting primarily of Hydrogen (H_2), Carbon Monoxide (CO), and various

impurities. These impurities may then be removed prior to combustion or further processing. Gasification is accomplished by partial oxidation of the coal and not by the more familiar complete oxidation (standard combustion) of coal that produces large amounts of criteria pollutants in the exhaust.

In the Methanol Plant, cleaned and shifted syngas - now consisting of a larger amount of H_2, less CO, and more CO_2 - is reacted across a catalyst to produce methanol (CH_3OH). The methanol is both a product and an raw material in many gasification plants. In a coal-to-gasoline facility, methanol is the raw material for the production of gasoline.

The methanol is then sent to the MTG Plant where it is reacted in presence of catalysts in a two step process to produce gasoline. In the first step, methanol is converted to an equilibrium mixture of methanol, dimethyl ether and water. In the second part, the equilibrium mixture is mixed with recycle gas and passed over a shape-selective catalyst to form hydrocarbons and water. The hydrocarbon mixture is further distilled into the two products: Liquid Petroleum Gas (LPG or Propane) and Gasoline.

Process Description of Proposed TransGas Coal-to-Gasoline Plant

The general layout of the TransGas plant is similar to that as described above. A detailed one-sheet block flow diagram of the facility (from the gasifier feeds to the MtG Plant) is supplied as Attachment A. The following will give an overview of the specific design of the proposed facility.

Material Handling

Using a paved haulroad, coal will be brought into the facility by truck and delivered to one of two partially enclosed dump bins (B1 and B2). A belt conveyer (BC1) will deliver the coal into a fully enclosed crusher (CR1) where it will be crushed to a size less than 1.5 inches. From the crusher, the coal will be belted (BC2, BC3, and BC4) to a building that fully encloses the coal storage pile (OS1). Exhaust from the coal storage building will be controlled by four baghouses (BHCS1 - BHCS4). From an underground reclaim conveyer (BC5), the coal will be transferred to the coal bunkers inside the plant. The maximum amount of coal handled by the processing equipment shall be 346 tons per hour (TPH) and 3,030,960 tons per year (TPY). The storage pile has maximum capacity of about 40,000 tons.

Limestone will be hauled to the facility by truck over a paved haulroad and direct dumped into an enclosed storage pile (OS2). Exhaust from the limestone storage building will be controlled by two baghouses (BHCL1, BHCL2). The material will reclaimed by an underground conveyer (BC11) and transferred to a fully enclosed crusher (CR7) where the limestone will be sized to less than 1.5 inches. From the crusher, the limestone is belted to the limestone bunkers inside the plant. The maximum amount of limestone handled by the processing equipment shall be 100 tons per hour (TPH) and 166,440 tons per year (TPY). The storage pile has maximum capacity of about 20,000 tons.

The gasification process shall produce, as waste products, ash, filter cake (accumulated fines collected in baghouses), and slag. Ash and slag are belted (BC7) from the plant to a fully enclosed

storage pile (SSP). From the pile, the waste material is reclaimed by an underground conveyer (BC8) and another conveyer (BC9) to a partially enclosed dump bin (SB) where the material is loaded on trucks for transport over a paved haulroad out of the facility. Filter cake is belted (BC10) directly from the plant into a silo (FCS1) where it is then loaded into trucks for transport over a paved haulroad out of the facility. The maximum amount of ash/slag handled by the processing equipment shall be 100 tons per hour (TPH) and 604,440 tons per year (TPY). The ash/slag storage pile has maximum capacity of about 200,000 tons. The maximum amount of filter cake handled by the processing equipment shall be 100 tons per hour (TPH) and 61,320 tons per year (TPY).

Gasification and Gas Cleanup (Steady-State)

Coal is transferred from the Coal Feed Bunkers (FH1, FH3, FH5, FH7, and FH9) into the Rolling Mills and Heaters (CR2 through CR6). Particulate matter emitted with displaced air from the coal feed bunkers is controlled by fabric filters (VF1, VF3, VF5, VF7, and VF9). In the Rolling Mills and Heaters coal is ground into a fine powder and dried. Dryers use natural gas on startup and then switch over to pure hydrogen when the steady-state operation of the facility begins. Offgases and any particulate entrained in the gases are controlled by baghouses (BH1 through BH5) and emitted (emission points A1/1 through A1/5). The mills can process an aggregate maximum of 346 TPH of coal. A maximum of four mills operate at any one time.

After preparation, the coal is transferred into the Lock Hoppers (LH1 through LH12) where it is placed under pressure with an inert gas (usually N_2 or CO_2). Displaced gas from the Lock Hoppers is controlled by baghouses (BH6 through BH18) prior to venting into the atmosphere (emission points B1/1 and B1/2). The Lock Hoppers feed two gasifier trains.

Limestone will be injected into the gasifiers from the Limestone Feed Bunkers (FH2, FH4, FH6, FH8, and FH10) to control the ash melting point and the viscosity of the slag so as to protect the membrane wall of the gasifier. Particulate matter emitted with displaced air from the Limestone Feed Bunkers is controlled by fabric filters (VF2, VF4, VF6, VF8, and VF10).

TransGas is proposing to feed the finely ground coal into two parallel gasification trains. The gasifiers will use a proprietary gasification method called "PRENFLO^{TM} with Direct Quench" (PDQ). This technology was developed by UHDE - an international plant construction and engineering company. In the PDQ gasifiers, the coal is partially oxidized with O_2 supplied from the air separation unit. Slag generated in the gasifiers flows down the cooled wall of the gasifiers and falls through the quench zone into the slag pool. From there it is discharged vial the slag removal.

Raw syngas and fly ash is quenched by a free down-flow water film and additionally cooled and saturated by water spray nozzles. The remaining fly ash is removed from the gas by scrubbing. The cleaned syngas is then routed to the CO-Shift.

The raw syngas coming from the gasifiers consists mainly of hydrogen (H_2) and carbon monoxide (CO). As the amount of hydrogen is too low to satisfy the required H_2/CO ratio for the Methanol Plant, additional hydrogen has to be produced by a CO-shift process. This is achieved by converting catalytically the CO with water into hydrogen and carbon dioxide (CO_2).

Waste condensate from the CO-shift Unit is sent to the Sour Water Stripper (SWS) for removal of H_2S, CO_2, NH_3, and HCN. This removal is accomplished by stripping with water vapor in a stripper column equipped with packings. The stripped water is reused and sent bask to the scrubbers and the contaminated process stream is sent to the Sulfur Recovery Unit (SRU).

After the CO-shift, the syngas is moved to the Acid Gas and Mercury Removal Unit (AGR and MA). In this unit, Mercury, CO_2, hydrogen cyanide, and total reduced sulfur compounds (primarily H_2S and COS) are removed from the syngas stream. The unit utilizes a Rectisol wash system to effect this gas cleaning. The Rectisol Wash is a physical wash system with methanol as preferable solvent. It consists of a methanol wash section, recycle gas compression, CO_2 product recovery section, hot regeneration section and the methanol/water separation.

Downstream of the Rectisol area, which removes the major part of mercury from the syngas, is the Mercury Adsorber. This vessel is equipped with a bed of impregnated activated carbon which is specifically designed for mercury adsorption and is effective in removing the remaining mercury.

After the Acid Gas and Mercury Removal Unit, the syngas is considered "clean" and contains less than 1 ppm_v of sulfur compounds. The waste gases from the unit are sent to the Sulfur Recovery Unit (SRU) and the CO_2 Purification Unit (COP). The SRU processes acid gases from the AGR and SWS. It decomposes the hydrogen cyanide and ammonia into less dangerous components and converts the sulfur containing compounds into elemental sulfur. The produced liquid sulfur is collected, degasssed, and solidified. The CO_2 removed from the AGR is sent to the COP where it is purified for use as an inert pressurizing gas elsewhere in the plant. Offgases from the COP are emitted (emission point C1).

Gasification and Gas Cleanup (Startup)

Prior to the steady-state operation of the plant, when all systems are online and the integrated plant is fully functional, the facility is brought on-line when each part of plant is properly pressurized and ready to process material or waste matter. During the period of time when the plant is going from shutdown to steady-state operation (or during a process of purging raw syngas during shutdown), several emission sources/points are in use that are not during steady-state operation.

During cold startup of the plant, the 81.84 mmBtu/Hr natural-gas fired Startup Steam Boiler (F) is used to provide steam and heat for various processes. It operates a maximum of 384 hours per year and emits from emission point F.

Prior to the gas cleanup operation of the plant coming on-line, raw syngas from each of the gasifiers is flared when each gasifier is started up (Emission Points B2/1 and B2/2). Also, during planned shutdowns, an amount of raw syngas is purged from the gasifiers and is sent to the flare. The gasifiers are limited to flaring an aggregate of 100,000 m^3/year of raw syngas during periods of startup and shutdown. Waste gas is also flared from the AGR during startup and shutdown (Emission Point C2). The AGR is limited to flaring 1,726,414 m^3/year of uncleaned syngas. Note that there is only one flare at the facility, and it is given a different emission point identification number based on the source of gas it is flaring.

Methanol and Methanol-to-Gasoline Plant

Cleaned syngas is sent from the AGR and MA to the Methanol Plant (MP). In this plant, the syngas, along with recovered H_2, is converted to methanol via a catalyst. Methanol is then sent to the Methanol-to-Gasoline (MtG) Plant where it is converted into hydrocarbons (primarily gasoline) and water in fixed bed catalytic reactors. The reaction is exothermic with the reaction heat managed by splitting the conversion into two parts. In the first part, methanol is converted to an equilibrium mixture of methanol, dimethyl ether, and water. In the second part, the equilibrium mixture is mixed with recycled gas and passed over a shape-selective catalyst to form hydrocarbons and water. The hydrocarbon mixture is further distilled into two products: Liquid Petroleum Gas (LPG or Propane) and Gasoline. The Gasoline contains both light and heavy streams. To get the final desired product, the heavy gas is treated and mixed with the light gasoline to create the final mixture.

During the conversion reaction on the MtG reactors, coke forms on the catalyst and reduces its efficacy. Therefore, periodically during steady-state operation, the catalyst in the MtG Plant needs to be regenerated. The regeneration procedure is established in several steps including purging, pressurization, depressurization, evacuation, sweep and a controlled coke burn on the catalyst. This work is done by the 120 mmBtu/hr Startup/Regeneration Heater (SURGH) and the 30 mmBtu/hr Startup/Reactivation Heater (SURG). The heaters are fired on cleaned syngas during steady-state operation and emitted from emission points E1 and E2, respectively (if cleaned syngas is not available, MtG regeneration offgas may be used). A heater is also used in the heavy gasoline treatment step. This heater is the 4 mmBtu/hr HGT Reactor Charge Heater (RCH) which exhausts from emission point E3. During the regeneration process, CO contaminated offgases are recirculated back to the CO_2 Purification Unit.

During steady-state times of plant operation, tail gas from the MtG Plant is recycled to the front end of the plant. However, during those times when the MtG Plant is in operation (using methanol from storage tanks) and the front end of the plant is down, MtG tail gas is flared (emission point E5).

Miscellaneous Sources

The facility also contains several emissions-generating ancillary and support operations. These are the cooling tower, storage tanks, and product loading racks. The cooling tower (CT) allows for process water to be cooled and reentered into the process. It has a maximum water circulation rate of 308,167 gallons per minute and has the potential to emit fugitive particulate matter as dissolved in the water vapor drift. The Cooling Tower will utilize drift eliminators to reduce the amount of particulate-entrained water vapor to escape from the unit.

The proposed facility will include seven storage tanks: three 2,000,000 gallons gasoline storage tanks (TK1, TK2, and TK3), two 400 ton LPG tanks (TK4 and TK5)), one 2,000,000 gallons methanol storage tank (TK6), and one 70,000 gallon liquid sulfur storage tank (TK7). The gasoline tanks are used to store product for distribution through the loading racks into trucks for delivery. The LPG tanks are also product tanks, and are pressurized. The methanol tank is a surge tank used to store excess produced methanol when the MtG plant is not in operation or incapable of accepting all methanol produced. It will also be used to supply methanol to the MtG when the front half of the plant is down. The gasoline tanks and the methanol tank has the potential to emit VOCs during tank filling (working losses) and during natural leakage (breathing losses).

Gasoline shall be loaded into tank trucks through two sets of loading racks with an aggregate loading capacity of 31,500 gallons/day. TransGas has proposed to a vapor collection and processing system that is compliant with the 40 CFR 63, Subpart R which will limit VOC emissions to 8.33 x 10^{-5} lb-VOC/gal gasoline loaded.

SITE INSPECTION

On April 8, 2009 the writer conducted an inspection of the proposed site of the TransGas facility. Also present at the proposed site during the inspection were Patrick Ward of Potesta and Associates, Aaron Daley of TransGas, Mike Whitt of the Mingo County Redevelopment Authority, Randy Harris of the Mingo County Redevelopment Authority, and a representative of Cobra Run Natural Resources.

The proposed location of the TransGas facility is upon approximately 63 acres of reclaimed land of a Cobra Run Natural Resources (CRNR) surface mine (Premium). According to the CRNR representative, the surface mine is currently active in other areas of the site and will continue to be for approximately another four years. The proposed site is in a remote location within the boundary of the surface mine, and from the site no populated areas were visible. The CRNR representative estimated that the nearest residential areas were greater than two miles away. Mike Whitt noted, however, that the proposed route of the King Coal Highway would pass within about one-half of a mile of the site selected for the TransGas facility.

It is the view of the writer that the site selected for the proposed facility is positive in the respect that the location is remote and not likely to have any site or audible impacts on local communities. Further, the remoteness of the site would tend to mitigate any potential odor, particulate fallout, or nuisance issues related to fenceline air pollution effects. With the completion of the King Coal Highway, it would be reasonable to expect that most coal delivered to the facility would come via the new route and would help to mitigate any increase of coal trucks passing through local communities.

Directions to the site: From the WV State Route 44 and U.S Highway 52 intersection, travel on 52S for approximately 7.3 miles until turning right on Gilbert Creek Road (County Road 13) and proceeding for approximately 1.9 miles. When reaching Right Fork Bens Creek Road (County Route 10), turn right and go approximately 1.1 miles until the entrance of the Cobra Run Natural Resources Premium Surface Mine is reached on the right. The proposed facility will be located approximately a mile up the hill inside CRNR property.

EMISSIONS CALCULATION METHODOLOGIES

The following section will summarize the general emission calculation methodologies used by TransGas to calculate the potential-to-emit of the proposed facility and provides a review of the methodolgy. For a detailed description of the methods used and to review the TransGas calculations, see Attachment N of the revised permit application submitted on June 17, 2009.

The facility-wide emission limits by emission point are given in Attachment B. The emission points are grouped according to the same division of the facility as used in the Process Description above and used below. Refer to the Attachment B for an inventory of emission points in each grouping and for specific emission rates.

Material Handling Operations

Emissions from material handling operations (conveyer transfer points, coal and limestone crushing, haulroad traffic, storage piles, etc.) were mostly calculated using the appropriate sections of AP-42 (AP-42 is a database of emission factors maintained by USEPA) or well known emission factors obtained from the Air Pollution Engineering Manual. Variables within the emission factor equations, including applicable particulate matter control devices, were based on guidance provided by DAQ or on reasonable values of anticipated inherent material properties. Maximum hourly and annual emission rates were based on the maximum hourly design and limited annual throughputs of the specific equipment, as applicable.

The following table details the source of the particulate matter emission factors for each material handling source.

Table 1: Material Handling PM Emission Factor Sources

Emission Source	Emission Factor(s)	Emission Factor Source	Comments
Coal Transfer Points	0.0010 lb-PM/ton-coal 0.0005 lb-PM_{10}/ton-coal	AP-42, Section 13.2.4 (11/06)	Emission factor calculation includes material moisture content (5.0%) and average wind speed (7 mph).
Limestone Transfer Points	0.0097 lb-PM/ton-limestone 0.0046 lb-PM_{10}/ton-limestone	AP-42, Section 13.2.4 (11/06)	Emission factor calculation includes material moisture content (1.0%) and average wind speed (7 mph).
Ash/Filter Cake Transfer Points	0.0097 lb-PM/ton-limestone 0.0046 lb-PM_{10}/ton-limestone	AP-42, Section 13.2.4 (11/06)	Emission factor calculation includes material moisture content (1.0%) and average wind speed (7 mph).
Coal Crushing	0.0600 lb-PM/ton-crushed 0.0286 lb-PM_{10}/ton-crushed	WV G-10C General Permit Guidance	G-10C Guidance based on emission factor given in Air Pollution Engineering Manual © 1992 pp. 793 & References. Based on Secondary Crushing Factor
Limestone Crushing	0.0054 lb-PM/ton-crushed 0.0024 lb-PM_{10}/ton-crushed	AP-42, Table 11.19.2-2 (8/04)	Based on Tertiary Crushing Factor
Coal Stockpile Erosion	5 mg-PM/m^3 5 mg-PM_{10}/m^3	Guaranteed Baghouse Stack Concentration	Stockpile located in building and controlled by four baghouses.
Limestone Stockpile Erosion	5 mg-PM/m^3 5 mg-PM_{10}/m^3	Guaranteed Baghouse Stack Concentration	Stockpile located in building and controlled by two baghouses.
Paved Haulroads	8.77 lb-PM/VMT 1.71 lb-PM_{10}/VMT	AP-42 Section 13.2.1 (11/06)	Based on average truck weights (40 tons), surface material silt content (8 g/m^2), and number of precipitation days (157).

Unless otherwise noted in the above table, the above emission factors represent uncontrolled emissions. For calculating controlled emissions, TransGas applied, where applicable, control efficiencies to the uncontrolled emissions. The control efficiencies were generally taken from General Permit Reference Documents (list of efficiencies can be found in various general permits

including Coal General Permit G10-C Reference Document pp. 11; Material Handling General Permit pp. 13).

Gasification and Gas Cleanup

From the gasification and gas cleanup phases of production, steady-state emissions are produced from the Roller Mill and Heaters, Lock Hoppers, Feed Dust Bunkers, and from the offgas of the CO_2 Purification system. Startup emissions are produced from the Roller Mill and Heaters and the Startup Vessels. Startup and shutdown emissions are produced from the flaring of raw syngas exhausted from the gasifier and AGR. For units with only emissions during startup, annual emissions were calculated based on the estimated maximum number of startups per year, the duration of each event, and the total amount of gas to be flared. Where units emit during both steady-state and startup/shutdown operations, annual emissions were based on the aggregate of steady-state operating hours and start-up hours.

Some general notes on potential emissions from the Gasification and Gas Cleanup stage of the process:

- During steady-state operation of the plant, all syngas is used, processed, or recycled and not flared.
- The PSA tail gas is recirculated inside the facility and is no direct source of emissions.
- Sulfur containing offgases from the SRU are recirculated back to the AGR and are not flared.
- Different Emission Point Identification Numbers are assigned to the flare depending on the source of the flared gas. There is, however, only one flare proposed for the facility.

Roller Mill and Heaters

. In the Rolling Mills and Heaters coal is ground into a fine powder and dried. Dryers use natural gas on startup and then switch over to pure hydrogen when the steady-state operation of the facility begins. Offgases and any particulate entrained in the gases are controlled by baghouses (BH1 through BH5) and emitted (emission points A1/1 through A1/5). The mills can process an aggregate maximum of 346 TPH of coal. A maximum of four mills operate at any one time.

Particulate matter emissions from these units were based on a maximum particulate loading of the baghouses (all particulate matter is considered PM_{10} or less) of 5 mg-PM/m^3 (0.0022 grains/dscf) exhaust. Emissions of NO_x were based on stack gas concentration of 100 ppm_v when combusting natural gas or pure hydrogen. TransGas stated this is an "industrial standard" and indicated that it was provided as a guarantee by the vendor. SO_2 emissions (during startup) were based on a maximum hydrogen sulfide natural gas concentration of 20 ppm_v. No SO_2 emissions are given for steady-state operations as the pure hydrogen will have undetectable levels of sulfur compounds. VOC and CO emissions are based mass emission factors (3.5 mg-VOC/kg-coal and 7.1 mg-CO/kg-coal) and include volatilization of these pollutants from the coal being dried. These factors are based on "tests that Uhde has performed for other coal."

Start-Up Vessels

Emissions from the Start-Up Vessels (emission points A2/1 and A2/2) occur only during gasifier startups. Particulate matter emissions from these units were based on a maximum particulate loading of the baghouses (all particulate matter is considered PM_{10} or less) of 5 mg-PM/m^3 (0.0022 grains/dscf) exhaust. CO and SO_2 are based on the residual CO and SO_2 concentrations (1 and 10 ppm_v, respectively) in the CO_2 stream that is used as an inert gas in the units.

Lock Hoppers and Feed Dust Bunkers

After preparation, the coal is transferred into the Lock Hoppers and Feed Dust Bunkers where it is placed under pressure with an inert gas (usually N_2 or CO_2). Displaced gas from the lock hoppers is controlled by baghouses (BH6 through BH18) prior to venting into the atmosphere (emission points B1/1 and B1/2).

Emissions from the Lock Hoppers and Feed Dust Bunkers (emission points B1/1 and B1/2) occur only during gasifier startups. Particulate matter emissions from these units were based on a maximum particulate loading of the baghouses (all particulate matter is considered PM_{10} or less) of 5 mg-PM/m^3 (0.0022 grains/dscf) exhaust. CO and SO_2 are based on the residual CO and SO_2 concentrations (1 and 10 ppm_v, respectively) in the CO_2 stream that is used as an inert gas in the units.

Flared Gasifier and AGR Start-Up Emissions

Prior to the gas cleanup operation of the plant coming on-line, raw syngas from each of the gasifiers is flared when each gasifier is started up (Emission Points B2/1 and B2/2). Also, during planned shutdowns, an amount of raw syngas is purged from the gasifiers and is sent to the flare. The gasifiers are limited to flaring an aggregate of 100,000 m^3/year of raw syngas during periods of startup and shutdown. Waste gas is also flared from the AGR during startup and shutdown (Emission Point C2). The AGR is limited to flaring 1,726,414 m^3/year of uncleaned syngas. Note that there is only one flare at the facility, and it is given a different emission point identification number based on the source of gas it is flaring.

SO_2 emissions from the raw tail gas flaring from the gasifiers is based on conversion of all H_2S into SO_2 when flaring. H_2S concentration in the tail gas is given at a maximum of 0.17% during use of 0.5% Sulfur coal. NO_x emission rates are based on information from the vendor that give pollutant concentration in the flare offgas (250 ppm_v). CO emissions were based on the CO content of the gas (60%) and a CO destruction rate in the flare of 99.5%. VOC emissions were based on the methane content of the gas sent to the flare. There are no particulate matter emissions estimated from the flare as it is a smokeless design.

SO_2 emissions from the raw tail gas flaring from the AGR are based on an estimate of 100 ppm_v sulfur in the raw syngas. CO and NO_x emission rates are based on information from the vendor that give pollutant concentration in the flare offgas (1000 ppm_v and 250 ppm_v, respectively). VOC emissions were based on the methane content of the gas sent to the flare. There are no particulate matter emissions estimated from the flare as it is a smokeless design.

CO_2 Purification System

Offgases from the CO_2 Purification System contain small residual amounts of CO and SO_2. The residual CO comes from both AGR offgas and the regeneration offgas from the MtG Plant. The CO emissions are based on the residual CO content of the gases being removed to less than 1 ppm_v by the purification step. The SO_2 is considered passed through the CO_2 Purification System at a rate of 10 ppm_v.

Methanol and Methanol-to-Gasoline Plant

From the Methanol and MtG phases of production, steady-state (but discontinuous) emissions are produced from the process heaters in the MtG Plant and the flaring of MtG tail gas. Startup emissions are produced from the process heaters in the MtG Plant. For units with only emissions during startup, annual emissions were calculated based on the estimated maximum number of startups per year (and the duration of each event). Where units emitted during both steady-state and startup operations, annual emissions were based on the aggregate of steady-state operating hours and start-up hours.

Process Heaters

During the conversion reaction on the MtG reactors, coke forms on the catalyst and reduces its efficacy. Therefore, periodically during steady-state operation, the catalyst in the MtG Plant needs to be regenerated. The regeneration procedure is established in several steps including purging, pressurization, depressurization, evacuation, sweep and a controlled coke burn on the catalyst. This work is done by the 120 mmBtu/hr Startup/Regeneration Heater (SURGH) and the 30 mmBtu/hr Startup/Reactivation Heater (SURG). The heaters are fired on cleaned syngas during steady-state operation and emitted from emission points E1 and E2, respectively (if cleaned syngas is not available, MtG regeneration offgas may be used). A heater is also used in the heavy gasoline treatment step. This heater is the 4 mmBtu/hr HGT Reactor Charge Heater (RCH) which exhausts from emission point E3. During the regeneration process, CO contaminated offgases are recirculated back to the CO_2 Purification Unit.

Emissions of CO and NO_x from the heaters were based on a stack gas concentration of 120 ppm_v and 100 ppm_v, respectively. TransGas stated each emission rate is an "industrial standard" and indicated that it was provided as a guarantee by the vendor. Particulate Matter emissions are based on an emission factor (7.6 lb-Total PM/10^6 standard cubic feet of natural gas combusted) obtained from Table 1.4-2 of AP-42. VOC emissions are also based on an emission factor (5.5 lb-VOC/10^6 standard cubic feet of natural gas combusted) obtained from Table 1.4-2 of AP-42. No SO_2 emissions are expected from the process heaters as they will fired with sulfur free syngas or regeneration offgas.

Flared MtG Tail Gas

During steady-state times of plant operation, tail gas from the MtG Plant is recycled to the front end of the plant. However, during those times when the MtG Plant is in operation (using methanol from storage tanks) and the front end of the plant is down, MtG tail gas is flared (emission point E5).

CO and NO_x emission rates are based on information from the vendor that give pollutant concentration in the flare exhaust (1000 ppm_v and 250 ppm_v, respectively). VOC emissions are based on an emission factor obtained from Table 13.5-1 of AP-42. No SO_2 emissions are expected from flaring the tail gas as there is no sulfur expected in the MtG tail gas. There are no particulate matter emissions estimated from the flare as it is a smokeless design.

Equipment Leaks

TransGas based their equipment leaks calculations on EPA guidance. Specifically they obtained emission factors and control methodology effectiveness from the document EPA-453/R-95-017. Emission factors were taken from Table 2-1 and control methodology effectiveness from Table 5-1 and 5-2.

Miscellaneous Emission Sources

Storage Tanks

TransGas calculated the potential emissions associated with the gasoline and methanol storage tanks using the TANKS 4.09d program as provided under AP-42, Section 7. Input and summary sheets were included in the permit application.

Cooling Tower

The potential particulate matter emissions from the cooling tower were calculated using a mass balance equation provided in AP-42 Section 13.4 (1/95). The variables in the equation are the maximum circulating water rate of the cooling tower, the estimated maximum total dissolved solids (TDS) in the cooling water, and the estimated maximum drift rate of the plume. A maximum drift percentage of 0.001% was estimated by TransGas in the calculation.

Gasoline Loading Racks

Gasoline shall be loaded into tank trucks through two sets of loading racks with an aggregate loading capacity of 31,500 gallons/day. Uncontrolled VOC emissions from the gasoline loading racks were based on calculations and factors obtained from AP-42, Section 5.2. Controlled emissions were then based on a collection efficiency of 99.2% (which the AP-42 states is appropriate for racks subject to a "MACT-level" annual leak test). Of the collected emissions, TransGas applied a control efficiency of 99.0%. They did not specify what this control would be.

Start-Up Steam Boiler

During cold startup of the plant, the 81.84 mmBtu/Hr natural-gas fired Startup Steam Boiler (F) is used to provide steam and heat for various processes. It operates a maximum of 384 hours per year and emits from emission point F. Emissions of CO and NO_x were based on stack gas concentration of 120 ppm_v and 100 ppm_v, respectively. TransGas stated each emission rate is an "industrial standard" and indicated that it was provided as a guarantee by the vendor. Particulate Matter emissions are based on an emission factor (7.6 lb-Total PM/10^6 standard cubic feet of natural gas combusted) obtained from Table 1.4-2 of AP-42. VOC emissions are also based on an emission factor (5.5 lb-VOC/10^6 standard cubic feet of natural gas combusted) obtained from Table 1.4-2 of

AP-42. SO_2 emissions were based on a maximum hydrogen sulfide natural gas concentration of 20 ppm_v.

Flare Pilot Light

TransGas included an estimate of emissions from the natural gas combustion of the flare pilot light. CO emissions were based on a CO conversion rate of the flare 99.5%. Emissions of NO_x were based on a stack gas concentration of 250 ppm_v. Particulate Matter emissions are based on an emission factor (7.6 lb-Total PM/10^6 standard cubic feet of natural gas combusted) obtained from Table 1.4-2 of AP-42. VOC emissions are also based on an emission factor (5.5 lb-VOC/10^6 standard cubic feet of natural gas combusted) obtained from Table 1.4-2 of AP-42. SO_2 emissions were based on a maximum hydrogen sulfide natural gas concentration of 20 ppm_v.

Estimates of Hazardous Air Pollutant (HAP) Emissions

The substantive emissions of HAPs take place during gasifier startup/shutdown when raw syngas is combusted in the flare, H_2S and MeOH emitted from equipment leaks, MeOH emitted from loading and breathing losses of the Methanol Tank, and constituent HAP loss associated with gasoline loading and storage.

Gasifier Startup

During gasifier startup, HAP emissions were based on a mass balance between the estimated constituent HAP species in the coal and the amount emitted (with an estimated 98% removal of the HAPs in the gasification/removal/flaring process).

Equipment Leaks

Using the calculation methodology outlined above for equipment leaks, TransGas calculated HAP emissions associated with equipment leaks.

Storage Tanks Losses

TransGas estimated the amount of MeOH lost during the loading and storage of methanol in the methanol storage tank with the TANKS 4.09d program as provided under AP-42, Section 7. Input and summary sheets were included in the permit application.

Gasoline Loading and Storage Tanks

Emissions from the gasoline storage tanks and gasoline loading were calculated as noted above, and constituent HAPs were estimated from both using the percentages as given by the TANKS 4.09d program.

Note on Data Used in Emissions Calculations

Parameters used in the emissions calculations are based on, according to the application, "available data and information according to current status of engineering work done for the

[TransGas] CTL project." This includes heat inputs, throughput rates, and other design variables. Further, flow rates, tail gas concentrations, stack concentrations, and other variables within the emissions calculations are based on, where noted in the application, on empirical data gathered at the TransGas IGCC facility located in Puertollano, Spain (this facility uses the PRENFLO gasification technology) and the New Zealand Synfuel Plant applying the MtG process. TransGas states in the application:

> All base values for the emissions and the calculation methods applied have been developed specifically for the [TransGas facility] utilizing proprietary in-house modeling and clculation tools based on project specific design basis data, such as coal and fuel gas specifications, and applying the experience and know-how from operating data and proven start-up and operating procedures from [the commercial plants mentioned above].

DAQ Review of Emission Calculation Methodologies

As part of the application review process, the TransGas emissions calculation methodologies were reviewed to determine if the as-calculated potential emissions represented a reasonable site-specific emissions profile of the proposed source. The determination is made with the understanding that the proposed source is not one in which there exists a well-developed and accepted database of available emission factors for all sources of potential emissions or is a replica of any other known source with easily accessible and historically verifiable operational data. Therefore, use of, where applicable, assumptions and process data based on engineering analysis or operation of other similar sources (including non U.S. sources) is accepted.

Notes on the TransGas emissions calculations:

- The use of noted material, roadway, and weather data by TransGas in the material handling equations is considered reasonable for the purpose of estimating the potential-to-emit of a facility for pre-construction permitting applicability purposes. The material and roadway data (moisture contents, roadway silt loading) are considered appropriate for the specific materials in question and the type of facility. The weather data used are based on guidance from DAQ and are based on state or regional averages. Again, this data is considered appropriate for the estimation of potential-to-emit.

- The control efficiency used for calculating potential fugitive emissions from use of paved haulroads was 85%. Due to the site specific nature of potential control strategies for paved haulroads, the DAQ has not given general guidance on control efficiencies for paved haulroad control. In most cases, the DAQ will accept the default control efficiencies for unpaved haulroads - which includes 85% for use of water truck using a chemical dust suppressant solution. TransGas listed their control strategy as a water truck using a chemical dust suppressant solution. However, again, due to unique features of paved haulraods, the DAQ believes that additional control strategies are required along with a water truck using a chemical dust suppressant solution to achieve practical enforceability of an 85% control of uncontrolled fugitive emission from paved haulroads. These include the use of a vacuum sweeper truck, posted speed limits, and shoulder paving which shall be required in the draft permit.

- The value used for particulate matter baghouse outlet loading is within the range described for "well-designed" baghouses as listed in the *Air Pollution Control Device Manual* (pp. 115).

The emission rate of 5 mg-PM/m^3 is also considered reasonable according to the USEPA's *Air Pollution Control Technologies Fact Sheets* for baghouses and fabric filters.

- For various combustion sources TransGas used pollutant stack gas concentrations that were listed as "industrial standards" or as vendor guaranteed and where AP-42 was used to calculate the potential emissions of other pollutants. When compared with AP-42, the emissions estimates used by TransGas were found to be conservative (higher than AP-42).

- As noted above, uncontrolled VOC emissions from the gasoline loading racks were based on calculations and factors obtained from AP-42, Section 5.2. Controlled emissions were then based on a collection efficiency of 99.2% (which the AP-42 states is appropriate for racks subject to a "MACT-level" annual leak test). Of the collected emissions, TransGas applied a control efficiency of 99.0%. The MACT that applies to gasoline loading operations at major sources of HAPs is 40 CFR 63, Subpart R. However, the TransGas shall be considered a synthetic minor with respect to HAPs and Subpart R does not apply. TransGas has stated, however, that the "design and unit [of the gasoline loading racks] will be performed to meet the MACT level requirement." It is the view of the DAQ that to qualify to use the 99.2% collection efficiency in Section 5.2, the loading racks must meet all applicable requirements of Subpart R including the emission limit of 8.33×10^{-5} lb-VOC/gallon of gasoline loaded. This emission rate is less than the back-calculated emission rate as provided by TransGas (15.30×10^{-5} lb-VOC/gallon of gasoline loaded). Therefore, the TransGas emissions estimate is considered conservative. Further, as TransGas did not provide any estimate for collateral combustion emissions from a flare, the permit will limit the Subpart R compliance measure to use of a non-combustion device. Note that the potential-to-emit given under Table 2 reflects the Subpart R based VOC emissions from the loading racks.

- It is not the policy of the DAQ to permit operational malfunctions (with associated emergency releases of pollutants) and quantification and inclusion of these emissions into a facility's potential-to-emit is not required (nor, for most sources without a site-specific operating history, considered practicable). Emissions resulting from operational malfunctions shall be considered "excessive" and considered a Compliance/Enforcement matter.

In conclusion, after review, the DAQ accepts the TransGas facility-wide potential-to-emit as reasonable and practically enforceable using the requirements contained in the proposed draft permit.

Emissions Summary

The following table lists the criteria pollutant potential-to-emit by plant section:

Table 2: Criteria-Pollutant Potential-to-Emit(1)

Section	Pollutant Annual Potential-To-Emit (TPY)					
	CO	NO_x	PM	PM_{10}	SO_2	VOC
Material Handling	0.00	0.00	28.55	10.46	0.00	0.00
Gasification and Gas Cleanup	50.37	36.24	12.40	12.40	91.28	8.03
Methanol Plant and MtG Plant	6.70	8.17	0.44	0.44	0.00	0.72

Miscellaneous Sources	3.48	4.25	33.90	33.90	0.08	19.66
Equipment Leaks	6.73	0.00	0.00	0.00	0.44	13.49
Total Facility-Wide	67.28	48.66	75.29	57.20	91.80	41.90

(1) VOC total is lower than in the permit application as this number reflects lower gasoline loading rack emissions due to voluntary Subpart R compliance.

The following table lists the facility-wide potential-to-emit of HAPs:

Table 3: HAP Facility-Wide Potential-to-Emit(1)

Pollutant	Potential-to-Emit		Comment
	lb/hr	ton/year	
Carbonyl Sulfide (COS)	9.90	0.30	Emitted only during Gasifier Startup, Controlled @ 98% by Flare
Hydrochloric Acid (HCl)	2.29	0.07	Emitted only during Gasifier Startup
Hydrogen Cyanide (HCN)	2.27	0.07	Emitted only during Gasifier Startup
Mercury (Hg)	0.34	0.01	Emitted only during Gasifier/AGR Startup
Methanol (CH_3OH)	0.24	3.08	From Equipment Leaks, Methanol Storage Tank
Nickel Carbonyl ($Ni(CO)_4$)	1.24	0.04	Emitted only during Gasifier Startup
Benzene	0.04	0.16	Emitted as Gasoline Constituent
Toulene	0.06	0.25	Emitted as Gasoline Constituent
Ethylbenzene	0.01	0.03	Emitted as Gasoline Constituent
Xylene	0.03	0.13	Emitted as Gasoline Constituent
Hexane	0.03	0.15	Emitted as Gasoline Constituent
Total HAPS	16.44	4.30	

(1) Hydrogen Sulfide (H_2S) is not a HAP. See *http://www.epa.gov/ttn/atw/pollutants/atwsmod.html*.

REGULATORY APPLICABILITY

The proposed TransGas facility is subject to the following substantive state and federal air quality rules and regulations: 45CSR2, 45CSR5, 45CSR7, 45CSR10, 45CSR13, 40 CFR 60 Subpart Y, 40 CFR 60 Subpart XX, 40 CFR 60 Subpart OOO, 40 CFR 60 Subpart RRR, 40 CFR 60 Subpart Kb, 40 CFR 60 Subpart Dc, and 40 CFR 60 Subpart VVa. Each applicable rule (and those that have possible applicability but are determined not to be applicable), and TransGas' compliance therewith, will be discussed in detail below.

45CSR2: To Prevent and Control Particulate Air Pollution from Combustion of Fuel in Indirect Heat Exchangers

The Startup Steam Boiler (F) has been determined to meet the definition of a "fuel burning unit" under 45CSR2 and is, therefore, subject to the applicable requirements therein. The three heaters in the MtG Plant each have been determined to meet the definition of a "process heater"

under 45CSR2 and, therefore, pursuant to 45CSR2, Section 2.14, are not defined as "indirect heat exchangers" and exempt from the rule. Each substantive 45CSR2 requirement is discussed below.

45CSR2 Opacity Standard - Section 3.1

Pursuant to 45CSR2, Section 3.1, the Startup Steam Boiler is subject to an opacity limit of 10%. Proper maintenance and operation of the boilers (and the use of natural gas and cleaned syngas) should keep the opacity of the unit well below 10% during normal operations.

45CSR2 Weight Emission Standard - Section 4.1.b

The allowable particulate matter (PM) emission rate for the boiler, identified as a Type "b" fuel burning unit, per 45CSR2, Section 4.1.a, is the product of 0.09 and the total design heat input of the boiler in million Btu per hour. The maximum design heat input (short-term) of the boiler is 81.84 mmBtu/Hr. Using the above equation, the 45CSR2 particulate matter emission limit is 7.37 lb/hr. The maximum potential hourly particulate matter emissions from the Startup Steam Boiler is estimated to be 0.61 lb/hr. This emission rate is 8.27% of the 45CSR2 limit.

45CSR2 Control of Fugitive Particulate Matter - Section 5

Section 5 of 45CSR2 requires a fugitive particulate matter control system for any source of fugitive particulate matter associated with the fuel burning unit. Using natural gas or cleaned syngas as the fuel of the boiler will result in no substantive potential for fugitive particulate emissions.

45CSR2 Testing, Monitoring, Record-keeping, & Reporting (TMR&R) - Section 8

Section 8 of Rule 2 requires testing for initial compliance with the limits therein, monitoring for continued compliance, and keeping records of that compliance. The TMR&R requirements are clarified under 45CSR2A and discussed below.

45CSR2A Applicability - Section 3

Pursuant to §45-2A-3, as an individual applicable "fuel burning unit" under 45CSR2 with an MDHI less than 100 MMBtu/Hr, the Startup Steam Boiler is not subject to the Testing and MRR Requirements under 45CSR2A.

<u>45CSR5: To Prevent and Control Air Pollution from Coal Preparation Plants, Coal Handling Operations, and Coal Refuse Disposal Operations</u>

The coal handling operations at the proposed facility are defined as a "coal preparation plant" under §45-5-2.4 and are, therefore, subject to the applicable requirements of 45CSR5. The substantive requirements applicable are discussed below.

45CSR5 Emission of Particulate Matter - Section 3

Section 3 of 45CSR5 sets a twenty percent (20%) opacity limit on all stack and fugitive dust control systems. TransGas's proposed use of enclosures and baghouses should allow them to easily meet this requirement.

45CSR5 Fugitive Emissions - Section 6

Section 6 of 45CSR5 requires all facilities subject to the rule to minimize emissions through the use of a fugitive dust control system. TransGas has proposed a fugitive dust control system of enclosures on belt conveyers and transfer points and use of paving and dust suppression on haulroads. These methods are considered appropriate fugitive emissions minimization.

45CSR6: To Prevent and Control Particulate Air Pollution from Combustion of Refuse

TransGas has proposed the use of a flare for combusting various off-gas streams during start-ups/shutdowns. This flare meets the definition of an "incinerator" under 45CSR6 and is, therefore, subject to the requirements therein. The substantive requirements applicable to the flare are discussed below.

45CSR6 Emission Standards for Incinerators - Section 4.1

Section 4.1 limits PM emissions from incinerators to a value determined by the following formula:

Emissions (lb/hr) = F x Incinerator Capacity (tons/hr)

Where, the factor, F, is as indicated in Table I below:

Table I: Factor, F, for Determining Maximum Allowable Particulate Emissions

Incinerator Capacity	Factor F
A. Less than 15,000 lbs/hr	5.43
B. 15,000 lbs/hr or greater	2.72

The capacity of the flare is 140 tons/hour (280,000 lbs/hr). Using this value in the above equation produces a PM emission limit of 380.8 lb/hr for the flare. The proposed flare will be of "smokeless" design and should emit only trace amounts of particulate matter.

45CSR6 Opacity Limits for - Section 4.3, 4.4

Pursuant to Section 4.3, and subject to the exemptions under 4.4, the flare has a 20% limit on opacity during operation. Proper design (according to the specification as mandated by 40 CFR 60.18) of the "smokeless" flare should prevent any opacity from the flares.

45CSR7: To Prevent and Control Particulate Air Pollution from Manufacturing Process Operations

45CSR7 applies to "source operations" located at "manufacturing processes" that, excluding those manufacturing processes specified under §45-7-10.5 and §45-7-10.6, have the potential-to-emit particulate matter and acid gases. The TransGas facility meets the definition of a "manufacturing process" as defined under 45CSR7. The source operations subject to 45CSR7 are the limestone/ash/slag handling transfer points and crusher, the Roller Mills and Heaters, the Start-Up Vessels, the Lock Hoppers, the Feed Dust Bunkers, and the process heaters in the MtG Plant. The rule has three substantive requirements applicable to these source operations: the opacity

requirements under Section 3, the mass emission standards under Section 4, and the fugitive emission standards under Section 5. Each of these sections will be discussed below.

45CSR7 Opacity Standards - Section 3

Section 3.1 sets an opacity limit of 20% on all applicable source operations. The use of cleaned syngas or natural gas as fuel for the process heaters, the use of partial enclosures, full enclosures, and baghouses on the significant material handling transfer points, and the use of baghouses on the process emission points are expected to limit any opacity from these source operations to a minimum.

45CSR7 Weight Emission Standards - Section 4

Section 4.1 of 45CSR7 requires that each manufacturing processes meet a particulate matter stack emission limit based on the weight of material processed through the source operation. The emission limits are given under Table 45-7A and are based on the type source operation as defined in the Rule. The source operations subject to this Section are the baghouses controlling the limestone crusher, the limestone stockpile, and the process heaters. The following table details the pertinent data for the compliance demonstration of each of these source operations.

Table 4: 45CSR7 Section 4.1 Compliance

Source Operation	EP ID	Source Type	Process Weight Rate (lb/hr)	Table 45-7A Limit (lb/hr)	PTE (lb/hr)	% of Limit	Control Device
Limestone Crusher	CR7	A	200,000	37.00	0.11	<1%	Full Enclosure
Limestone Stockpile	BHCL1 BHCL2	A	200,000	37.00	0.12	<1%	2 Baghouses
Roller Mill and Heater	A1/1	A	1,384,000(1)(2)	10.00(1)	0.56	5.6	Baghouse
Roller Mill and Heater	A1/2	A		10.00(1)	0.56	5.6	Baghouse
Roller Mill and Heater	A1/3	A		10.00(1)	0.56	5.6	Baghouse
Roller Mill and Heater	A1/4	A		10.00(1)	0.56	5.6	Baghouse
Roller Mill and Heater	A1/5	A		10.00(1)	0.56	5.6	Baghouse
Start-Up Vessel 1	A2/1	A	144,000(1)	17.38(1)	0.10	<1%	Filter
Start-Up Vessel 2	A2/2	A		17.38(1)	0.10	<1%	Filter
Lock Hoppers 1 - 6 & Feed Dust Bunker 1	B1/1	A	1,384,000(1)(2)	25.00(1)	0.25	1%	Baghouse
Lock Hoppers 7 - 12 & Feed Dust Bunker 2	B1/2	A		25.00(1)	0.25	1%	Baghouse
Cooling Tower	CT	A	154,021,700(3)	50.00	7.71	15.42%	Drift Eliminator

Start-Up/Regeneration Gas Heater	E1	D	1,578,000[(1)]	7.07[(1)]	0.22	3.11%	Clean Syngas or Natural Gas
Start-Up/Reactivation Heater	E2	D		7.07[(1)]	0.89	12.59%	Clean Syngas or Natural Gas
HGT Reactor Charge Heater	E3	D		7.07[(1)]	0.03	<1%	Clean Syngas or Natural Gas

(1) These sources, for a conservative compliance demonstration, are considered "duplicate sources" as defined in 45CSR7. As such the PWR of all duplicate sources are aggregated and the resulting limit is distributed to each emission point relative to each source's contribution to the total PWR.
(2) The aggregate PWR of the Roller Mill and Heaters was based on the maximum aggregate design capacity of the gasifiers.
(3) Based on water circulated through Cooling Tower.

45CSR7 Fugitive Emissions - Section 5

Section 5.1 of Rule 7 states that each manufacturing process must include a system to minimize the emissions of fugitive particulate matter. The limestone handling operations and the Cooling Tower at the TransGas facility have the potential to emit fugitive emissions and are, therefore, subject to this requirement. The substantive limestone transfer points are controlled with enclosures and baghouses and the haulroads are required to be paved, vacuum swept, and dust suppression applied. The cooling tower uses a drift eliminator to minimize the steam drift (which contains entrained particulate matter). These measures represent the minimization of fugitive particulate matter.

45CSR10: To Prevent and Control Air Pollution from the Emission of Sulfur Oxides

45CSR10 has requirements limiting SO_2 emissions from "fuel burning units," limiting in-stack SO_2 concentrations of source operations from "manufacturing processes," and limiting H_2S concentrations in process gas streams. Each of these requirements, and any applicability and compliance therewith, are discussed below.

45CSR10 Fuel Burning Units - Section 3

The Start-Up Steam Boiler is defined as a "fuel burning unit" and subject to the SO_2 limitation of Section 3. The allowable SO_2 emission rate for the boiler, identified as a Type "b" fuel burning unit, per 45CSR10, Section 3.2(c), is the product of 1.6 and the total design heat input of the boiler in million Btu per hour. The maximum aggregate design heat input (short-term) of the boiler will be 81.84 mmBtu/Hr. Using the above equation, the 45CSR10 facility-wide SO_2 emission limit of the boilers will be 130.94 lb/hr. The maximum potential hourly SO_2 emissions from the boiler is estimated to be 0.31 lb/hr. This emission rate is less than 1% of the 45CSR10 limit.

45CSR10 Manufacturing Processes - Section 4

Section 4.1 of Rule 10 requires that no in-stack SO_2 concentration exceed 2,000 parts per million by volume (ppm_v) from any manufacturing process source operation. Use of cleaned syngas, pure hydrogen, and natural gas as fuel in the Roller Mills and Heaters and the MtG process heaters will limit SO_2 exhaust emissions from these sources to trace or undetectable levels. Sources that use

CO_2 as an inert purging or blanket gas will have any associated SO_2 emissions limited to 10 ppm_v as this is the limit the CO_2 stream is limited to with respect to SO_2 concentration.

45CSR10 Combustion of Refinery Gas Streams - Section 5

Section 5.1 of Rule 10 prohibits the combustion of any "refinery process gas stream" that contains H_2S in excess of 50 grains for every 100 cubic feet of gas consumed. Both raw and cleaned syngas consumed by the process heaters and flare would be considered a "refinery process gas stream" under 45CSR10. Cleaned syngas (syngas after cleaning in the AGR) used as fuel in the heaters or the Start-Up Steam Boiler will have less than 1 ppm_v total reduced sulfur compounds and will easily meet the Section 5 standard.

Raw syngas from the gasifiers is only flared during limited startup/shutdown operations (gasifiers are limited to only starting up one at a time). However, during these times, significant H_2S is present in the gas stream. TransGas has estimated that the maximum hourly concentration of H_2S in the raw syngas is 62.6 grains-H_2S/100 ft^3 of gas. This is in excess of the limit under Section 5.1. However, §45-10-5.4 states that "[c]ompliance with the allowable hydrogen sulfide concentration limitations for combustion sources set forth in this rule shall be based on a block three (3) hour averaging time." As averaged over 3 hours (gasifier startup venting to the flare is expected to last no longer than 1 hour), the average H_2S concentration would be 20.9 grains-H_2S/100 ft^3 of gas - or 42% of the Rule 10 limit. Even if both gasifiers were started back to back in consecutive hours, the average H_2S concentration would be 41.7 grains-H_2S/100 ft^3 of gas - or 83% of the Rule 10 limit.

Raw syngas is also sent to the flare during AGR start-up prior to the Rectisol system operating at rated efficacy. TransGas has conservative estimate the maximum short-term sulfur concentration of the flared gas to peak at 100 ppm_v while quickly falling to less than 1 ppm_v. The AGR only takes 0.5 hours per start-up. As averaged over a three hour block, the syngas sent to the flare during AGR startup should easily meet the Section 5.1 standard.

45CSR10 Testing, Monitoring, Record-keeping, & Reporting (TMR&R) - Section 8

Section 8 of Rule 10 requires to test for initial compliance with the limits therein, monitor for continued compliance, and keep records of that compliance. Pursuant to §45-10-10.3, as the Start-Up Steam Boiler "combust[s] natural gas, wood or distillate oil, alone or in combination," it is not subject to the Testing and MRR Requirements under Section 8 of 45CSR10.

Pursuant to §45-10A-8.2(a), "the owner and/or operator of a source shall install such stack gas monitoring devices as the Director deems necessary to determine compliance with [45CSR10]." Due to the large variation of sulfur content in coal and the relative high percentage of the Section 5.1 limit achieved when both gasifiers are started in one three-hour block, the permit will require an H_2S Continuous Emissions Monitor System (CEMS) on the inlet to the flare to show continuous compliance with the Section 5.1 Rule 10 limit.

45CSR13: Permits for Construction, Modification, Relocation and Operation of Stationary Sources of Air Pollutants, Notification Requirements, Administrative Updates, Temporary Permits, General Permits, and Procedures for Evaluation

The proposed TransGas Coal-to-Gasoline Plant, as limited by the draft permit, has the potential-to-emit of several regulated pollutants in excess of the thresholds under §45-13-2.24(b) that define the source as a "stationary source." However, all regulated pollutants have a potential-to-emit less than the applicability thresholds that would define the proposed facility as a "major stationary source" under 45CSR14. Therefore, the proposed facility was defined as a synthetic minor source and reviewed pursuant to the provisions of 45CSR13.

Compliance with the public review procedures under 45CSR13 are detailed under the PUBLIC REVIEW PROCEDURES Section above.

45CSR14: Permits for Construction and Major Modification of Major Stationary Sources of Air Pollution for the Prevention of Significant Deterioration

The proposed TransGas Coal-to-Gasoline Plant is a source listed under §45-14-2.43.a (Fuel Conversion Plants) and, therefore pursuant to 2.43.b., is defined as a "major stationary source" if any regulated pollutant has a potential-to-emit in excess of 100 TPY. The facility, as limited by the draft permit, does not have a potential-to-emit of any regulated pollutant in excess of 100 TPY and is, therefore, not defined as a major stationary source and is not subject to the provisions of 45CSR14.

45CSR30: Requirements for Operating Permits

45CSR30 provides for the establishment of a comprehensive air quality permitting system consistent with the requirements of Title V of the Clean Air Act. The proposed TransGas Coal-to-Gasoline Plant, as proposed and limited by the draft permit, does not have a potential-to-emit of any regulated pollutant above any threshold listed under §45-30-2.26 that would define the facility as "major" under 45CSR30. However, as the proposed facility is subject to several National Performance Standards (NSPS), pursuant to 45CSR30, the facility is subject to Title V. Non-major sources subject to Title V, pursuant to DAQ policy, are deferred from having to submit a Title V application.

45CSR31: Confidential Information

45CSR31 "establishes the requirements for claiming information. . . as confidential and the procedures for determinations of confidentiality." TransGas claimed information in permit application R13-2791 as Confidential Business Information (CBI). After several significant retractions of CBI claims, the final iteration of the application contained claims of CBI on the following information:

Table 5: Information Claimed CBI

Application Page	Description
L10	Gasifier Process Line Data
L38	PSA Process Line Data

L50	MtG Process Line Data
N20-N22	Various Process Line Data
Appendix: pp. 3-23	Complete Start-up Description CTL Overall
Appendix: pp. 5-12	Parts of Supplemental Process Description
Appendix: pp. 27-35	MtG Supplemental Process Description
Appendix: n/a	MtG Process Flow Diagrams

As mentioned above under the PUBLIC REVIEW PROCEDURES, and pursuant to §45-31-3.4, TransGas submitted a properly labeled redacted copy of the permit application. This version of the permit application is the version made available to the public for review (CBI is indicated as a blacked out area). Additionally, pursuant to §45-31-3.3.c, TransGas submitted a CBI cover sheet that provides information concerning the submission of CBI. This cover letter is included in the TransGas application under Attachment Q.

As per internal guidance, the role of the permit engineer in reviewing claims of CBI is to determine if the applicant has made a creditable request that certain information be protected as CBI and that the specific information is reasonably appropriate (most importantly, not defined as "emissions data") for such designation.

45CSR31 Determination of Confidentiality - Section 4

Section 4 of 45CSR31 lists a series of requirements that information claimed as CBI must meet to be eligible for protection and substantively includes the following:

- The person asserting the claim of confidentiality has satisfactorily shown that it has taken reasonable measures to protect the confidentiality of the information, and that it intends to continue to take such measures; and

- The information claimed confidential is not, and has not been, reasonably obtainable without the person's consent by other persons (other than governmental bodies) by use of legitimate means; and

- No statute specifically requires disclosure of the information; and

- The person [asserting the claim of confidentiality] has satisfactorily shown that disclosure of the information is likely to cause substantial harm to the business's competitive position

TransGas provided a reasonable justification to these points in Attachment Q of the application.

45CSR31 Determination of Confidentiality - Section 6

Section 6 of 45CSR31 states that "[n]o person shall claim as confidential, information concerning the types and amounts of air pollutants discharged." "Types and amounts of air pollutants discharged" is defined under Section 2.4. Substantively relevant to the TransGas claims

of CBI, within the definition, it states that generally "emissions data" (§45-31-2.4.a.1 and 2.4.a.2) and a "general description of the facility" (§45-31-2.4.a.3) may not be claimed CBI. What constitutes "emissions data" is clarified under 45CSR31B.

As noted above, TransGas claimed portions of their supplemental process descriptions as CBI under the Appendix of the permit application. After review, it was determined that their claim of supplemental process description did not violate the restriction on CBI claims of a "general description of the facility." Under Attachment G of the permit application, TransGas did supply a general process description of the facility and it, combined with other information in the application, supplied the basis for the DESCRIPTION OF PROCESS in this evaluation. Specifically, the process information provided was determined to be "to the extent necessary to identify the source and to distinguish it from other sources (including, to the extent necessary for such purposes, a description of the device, installation, or operation constituting the source)." [§45-31-2.4.a.3]

Section 4 of 45CSR31B provides the clarification of what constitutes emissions data. Specifically, the section states that "[i]nformation or data that is indispensable or essential to determining emissions or location . . . will be considered emission data and thus non-confidential." After review, it has been determined that the information claimed CBI, as noted above, does not constitute "emissions data" in that it is not "indispensable or essential to determining emissions or location." TransGas has provided under Attachment N a reasonable estimate of emissions (as described and reviewed above under EMISSIONS CALCULATION METHODOLOGIES) that does not require, to verify to an acceptable level, any information claimed CBI, including the process line data claimed CBI under Attachment N.

45CSR42: Greenhouse Gas Emissions Inventory Program (**NON APPLICABILITY)**

Section 3 of 45CSR2 states that reporting of greenhouse gas emissions are only required for a source that "emits one or more greenhouse gases on an annual basis greater than the *de minimis* amounts listed. . ., and reports emissions of regulated air pollutants pursuant to the emissions inventory requirements of the Secretary. . ." Currently, only major Title V sources are required to submit emission inventories. The proposed TransGas facility is not defined as a major source under Title V. Therefore, unless otherwise required to submit an emissions inventory by the Secretary after construction, 45CSR42 is not applicable.

40 CFR 60, Subpart Db: Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units (**NON APPLICABILITY)**

Subpart Db generally applies to non-Electric Generating Unit (EGU) boilers with a MDHI greater than 100 mmBtu/hr and that meet the definition of a "steam generating unit." The Start-Up/Reactivation Heater (MDHI = 120 mmBtu/hr), however, has been determined to meet the definition of a "process heater" under Subpart Db and, therefore, is not defined as a "steam generating unit" and is exempt from the rule.

40 CFR 60, Subpart Dc: Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

Subpart Dc generally applies to boilers with a MDHI between 10 and 100 mmBtu/hr and meet the definition of a "steam generating unit." The proposed Startup Steam Boiler (81.84 mmBtu/hr)

is subject to under the applicability requirements of §60.40c(a). The Start-Up/Regeneration Gas Heater (30 mmBtu/hr), however, has been determined to meet the definition of a "process heater" under Subpart Dc and, therefore, is not defined as a "steam generating unit" and is exempt from the rule.

Subpart Dc does not have any emission standards for combusting natural gas or cleaned syngas. However, the permittee is required to meet the reporting and record-keeping requirements under §60.48c for the Startup Steam Boiler.

40 CFR 60, Subpart Kb: Standards of Performance for Volatile Organic Liquid Storage Vessels (including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984

Subpart Kb applies to "each storage vessel with a capacity greater than or equal to 75 m^3 [19,813 gallons] that is used to store volatile organic liquids (VOL) for which construction, reconstruction, or modification is commenced after July 23, 1984" except for "storage vessels with a capacity greater than or equal to 151 m^3 [39,890 gallons] storing a liquid with a maximum true vapor pressure less than 3.5 kilopascals (kPa)." TransGas is proposing three gasoline and one methanol storage tank each with a capacity of 2,000,000 gallons. Gasoline and methanol are defined as VOLs and have vapor pressures of 6.37 kPa and 12.3 kPa (@20 degrees Celsius), respectively. Therefore, these tanks are subject to the requirements of Subpart Kb.

Pursuant to §60.112b(a), Subpart Kb requires storage tanks with capacities in excess of 39,890 gallons and which store a VOL with a vapor pressure between 5.2 kPa and 76.6 kPa to comply with one of three control options. TransGas has proposed to meet the requirements under §60.112b(a)(1): use on each storage tank of an external fixed roof with an internal floating roof.

40 CFR 60, Subpart Y: Standards of Performance for Coal Preparation Plants

On October 8, 2009 the USEPA promulgated final amendments to Subpart Y that included additional requirements applicable to the TransGas facility beyond the previous version of the rule. This review includes those additional requirements.

Subpart Y contains requirements relating to the performance of coal preparation plants. Pursuant to §60.250, affected facilities under Subpart Y include "coal conveying and processing equipment (including breakers and crushers), coal storage systems, coal transfer and loading systems, and coal storage piles" located at "coal preparation and processing plants" that process greater than 200 tons per day. "Coal preparation and processing plants" is defined as "any facility (excluding underground mining operations) which prepares coal by one or more of the following processes: breaking, crushing, screening, wet or dry cleaning, and thermal drying." TransGas has proposed to crush coal at their facility and, therefore, all coal conveying and crushing equipment is subject to the applicable sections of Subpart Y.

The substantive standards under Subpart Y applicable to the proposed TransGas facility are given in §60.254(b) and (c):

- A 10% opacity limit on all emission points;

- A particulate matter limit on any "mechanical vent" of 0.023 g/dscm

- Operation of all coal open storage piles in accordance with a fugitive coal dust emissions control plan.

TransGas's proposed use of enclosures on coal conveying and processing equipment (including breakers and crushers), coal storage systems, and coal transfer and loading systems should allow them to meet the 10% opacity limit and the baghouses on the coal crusher and coal storage building are limited to 0.005 g/dscm (under the Subpart Y limit). TransGas has proposed to fully enclose the coal storage pile and control vented emissions with baghouses.

TransGas will be required to comply with all applicable monitoring, testing, reporting, and record-keeping requirements in Subpart Y.

40 CFR 60, Subpart XX: Standards of Performance for Bulk Gasoline Terminals

Subpart XX applies to "all the loading racks at a bulk gasoline terminal which deliver liquid product into gasoline tank trucks" constructed after December 17, 1980. A "bulk gasoline terminal" is defined as "any gasoline facility which receives gasoline by pipeline, ship or barge, and has a gasoline throughput greater than 75,700 liters [~20,000 gallons] per day." The TransGas facility meets the definition of a bulk gasoline terminal as it will have the capacity to load 756,000 gallons of gasoline per day.

The substantive control and emission standards in Subpart XX are listed in the following:

- §60.502(a) requires the use of a "vapor collection system" installed on the loading racks,

- §60.502(b) sets an emissions limit from the vapor collection system of 35 mg-VOC/L gasoline loaded (29×10^{-5} lb-VOC/gal gasoline loaded),

- §60.502(e) requires that gasoline shall only be loaded into vapor-tight gasoline tanks trucks (as defined under §60.501.

To maintain the synthetic minor status of the facility, TransGas has proposed voluntarily complying with loading racks requirements under 40 CFR 63, Subpart R. Subpart R has an emission standard of 10 mg-VOC/L gasoline loaded (8.33×10^{-5} lb-VOC/gal gasoline loaded) with is less than 30% of the Subpart XX limit. TransGas will be required to meet the other applicable sections of Subpart XX unless a more stringent requirement is applicable under 40 CFR 63, Subpart R.

40 CFR 60, Subpart VVa: Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006

Subpart VVa applies to "affected facilities in the synthetic organic chemicals manufacturing industry." "Synthetic organic chemicals manufacturing industry" is defined in VVa as an "industry

that produces, as intermediates or final products, one or more of the chemicals listed in §60.489." §60.489 lists methanol as an applicable product.

Subpart VVa contains LDAR requirements for all affected facilities at the TransGas plant; these affected facilities are defined under Subpart VVa as "the components assembled and connected by pipes or ducts to process raw materials and . . . includes any feed, intermediate and final product storage vessels (except as specified in §60.482–1a(g)), product transfer racks, and connected ducts and piping."

40 CFR, 60, Subpart NNN: Standards of Performance for Volatile Organic Compound (VOC) Emissions From the Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations (**NON APPLICABILITY)**

Subpart NNN applies to each affected facility that "designated in [§60.660(b)] that is part of a process unit that produces any of the chemicals listed in §60.667 as a product, co-product, by-product, or intermediate." Methanol is listed under §60.667 as a regulated chemical product. The TransGas facility will produce methanol as an intermediate prior to converting it to gasoline in the MtG plant.

However, the only distillations at the facility are located in the MtG plant that does not produce methanol as a product, co-product, by-product, or intermediate and, instead, uses methanol as a raw material. Additionally, the distillation units do not vent to atmosphere. Therefore, these units are not considered affected facilities under Subpart NNN.

40 CFR 60, Subpart OOO: Standards of Performance for Nonmetallic Mineral Processing Plants

Subpart OOO contains requirements relating to the performance of non-metallic mineral processing plants. The proposed TransGas facility contains equipment that is applicable to Subpart OOO. The following discusses the substantive applicable requirements of Subpart OOO relating to the TransGas facility.

Subpart OOO Applicability - Section §60.670

Pursuant to §60.670, affected facilities under Subpart OOO include "each crusher, grinding mill, screening operation, bucket elevator, belt conveyor, bagging operation, storage bin, enclosed truck or railcar loading station" located at a "fixed or portable nonmetallic mineral processing plant[s]." "Non-metallic processing plant" is defined as "any combination of equipment that is used to crush or grind any nonmetallic mineral wherever located." The definition of "non-metallic mineral" includes limestone. TransGas has proposed a limestone handling operation that includes affected facilities listed under §60.670. Therefore, Subpart OOO will be applicable to the limestone handling operations at the proposed TransGas facility.

Subpart OOO Standard for Particulate Matter - Section §60.672

Section §60.672 sets the following particulate matter standards for affected facilities under Subpart OOO:

Table 6: Subpart OOO Emission Standards

Reference	Affected Facility	Stack Emissions	
		Mass (gr/dscf)[1]	Opacity (%)
Table 2	Affected Facilities with Capture Systems	0.014	n/a
Table 3	Affected Facilities (non-crushers) without Capture Systems	n/a	7
Table 3	Crushers without Capture System	n/a	12
§60.672(d)	Truck Dumping	n/a	n/a
§60.672(e)	Affected Facilities inside a Building	Must meet Table 2 or Table 3 limits or building openings/vents must meet:	
	Building Openings	n/a	7
	Building Vents	Table 2 Limits	n/a
§60.672(f)	Enclosed Storage Bins w/ Baghouse	n/a	7

(1) Mass emission standard represents filterable emissions only (compliance test requires use of Method 5 or Method 17).

TransGas has proposed particulate matter controls to minimize any potential fugitive emissions and comply with the requirements of Subpart OOO. All material will be transported on covered conveyors and each conveyor transfer point is fully enclosed. The limestone crusher will also be fully enclosed. These full enclosures should prevent opacity in excess of the limits in the above table.

Subpart OOO Monitoring of Operations - Section §60.674

Section §60.674 requires monitoring for sources that control particulate matter with wet scrubbers. TransGas has not proposed use of a wet scrubber for control of particulate matter in the limestone handling operations.

Subpart OOO Test Method and Procedures - Section §60.675

Section §60.675 outlines the test methods and procedures to determine initial compliance with the standards noted above including the use of Method 9 to determine compliance with the opacity limits. TransGas will be required to follow these requirements to determine initial compliance with the emission standards.

Subpart OOO Reporting and Record-keeping - Section §60.676

Section §60.51a outlines the reporting and record-keeping requirements required to be followed to be in compliance with Subpart OOO. TransGas will be required to follow these requirements.

<u>40 CFR 60, Subpart RRR: Standards of Performance for Volatile Organic Compound Emissions From Synthetic Organic Chemical Manufacturing Industry (SOCMI) Reactor Processes</u>

Subpart RRR applies to each affected facility that "is part of a process unit that produces any of the chemicals listed in §60.707 as a product, co-product, by-product, or intermediate." Methanol

is listed under §60.707 as a regulated chemical product. The TransGas facility will produce methanol as an intermediate prior to converting it to gasoline in the MtG plant. The substantive requirement under Subpart RRR is to control any vented gas streams produced in "process reactors" by one of the three options given under §60.702. TransGas has chosen to meet this requirement by flaring the startup offgas from their reactors (in this case, the gasifiers are the process reactors) with a flare that is compliant with §60.18. As the gas vented from the AGR during AGR startup is also produced in the gasifiers it will also be subject to this requirement. No affected facilities downstream of the MtG Plant are subject to this Subpart as they are not "part of a process unit that produces" methanol.

40CFR63, Subpart R: National Emission Standards for Gasoline Distribution Facilities (Bulk Gasoline Terminals and Pipeline Breakout Stations) **(PARTIAL VOLUNTARY APPLICABILITY)**

To maintain VOC synthetic minor status of the facility, TransGas has voluntarily chosen to comply with Subpart R requirements for the loading racks. The substantive requirements of Subpart R applicable to the gasoline loading racks are:

- Pursuant to §63.422, TransGas will be limited to a total emission rate from the loading racks of 10 mg-VOC/L gasoline loaded (8.33×10^{-5} lb-VOC/gal gasoline loaded).

- Pursuant to §63.425(e), TransGas will be required to conduct annual leak test on the gasoline cargo tanks that meet the provisions of Table 2 of Subpart R.

40 CFR63, Subpart BBBBB: National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Distribution Bulk Terminals, Bulk Plants, and Pipeline Facilities **(NON DETERMINATION)**

The DAQ has not taken delegation of 40 CFR 63, Subpart BBBBBB and, therefore, has not determined whether the permittee is subject to an area source air toxics standard requiring Generally Achievable Control Technology (GACT) promulgated after January 1, 2007 pursuant to 40 CFR 63, including the area source air toxics provisions of 40 CFR 63, Subpart BBBBBB.

TOXICITY ANALYSIS OF NON-CRITERIA REGULATED POLLUTANTS

This section provides a general toxicity/carcinogenic analysis for those regulated pollutants that may be emitted from the TransGas facility and that are not classified as "criteria pollutants." Criteria pollutants are defined as Carbon Monoxide (CO), Lead (Pb), Oxides of Nitrogen (NO_x), Ozone, Particulate Matter (PM), Particulate Matter less than 10 microns (PM_{10}), Particulate Matter less than 2.5 microns ($PM_{2.5}$), and Sulfur Dioxide (SO_2). These pollutants have National Ambient Air Quality Standards (NAAQS) set for each that are designed to protect the public health and welfare. Other pollutants of concern, although designated as non-criteria and without national concentration

standards, may be regulated through various federal programs designed to limit their emissions and public exposure. These programs include federal source-specific Hazardous Air Pollutants (HAPs) limits promulgated under 40 CFR 61 (NESHAPS) and 40 CFR 63 (MACT). Potential applicability to these federal regulations were discussed above under REGULATORY APPLICABILITY.

HAPs

The majority of non-criteria regulated pollutants fall under the definition of Hazardous Air Pollutants (HAPs). Section 112(b) of the Clean Air Act (CAA) identifies 187 compounds as pollutants or groups of pollutants that EPA knows or suspects may cause cancer or other serious human health effects. The non-criteria regulated pollutants identified by TransGas as potential pollutants emitted from the facility are all defined as HAPs. The potential emission rates of these pollutants, as calculated by TransGas, are given above under Table 3.

The following table lists each HAP in Table 3 and the carcinogenic risk associated thereto (as based on analysis provided in the Integrated Risk Information System (IRIS)):

Table 7: Potential HAPs - Carcinogenic Risk(1)

HAPs	Type	Known/Suspected Carcinogen	Classification
Carbonyl Sulfide (COS)	VOC	No	Not Assessed
Hydrochloric Acid (HCl)	VOC	No	Not Assessed
Hydrogen Cyanide (HCN)	VOC	No	Not Assessed
Mercury (Hg)	PM	No	D - Not Classifiable
Methanol (CH_3OH)	VOC	No	Not Assessed
Nickel Carbonyl ($Ni(CO)_4$)	PM	Probable	B2 - Probable
Benzene	VOC	Yes	A - Human Carcinogen
Toluene	VOC	No	D - Not Classifiable
Ethyl benzene	VOC	No	D - Not Classifiable
Xylene	VOC	No	Not Assessed
Hexane	VOC	No	Not Assessed

(1) Hydrogen Sulfide (H_2S) is not a HAP. See http://www.epa.gov/ttn/atw/pollutants/atwsmod.html.

All of the above HAPs have other non-carcinogenic chronic and acute effects. These adverse health affects may be associated with a wide range of ambient concentrations and exposure times and are influenced by source-specific characteristics such as emission rates and local meteorological conditions. Health impacts are also dependent on multiple factors that affect variability in humans such as genetics, age, health status (e.g., the presence of pre-existing disease) and lifestyle. As stated previously, *there are no federal or state ambient air quality standards for these specific chemicals*. The regulatory applicability of any potential NESHAP or MACT to the TransGas facility was discussed above. For a complete discussion of the known health effects of each compound refer to the IRIS database located at *www.epa.gov/iris*.

Mercury

The toxicity of mercury, as a well-known by-product of coal combustion (which it is important to note is not the same as coal gasification, however), will be further discussed. Mercury is a toxic metal that exists in three forms: elemental Hg (Hg^0), inorganic Hg (Hg++) compounds (primarily mercuric chloride), and organic Hg compounds (primarily methylmercury). While each form of mercury exhibits different health effects, environmental methylmercury is the mercury compound of major concern. It is typically formed by biological processes after elemental or inorganic Hg has precipitated from the air and is deposited into water bodies. Methylmercury is the primary health threat to humans, particularly the unborn and young children, because of its ability to bioaccumulate and biomagnify in sport fish which then may be caught and ingested. As stated previously with HAPs, *there are currently no federal or state ambient air quality standards for mercury*.

AIR QUALITY IMPACT MODELING ANALYSIS

The estimated maximum emissions of the proposed facility are less than applicability thresholds that would define the proposed facility as "major" under 45CSR14 and, therefore, no air quality impacts modeling analysis was required.

MONITORING, COMPLIANCE DEMONSTRATIONS, AND RECORDING OF OPERATIONS

The draft permit contains extensive monitoring, compliance demonstrations, and recording of operations (MCDR). The purpose of these requirements are to monitor the efforts of the permittee to meet the requirements under Section 4.1 of the draft permit, to require the permittee to demonstrate how they are showing compliance with Section 4.1 requirements, and to require certification and recording of these efforts so as to allow the DAQ to verify that the requirements of the permit are being met.

Specific MCDR requirements for each section of the proposed facility are listed below:

Material Handling

- For the purposes of demonstrating continuous compliance with maximum trucking throughput limitations, TransGas shall be required to monitor the throughput of each material trucked into or out of the facility.

- For the purpose of determining continuous compliance with the material handling opacity limits, TransGas shall conduct visible emission checks for all material handling emission sources subject to an opacity limit.

- TransGas shall demonstrate continuous compliance with the aggregate fugitive particulate matter emission limit in Appendix A by using the appropriate emission factors

for each fugitive source that were used to estimate the source's potential emissions in the permit application unless an alternative emission factor is approved by the Director.

- The permittee shall meet all applicable material handling monitoring, compliance demonstration, and record-keeping requirements as given under 45CSR5, 45CSR7, 40 CFR 60, Subpart Y, and 40 CFR 60, Subpart OOO.

Gasification and Gas Cleanup

- For the purposes of demonstrating continuous compliance with maximum Rolling Mill and Heater coal processing limitations, TransGas shall daily monitor and record the hours of operation and the amount of coal processed by each Rolling Mill and Heater. TransGas may, upon approval, be exempt from this requirement if information is supplied to the Director verifying that the maximum design capacity of a Rolling Mill and Heater is less than the limit given under 4.1.1.5(a) of the permit.

- TransGas shall continuously monitor and record the CO and SO_x concentrations of the outlet of the CO_2 Purification System (Process Stream 26).

- For the purposes of demonstrating continuous compliance with maximum aggregate coal gasification limitation, TransGas shall daily monitor and record the hours of operation of each gasifier and the amount of coal gasified in each gasifier.

- During each startup/shutdown of a gasifier, TransGas shall monitor and record the following:

  a. The date, time and duration of each specific gasifier startup/shutdown.

  b. The source, amount, and sulfur and content of the coal used during start-up.

  c. The volume, CO content, and total reduced sulfur (including H_2S) concentration of raw syngas sent to the flare.

- TransGas shall continuously monitor and record the SO_x content of the waste CO_2 gas stream from the AGR (Process Stream 16).

- During each startup/shutdown the AGR, TransGas shall monitor and record the following:

  a. The date, time and duration of the AGR startup/shutdown.

  b. The volume and total reduced sulfur concentration (including H_2S) of syngas sent to the flare.

- TransGas shall meet all applicable gasification and gas cleanup monitoring, compliance demonstration, and record-keeping requirements as given under 45CSR7, 45CSR10, and 40 CFR 60, Subpart RRR.

Methanol and Methanol-to-Gasoline Plant

- For the purposes of demonstrating compliance with maximum fuel combustion limitations, TransGas shall monitor and record the monthly and rolling twelve month total of fuel (as expressed in mmBtu) combusted by each process heater.

- TransGas shall meet all applicable Start-Up Steam Boiler monitoring, compliance demonstration, and record-keeping requirements as given under 45CSR2 and 40 CFR 60, Subpart Dc.

- TransGas shall continuously monitor and record the volume of regeneration offgas sent to the CO_2 purification unit. The rolling yearly total of regeneration offgas sent to the CO_2 purification unit shall be calculated and recorded.

- For each period when tail gas produced in the MtG Plant is flared, TransGas shall monitor and record the date, time and duration of the event.

- For the purposes of demonstrating continuous compliance with maximum flaring time limitations, TransGas shall record the monthly and rolling twelve month total of time that the tail gas produced in the MtG Plant is flared.

- For the purposes of demonstrating continuous compliance with gasoline production limitations, TransGas shall record the daily total of gasoline produced.

- TransGas shall meet all applicable Methanol Plant and MtG Plant monitoring, compliance demonstration, and record-keeping requirements as given under 45CSR7, 45CSR10, and 40 CFR 60, Subpart RRR.

Miscellaneous Sources

- For the purposes of demonstrating compliance with maximum fuel combustion limitations, TransGas shall monitor and record the monthly and rolling twelve month total of fuel (as expressed in mmBtu) combusted by the Start-Up Steam Boiler.

- TransGas shall meet all applicable Start-Up Steam Boiler monitoring, compliance demonstration, and record-keeping requirements as given under 45CSR2, and 40 CFR 60, Subpart Dc.

- For the purposes of demonstrating continuing compliance with the Cooling Tower operational limits, TransGas shall meet the following requirements:

a. TransGas shall continuously monitor the circulating water flow rate in units of gallons per minute, the circulating water's total dissolved solids content via conductivity and the number of cycles of concentration of CT.

b. TransGas shall take a grab sample of the cooling tower circulating water and analyze on a weekly basis to determine the total solids content of the cooling tower circulating water. Upon request of TransGas, the Director may change the frequency of the testing under this section to a monthly basis once enough data has been established to verify compliance.

c. TransGas shall, if there is an increase in the total dissolved solids content conductivity measurement from the normal operating range of conductivity, take a grab sample of the cooling tower circulating water and analyze the sample within 8 hours to verify the accuracy of the measurement and the total solids content of the circulating water.

d. TransGas shall periodically monitor the cooling water for reasonably detectable levels of CO.

- For the purposes of demonstrating compliance with maximum throughput limitations, TransGas shall monitor and record the monthly and rolling twelve month total of material throughput in storage tanks TK1, TK2, TK3, and TK6.

- TransGas shall meet all applicable monitoring, compliance demonstration, and record-keeping requirements as given under 40 CFR 60, Subpart Kb for storage tanks TK1, TK2, TK3, and TK6.

- TransGas shall meet the following requirements for the loading out of gasoline:

  a. TransGas shall monitor and record the monthly and rolling twelve month total of the amount of gasoline loaded from the loading racks.

  b. TransGas shall meet all applicable monitoring, compliance demonstration, and record-keeping requirements as given under 40 CFR 60, Subpart XX and 40 CFR 63, Subpart R.

Control Devices

- TransGas shall install, maintain, and operate instrumentation to continuously monitor control device parameters.

- TransGas shall record the date, time and duration of all deviations of the control device parameters outside the ranges established under 4.1.8.1. and any corrective action taken to bring the control devices back within the operating ranges.

- TransGas shall monitor and record the following parameters as related to the venting of syngas to the Flare:

    a. The date, time and duration of all gas venting to the flare.

    b. The hourly gas combustion rate (in SCFM).

    c. The hourly natural gas usage rates by the flare.

    d. A Continuous Emissions Monitoring System (CEMS) shall be installed prior to the flare to continuously monitor the H_2S concentration of all gas vented to the flare for destruction.

- TransGas shall meet all applicable flare monitoring, compliance demonstration, and record-keeping requirements as given under 40 CFR §60.18 and 40 CFR 60, Subpart RRR.

Leak Detection and Repair

- TransGas shall meet all applicable monitoring, compliance demonstration, and record-keeping requirements as given under 40 CFR 60, Subpart VVa.

Other MCDR Requirements

- TransGas shall produce, upon request by the Director, and within a reasonable time-frame, calculations that show the actual emissions of the facility from the previous 12 calendar months. Actual emissions shall be calculated by using emission factors, emission modeling software, or other appropriate emission estimation models or calculation methodologies developed, where applicable, from site-specific testing or data. The emission factors, emission models, and other calculation methods shall be maintained current for all processes and process modifications.

- For the purposes of demonstrating continuous compliance with the facility-wide mercury emission limit, TransGas shall, on a monthly basis, determine the emissions of mercury from the previous 12 calendar months. This calculation shall be based on the actual mercury content of the gasified coal as determined according to coal sampling done, at a minimum, on a weekly basis, or more frequently if necessary due blending of different sources of coal. TransGas exercise a different testing schedule upon written approval by the Director that there is reasonable evidence that the this requirement will be met under a different testing schedule. Additionally, this calculation may take into account the efficiency of the mercury control system if verified by performance testing conducted according to an approved protocol under 3.3.1.

- TransGas shall install, maintain, and operate all monitoring equipment required by this permit in accordance with all manufacture's recommendations concerning maintenance and performance.

PERFORMANCE TESTING OF OPERATIONS

Performance testing is required to verify that certain data and assumptions used in determining the facility's potential-to-emit was appropriate and to show compliance with certain permitted emission limits. Performance testing must be conducted in accordance with accepted test methods and according to a protocol approved by the Director prior to testing. Periodic testing may be required for certain sources depending on the specifics of the emissions unit in question. Further, any additional reasonable testing may be at any time required by the Director.

Specific testing requirements for each section of the proposed facility are listed below:

Material Handling

- Within 180 days after initial startup, TransGas shall conduct performance tests on the coal crusher baghouse to determine compliance with the particulate matter limit given under Appendix A. The baghouse performance test shall take place while the crusher is operating at maximum permitted capacity.

- TransGas shall meet all applicable material handling testing requirements as given under 45CSR5, 45CSR7, 40 CFR 60, Subpart Y, and 40 CFR 60, Subpart OOO.

Gasification and Gas Cleanup

- Within 60 days after achieving the maximum syngas production rate at which the gasifiers will be operated, but not later than 180 days after initial startup, TransGas shall conduct performance tests on each baghouse to determine compliance with the particulate matter limits given under 4.1.5.1(c) and 4.1.5.2(b) of the draft permit. The baghouse performance tests shall take place while the associated emission sources are operating at maximum permitted capacity.

- Within 180 days after initial startup, TransGas shall conduct a test on the purity of the hydrogen fuel supplied to the Rolling Mill and Heaters.

- Within 60 days after achieving the maximum gasoline production rate at which the gasifiers will be operated, but not later than 180 days after initial startup, TransGas shall conduct a test on the gasifiers' and AGR waste gas streams sent to the flare so as to determine the validity of the substantive mass balance assumptions made in calculation of the potential emissions in Permit Application R13-2791.

- Within 60 days after achieving the maximum syngas production rate at which the gasifiers will be operated, but not later than 180 days after initial startup, TransGas shall conduct a test on the gasifiers' and AGR raw syngas streams sent to the flare (during

startup/shutdown) so to determine the concentrations of CO and total reduced sulfur compounds (including H_2S).

- Within 60 days after achieving the maximum syngas production rate at which the gasifiers will be operated, but not later than 180 days after initial startup, TransGas shall conduct, or have conducted, in accordance with a protocol submitted pursuant to 3.3.1.c., a test on the waste CO_2 gas stream from the AGR (Process Stream 16) so as to determine the concentration of SO_x.

- TransGas shall meet all applicable gasification and gas cleanup testing requirements as given under 45CSR7, 45CSR10, and 40 CFR 60, Subpart RRR.

Methanol and Methanol-to-Gasoline Plant

- Within 60 days after achieving the maximum rate at which the Startup/Reactivation Heater and Startup/Regeneration Heater will be operated, but not later than 180 days after initial startup, and at such times thereafter as may be required by the Secretary, TransGas shall conduct, a performance test on the Startup/Reactivation Heater and Startup/Regeneration Heater to determine compliance with the CO, NO_x, and particulate matter emission limits.

- Within 60 days after achieving the maximum gasoline production rate at which the MtG Plant will be operated, but not later than 180 days after initial startup, TransGas shall conduct a test on the MtG Plant waste gas stream sent to the flare so as to determine the validity of the substantive mass balance assumptions made in calculation of the potential emissions in Permit Application R13-2791.

- Within 180 days after initial startup, TransGas shall conduct a test on the catalyst regeneration offgas stream sent to the CO_2 Purification Unit so to determine if reasonably detectable levels of NOx, reduced sulfur compounds, particulate matter, or VOCs are present in the gas stream.

- TransGas shall meet all applicable Methanol Plant and MtG Plant testing requirements as given under 45CSR7, 45CSR10, and 40 CFR 60, Subpart RRR.

Miscellaneous Sources

- Within 60 days after achieving the maximum rate at which the Startup Steam Boiler will be operated, but not later than 180 days after initial startup, and at such times thereafter as may be required by the Secretary, TransGas shall conduct, a performance test on the Startup Steam Boiler to determine compliance with the CO, NO_x, and particulate matter emission limits.

- TransGas shall conduct all applicable Startup Steam Boiler performance testing in accordance with the requirements of 45CSR2 and 40 CFR 60, Subpart Dc.

- TransGas shall comply with all testing requirements relating to the loading racks as given under 40 CFR 60, Subpart XX and 40 CFR 63, Subpart R provided that TransGas shall

comply only with the provisions in each subpart that contain the most stringent control requirements.

- TransGas shall meet all testing requirements as given under 40 CFR 60, Subpart Kb for storage tanks TK1, TK2, TK3, and TK6.

Control Devices

- Within 60 days after achieving the maximum syngas production rate at which the gasifiers will be operated, but not later than 180 days after initial startup, TransGas shall conduct, in accordance with manufacturer's recommendations and good engineering practices, tests on the flare to confirm proper operation of the components required under 4.1.8.1. of the draft permit.

- TransGas shall meet all applicable flare testing requirements as given under 40 CFR §60.18 and 40 CFR 60, Subpart RRR.

Leak Detection and Repair

- Within 60 days after achieving the maximum syngas production rate at which the gasifiers will be operated, but not later than 180 days after initial startup, TransGas shall conduct, or have conducted, tests on the syngas to verify the accuracy of the constituent weight fractions used in the fugitive emissions calculations located under "Attachment N: Attachment 3 to Task Order 1" in permit application R13-2791.

- TransGas shall meet all applicable performance testing requirements as given under 40 CFR 60, Subpart VVa.

Other Testing Requirements

- Within 60 days after achieving the maximum syngas production rate at which the gasifiers will be operated, but not later than 180 days after initial startup, TransGas shall conduct a test on each of the monitors required under Section 4.2. of the permit to demonstrate the accuracy of the monitoring equipment.

- Within 60 days after achieving the maximum syngas production rate at which the gasifiers will be operated, but not later than 180 days after initial startup, TransGas shall conduct a test on the gasifiers' and AGR waste gas streams sent to the flare during startup/shutdown to determine if there is a potential to emit any HAPs, in addition to those already identified in Appendix A, in amounts that exceed 0.01 lbs/hr.

RECORD-KEEPING AND REPORTING

The draft permit contains standard boilerplate record-keeping language under Section 4.4. Under Section 4.5, TransGas is required to, with respect to the reporting of information:

- TransGas shall submit reports of all required monitoring on or before September 15 for the reporting period January 1 to June 30 and March 15 for the reporting period July 1

to December 31. All instances of deviation from permit requirements must be clearly identified in such reports.

- TransGas shall submit to the Director on or before March 15, a certification of compliance with all requirements of this permit for the previous calendar year ending on December 31. If, during the previous annual period, TransGas had been out of compliance with any part of this permit, it shall be noted along with the following information: 1) the source/equipment/process that was non-compliant and the specific requirement of this permit that was not met, 2) the date the permitted discovered that the source/ equipment/process was out of compliance, 3) the date the Director was notified, 4) the corrective measures to get the source/equipment/process back into compliance, and 5) the date the source began to operate in compliance. The submission of any non-compliance report shall give no enforcement action immunity to episodes of non-compliance contained therein.

- TransGas shall meet all applicable performance reporting requirements as given under 45CSR2, 45CSR5, 45CSR7, 45CSR10, 45CSR13, 40 CFR 60 Subpart Y, 40 CFR 60 Subpart XX, 40 CFR 60 Subpart OOO, 40 CFR 60 Subpart RRR, 40 CFR 60 Subpart Kb, 40 CFR 60 Subpart Dc, and 40 CFR 60 Subpart VVa.

RECOMMENDATION TO DIRECTOR

The information provided in the permit application indicates that compliance with all applicable regulations will be achieved. Therefore, I recommend to the Director the issuance of Permit Number R13-2791 to TransGas Development, LLC for the construction of the TransGas Coal to Gasoline Plant to be located near Wharncliffe, Mingo County, WV.

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Joe R. Kessler, PE
Engineer

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Date