Toups, Brad

From:	Larry Moon <lmoon@zephyrenv.com>
Sent:	Wednesday, September 10, 2014 5:01 PM
To:	Toups, Brad
Cc:	Thomas Sullivan; Flavio Assis (Flavio.Assis@gruppomg.com.br); Martha.Martinez@gruppomgus.com; Allana.ratliff@chemtex.com; mauro.fenoglio@gruppomg.com
Subject:	RE: M&G Resins Utility Plant Draft Permit and Statement of Basis are ready for your review and comment
Attachments:	MG Resins Utilities Plant GHG Permit PSD-TX-1354-GHG Draft Sep 4 2014 Zephyr Comments.docx; MG Resins Utilities Plant GHG Permit PSD-TX-1354-GHG SOB Sep 4 2014 draft Zephyr comments.docx

Brad,

Attached are our comments on the draft permit and SOB for the M&G Utility Plant. In addition, in the SOB Table 1.a., the total CO2e represented at the bottom of the Table does not appear to be accurate. The CO2e listed on the table is **419,262**. When we sum the TPY CO2e listed in the column and subtract the 9,309 TPY associated with the Biogas Burning in the Flare, we get **438,280**.

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Wednesday, September 10, 2014 8:51 AM
To: Larry Moon
Subject: RE: M&G Resins Utility Plant Draft Permit and Statement of Basis are ready for your review and comment

Hi Larry,
It may be that the file format we use (.docx) could have something to do with it. This is the file extension that word 2013 uses, which is our current version. I saved the same file as an older version with a (.doc) extension. See if this helps. I bet the problem is in how it treats the tables I created.
Brad

From: Larry Moon [mailto:lmoon@zephyrenv.com]
Sent: Wednesday, September 10, 2014 8:46 AM
To: Toups, Brad
Subject: RE: M&G Resins Utility Plant Draft Permit and Statement of Basis are ready for your review and comment

Thanks Brad. For some reason my version of Word does not pull up the SOB file correctly, but others here do not have that problem.

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Wednesday, September 10, 2014 8:22 AM
To: Larry Moon; Thomas Sullivan
Cc: Robinson, Jeffrey
Subject: RE: M&G Resins Utility Plant Draft Permit and Statement of Basis are ready for your review and comment

Sure, I will send a new copy, one as word, the other as a pdf of the word. See attached.

Let me know if these work.
Brad

From: Larry Moon [mailto:lmoon@zephyrenv.com]
Sent: Wednesday, September 10, 2014 8:16 AM
To: Toups, Brad; Thomas Sullivan
Cc: Robinson, Jeffrey
Subject: RE: M&G Resins Utility Plant Draft Permit and Statement of Basis are ready for your review and comment

Brad,

There is a problem with the Word file. I am only seeing 9 pages. Can you send a pdf copy of the SOB?

Larry Moon P.E. | Principal
Zephyr Environmental Corporation
2600 Via Fortuna, Ste 450 | Austin, TX 78746
Direct: 512.879.6619 | lmoon@zephyrenv.com
ZephyrEnv.com | HazMatAcademy.com

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Wednesday, September 10, 2014 7:57 AM
To: Larry Moon; Thomas Sullivan
Cc: Robinson, Jeffrey
Subject: RE: M&G Resins Utility Plant Draft Permit and Statement of Basis are ready for your review and comment

Hi Larry,

I took a quick scan thru the 26 page SOB we sent on the utility plant, and it looks complete. The SOB on this is relatively short, but that is because it entails only a few source. The SOB on the Resins plant will be longer.

Was there a specific section you thought was cut off?
Thanks
Brad

From: Toups, Brad
Sent: Friday, September 05, 2014 4:13 PM
To: Larry Moon; 'Thomas Sullivan'
Cc: Robinson, Jeffrey
Subject: RE: M&G Resins Utility Plant Draft Permit and Statement of Basis are ready for your review and comment

Hi All,
Apparently the imbedded acrobat file that was the site location map in the SOB is not permitted to pass your server, and so my original email was kicked back to me. Therefore, I have replaced the graphic with the error message I got from your email server. Looks like I will need to find a way to convert the acrobat graphic into a plain jpg or something. Otherwise, the files are ready for your review.

Brad

From: Toups, Brad
Sent: Friday, September 05, 2014 4:02 PM
To: Larry Moon; 'Thomas Sullivan'

Cc: Robinson, Jeffrey
Subject: M&G Resins Utility Plant Draft Permit and Statement of Basis are ready for your review and comment

Hi Larry, Thomas,

We are ready for your review and comment on the Utility plant permit documents. The Resins plant related documents are still in legal review here at the EPA. We would appreciate you providing your comments to us by COB Wed, Sept 10, if at all possible.

Also, we anticipate the large discrepancy in the original estimate of CCS (The 2013 app, approx. $150MM) and the revised cost estimate (May 2014, >$600 MM) should have a more detailed rationale in the record. Providing that rationale in the record prior to going to public notice may allow the public to better understand why the more recent estimate is validly and substantially more accurate.

Thanks for your comments in advance,

Brad Toups
Air Permit Section
Multimedia Planning and Permitting Division
US EPA, Region 6
1445 Ross Ave, Suite 1200 (6PD-R)
Dallas, Tx 75202
214.665.7258

**PREVENTION OF SIGNIFICANT DETERIORATION PERMIT
FOR GREENHOUSE GAS EMISSIONS
ISSUED PURSUANT TO THE REQUIREMENTS AT 40 CFR § 52.21**

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 6

PSD PERMIT NUMBER: PSD-TX-1354-GHG

PERMITTEE: M & G Resins USA, L.L.C.
450 Gears Rd Ste 240
Houston, Texas 77067-4513

FACILITY NAME: Utility Plant

FACILITY LOCATION: 7001 Joe Fulton International Trade Corridor, Suite 200, Corpus Christi, Texas 78409

Pursuant to the provisions of the Clean Air Act (CAA), Subchapter I, Part C (42 U.S.C. Section 7470, et. Seq.), and the Code of Federal Regulations (CFR) Title 40, Section 52.21, and the Federal Implementation Plan at 40 CFR § 52.2305 (effective May 1, 2011 and published at 76 FR 25178), the U.S. Environmental Protection Agency, Region 6 is issuing a Prevention of Significant Deterioration (PSD) permit to M & G Resins USA, L.L.C. (M&G Resins) for Greenhouse Gas (GHG) emissions. The Permit for the Utility Plant applies to the construction of a plant, as part of a larger new major stationary source located in Nueces County, Texas, that consists of (1) a combined heat and power plant option or (2) three boilers with no power production option.

M&G Resins is authorized to construct a new utility plant as described herein, in accordance with the permit application (and plans submitted with the permit application), the federal PSD regulations at 40 CFR § 52.21, and other terms and conditions set forth in this PSD permit in conjunction with the corresponding Texas Commission on Environmental Quality (TCEQ) PSD permit No. PSD-TX-1354. Failure to comply with any condition or term set forth in this PSD Permit may result in enforcement action pursuant to Section 113 of the Clean Air Act (CAA). This PSD Permit does not relieve M&G Resins of the responsibility to comply with any other applicable provisions of the CAA (including applicable implementing regulations in 40 CFR Parts 51, 52, 60, 61, 72 through 75, and 98) or other federal and state requirements (including the state PSD program that remains under approval at 40 CFR § 52.2303).

In accordance with 40 CFR §124.15(b), this PSD Permit becomes effective 30 days after the service of notice of this final decision unless review is requested on the permit pursuant to 40 CFR §124.19.

______________________________ ______________

Wren Stenger, Director — Date
Multimedia Planning and Permitting Division

Sept 4 2014 Draft for Company Comment prior to public notice.

M&G Resins USA, L.L.C. (PSD-TX-1354-GHG)
Prevention of Significant Deterioration Permit
For Greenhouse Gas Emissions
Draft Permit Conditions

PROJECT DESCRIPTION

M&G Resins USA, L.L.C. (M&G Resins) is proposing the construction of a new Utility Plant that will either be composed of a Combined Heat and Power (CHP) Plant (Option 1) or three auxiliary boilers with no power production (Option 2). The equipment will support the new collocated PET Plant, an M&G Resins manufacturing facility comprised of a new polyethylene terephthalate (PET) unit and a new terephthalic acid (PTA) unit located in Corpus Christi, Nueces County, Texas. The Utility Plant will provide steam to the M&G Resins plant. Power will also be supplied by the CHP plant, if constructed.

The new CHP plant (Option 1) will generate approximately 49 megawatts (MW) of gross electrical power in addition to high and low pressure steam for use in the PET plant. Power generating equipment, as well as ancillary equipment, is listed below:

- One General Electric LM6000 natural gas-fired combustion turbine equipped with lean pre-mix low-NO_x combustors
- One heat recovery steam generator (HRSG) with 263 million British thermal units per hour (MMBtu/hr) natural gas-fired duct burner system containing a selective catalytic reduction system (SCR)
- One 445 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler A1)
- One 250 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler B)
- Natural gas venting
- Natural gas piping and metering

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The three Auxiliary Boilers (Option 2) will produce high and low pressure steam for use in the PET plant. Boilers, as well as ancillary equipment, are listed below:

- One 445 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler A1)
- One 445 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler A2)
- One 250 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler B)
- Natural gas venting
- Natural gas piping and metering

EQUIPMENT LIST

The following equipment is subject to this GHG PSD permit.

Option 1 (CHP Facility) Equipment

FIN	EPN	Description
CTG	CTG	Natural Gas-Fired General Electric LM6000 Combustion Turbine. The unit has a nominal base-load gross electric power output of approximately 49 MW vented to a 263 MMBtu/hr duct-fired HRSG for steam generation (Combustion Unit). The Combustion Unit is
AUXBLRA1	AUXBLRA1	Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 445 MMBtu/hr.
AUXBLRB	AUXBLRB	Limited-use Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 250 MMBtu/hr.
NG-FUG	NG-FUG	Natural Gas Piping and Metering Equipment Leak Components.
MSS-FUG	MSS-FUG	Natural Gas Venting related to Turbine Startup and Shutdown and Equipment Maintenance.

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Option 2 (Three Auxiliary Boilers) Equipment

FIN	EPN	Description
AUXBLRA1	AUXBLRA1	Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 445 MMBtu/hr.
AUXBLRA2	AUXBLRA2	Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 445 MMBtu/hr.
AUXBLRB	AUXBLRB	Limited-use Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 250 MMBtu/hr.
NG-FUG	NG-FUG	Natural Gas Piping and Metering Equipment Leak Components.
MSS-FUG	MSS-FUG	Natural Gas Venting related to Equipment Maintenance.

I. GENERAL PERMIT CONDITIONS

A. PERMIT EXPIRATION

As provided in 40 CFR §52.21(r), this PSD Permit shall become invalid if construction:

1. is not commenced (as defined in 40 CFR §52.21(b)(9)) within 18 months after the approval takes effect; or

2. is discontinued for a period of 18 months or more; or

3. is not completed within a reasonable time.

Pursuant to 40 CFR §52.21(r), EPA may extend the 18-month period upon a written satisfactory showing that an extension is justified.

B. PERMIT NOTIFICATION REQUIREMENTS

Permittee shall notify EPA Region 6 in writing or by electronic mail of the:

1. date construction is commenced, postmarked within 30 days of such date;

2. actual date of initial startup, as defined in 40 CFR §60.2, postmarked within 15 days of such date; and

3. date upon which initial performance tests will commence, in accordance with the provisions of Section VI, postmarked not less than 30 days prior to such date. Notification may be provided with the submittal of the performance test protocol required pursuant to Condition VI.C.

C. FACILITY OPERATION

At all times, including periods of startup, shutdown, and maintenance, Permittee shall, to the extent practicable, maintain and operate the facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the EPA, which may include, but is not limited to, monitoring results, review of operating maintenance procedures and inspection of the facility.

D. **MALFUNCTION REPORTING**

1. Permittee shall notify EPA by mail within 48 hours following the discovery of any failure of air pollution control equipment, process equipment, or of a process to operate in a normal manner, which results in an increase in GHG emissions above the allowable emission limits stated in Sections II and III of this permit.

2. Within 10 days of the restoration of normal operations after any failure described in condition I.D.1., Permittee shall provide a written supplement to the initial notification that includes a description of the malfunctioning equipment or abnormal operation, the date of the initial malfunction, the period of time over which emissions were increased due to the failure, the cause of the failure, the estimated resultant emissions in excess of those allowed in Section II and III, and the methods utilized to mitigate emissions and restore normal operations.

3. Compliance with this malfunction notification provision shall not excuse or otherwise constitute a defense to any violation of this permit or any law or regulation such malfunction may cause.

E. **RIGHT OF ENTRY**

EPA authorized representatives, upon the presentation of credentials, shall be permitted:

1. to enter the premises where the facility is located or where any records are required to be kept under the terms and conditions of this PSD Permit;

2. during normal business hours, to have access to and to copy any records required to be kept under the terms and conditions of this PSD Permit;

3. to inspect any equipment, operation, or method subject to requirements in this PSD Permit; and,

4. to sample materials and emissions from the source(s).

F. **TRANSFER OF OWNERSHIP**

In the event of any changes in control or ownership of the facilities to be constructed, this PSD Permit shall be binding on all subsequent owners and operators. Permittee shall notify the succeeding owner and operator of the existence of the PSD Permit and its conditions by letter; a copy of the letter shall be forwarded to EPA Region 6 within thirty days of the letter signature.

G. SEVERABILITY

The provisions of this PSD Permit are severable, and, if any provision of the PSD Permit is held invalid, the remainder of this PSD Permit shall not be affected.

H. ADHERENCE TO APPLICATION AND COMPLIANCE WITH OTHER ENVIRONMENTAL LAWS

Permittee shall construct this project in compliance with this PSD Permit, the application on which this permit is based, the TCEQ PSD Permit PSD-TX-1354 (when issued) and all other applicable federal, state, and local air quality regulations. This PSD permit does not release the Permittee from any liability for compliance with other applicable federal, state and local environmental laws and regulations, including the Clean Air Act.

I. ACRONYMS AND ABBREVIATIONS

API	American Petroleum Institute
BACT	Best Available Control Technology
CAA	Clean Air Act
CC	Carbon Content
CCS	Carbon Capture and Sequestration
CHP	Combined Heat and Power
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
CH_4	Methane
CO_2	Carbon Dioxide
CO_{2e}	Carbon Dioxide Equivalent
CT	Combustion Turbine
DLNB	Dry Low-NO_x Burner
dscf	Dry Standard Cubic Foot EF Emission Factor
EPN	Emission Point Number
FIN	Facility Identification Number
Fc	Carbon Dioxide-Based Fuel Factor
FR	Federal Register
GCV	Gross Calorific Value
GHG	Greenhouse Gas
gr	Grains
GWP	Global Warming Potential
HRSG	Heat Recovery Steam Generator
HHV	High Heating Value
hr	Hour
lb	Pound
LDAR	Leak Detection and Repair
MMBtu	Million British Thermal Units
MSS	Maintenance, Start-up and Shutdown
N_2O	Nitrous Oxides
NO_x	Nitrogen Oxides
NSPS	New Source Performance Standards
PSD	Prevention of Significant Deterioration
QA/QC	Quality Assurance and/or Quality Control
SCFH	Standard Cubic Feet per Hour
SCR	Selective Catalytic Reduction
SF_6	Sulfur Hexafluoride
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TPY	Tons per Year
USC	United States Code
VOC	Volatile Organic Compound

II. Annual Emission Limits

Annual emissions in tons per year (TPY) on a 12-month rolling average shall not exceed the following:

Table 1A. Annual Emission Limits (Option 1)[1]

FIN	EPN	Description	GHG Mass Basis		TPY CO_2e[2,3]	BACT Requirements
				TPY[2]		
CTG	CTG	General Electric LM6000 CT with 263 MMBtu/hr Duct Burner and HRSG	CO_2 CH_4 N_2O	363,652 6.86 0.69	364,027	Minimum Thermal Efficiency of 60% (LHV basis). See Special Condition III.C.1. and 2.
AUXBLRA1	AUXBLRA1	Auxiliary Boiler A1	CO_2 CH_4 N_2O	247,281 4.66 0.47	247,537	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
AUXBLRB	AUXBLRB	Auxiliary Boiler B	CO_2 CH_4 N_2O	127,992 2.41 0.24	128,125	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
NG-FUG	NG-FUG	Natural Gas Fugitives	CH_4	No Emission Limit Established[4]	No Emission Limit Established[4]	Implementation of AVO monitoring program. See Special Condition III.F.1. and 2.
MSS-FUG	MSS-FUG	MSS Natural Gas Venting	CH_4	No Emission Limit Established[4]	No Emission Limit Established[4]	Implementation of AVO monitoring program. See Special Condition III.G.1. and 2.
Totals[5]			**CO_2** **CH_4** **N_2O**	**738,926** **34** **1**	**CO_2e 740,199**	

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1. Compliance with the annual emission limits (tons per year) is based on a 12-month, rolling total.
2. The TPY emission limits specified in this table are not to be exceeded for this facility and include emissions from the facility during all operations and include MSS activities.
3. Global Warming Potentials (GWP): CH_4 = 25, N_2O = 298, SF_6=22,800
4. Fugitive process emissions from EPNs NG-FUG and MSS-FUG are estimated to be 20 TPY of CH_4, and 511 CO_{2e}. The emission limit will be a design/work practice standard as specified in the permit.
5. The total emissions for CH_4 and CO_{2e} include the PTE for process fugitive emissions of CH_4. Total emissions are for information only and do not constitute an emission limit.

Table 1B. Annual Emission Limits (Option 2)[1]

FIN	EPN	Description	GHG Mass Basis		TPY CO_2e[2,3]	BACT Requirements
				TPY[2]		
AUXBLRA1	AUXBLRA1	Auxiliary Boiler A1	CO_2	247,281	247,537	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
			CH_4	4.66		
			N_2O	0.47		
AUXBLRA2	AUXBLRA2	Auxiliary Boiler A2	CO_2	247,281	247,537	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
			CH_4	4.66		
			N_2O	0.47		
AUXBLRB	AUXBLRB	Auxiliary Boiler B	CO_2	127,992	128,125	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
			CH_4	2.41		
			N_2O	0.24		
NG-FUG	NG-FUG	Natural Gas Fugitives	CH_4	No Emission Limit Established[4]	No Emission Limit Established[4]	Implementation of AVO monitoring program. See Special Condition III.F.1. and 2.
MSS-FUG	MSS-FUG	MSS Natural Gas Venting	CH_4	No Emission Limit Established[4]	No Emission Limit Established[4]	Implementation of AVO monitoring program. See Special Condition III.G.1. and 2.
Totals[5]			**CO_2**	**622,555**	**CO_2e**	
			CH_4	**32**		
			N_2O	**1**	**623,708**	

1. Compliance with the annual emission limits (tons per year) is based on a 12-month, rolling total.
2. The TPY emission limits specified in this table are not to be exceeded for this facility and include emissions from the facility during all operations and include MSS activities.
3. Global Warming Potentials (GWP): CH_4 = 25, N_2O = 298, SF_6=22,800
4. Fugitive process emissions from EPNs NG-FUG and MSS-FUG are estimated to be 20 TPY of CH_4, and 511 CO_{2e}. The emission limit will be a design/work practice standard as specified in the permit.
5. The total emissions for CH_4 and CO_{2e} include the PTE for process fugitive emissions of CH_4. Total emissions are for information only and do not constitute an emission limit.

III. SPECIAL PERMIT CONDITIONS

A. Construction Limitations

1. Permittee shall only construct and operate the emission units in either Option 1 or Option 2. No combination of the two options is allowed. Within 120 days of making the selection of which Option to implement, but in any case, no later than 180 days prior to the projected date of startup, the permit holder must submit a permit application to the permitting authority to administratively amend the permit to remove the relevant provisions from the permit related to the option not selected.

B. Combined Heat and Power Plant (Option 1 EPN: CTG) Work Practice Standards, Operational Requirements, and Monitoring:

1. Permittee shall limit fuel to the combustion turbine (CT) and duct burner (DB) to pipeline quality natural gas with a fuel sulfur content of up to 5 grains of sulfur per 100 dry standard cubic feet (gr S/100 dscf). The gross calorific value of the fuel shall be determined monthly by the procedures contained in 40 CFR Part 98 and records shall be maintained of the monthly fuel gross calorific value for a period of five years.

2. The carbon content of the natural gas fuel shall be obtained by semiannual testing per 40 CFR§98.34(b)(3)(ii)(A). Upon request, Permittee shall provide a sample and/or analysis of the fuel that is fired in the CT at the time of the request, or shall allow a sample to be taken by EPA for analysis.

3. Permittee shall monitor fuel gas flow continuously for both the CT and DB; determine fuel higher heating value whenever there is a fuel change or monthly, whichever is less; and calculate the total daily heat input.

4. The flow rate of the fuel combusted in the CT and DB shall be measured and automatically recorded using an operational data acquisition and handling system.

5. Natural gas flow meters shall be calibrated in accordance with 40 CFR§98.34(b)(1).

6.

7.

8. In accordance with 40 CFR Part 60, the Permittee shall ensure that all required fuel flow meters are installed, a periodic schedule for GCV fuel sampling is initiated and all certification tests are completed on or before the earlier of 90 unit operating days or 180 calendar days after the date the affected combustion unit commences commercial operation.

9. The emission limits established in Table 1A include emissions associated with MSS Activities.

10. Permittee shall monitor and record the following parameters daily:

Deleted: Natural gas quality fuels with t

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Commented [ER1]: The flow meters in this performance specification are exhaust gas flowmeters (note that section 8.2.2 of PS6 references exhaust flow Reference Methods). This condition should be removed because the GHG emission rate is calculated based on fuel flow rather than exhaust flow.

Deleted: Flow meters shall meet the specification in 40 CFR 60 Appendix B Spec. 6

Commented [ER2]: 40 CFR 60 Appendix F contains quality assurance requirements for continuous emission monitoring SYSTEMS as a whole. Appendix F does not contain QA requirements for individual components of the system. This condition should be removed as there are no applicable QA requirements in App F for the flow meter component.

Deleted: All flow meters shall meet the Quality Assurance Specifications in 40 CFR Appendix F

Commented [ER3]: This is inconsistent with the efficiency limit table which is on a lower heating value basis

a. CT fuel input – volumetric measurement of fuel flow converted into mass (lb/hr) and energy flow (MMBtu/hr);
b. DB fuel input – volumetric measurement of fuel flow converted into mass (lb/hr) and energy flow (MMBtu/hr);
c. Gross hourly energy output of CT (kwh);
d. Hourly steam flow rate (lb/hr);
e. Hourly steam enthalpy (MMBtu/lb);
f. Hourly feedwater flow rate (lb/hr);
g. Hourly feedwater enthalpy (MMBtu/lb);
h. CHP plant thermal efficiency %;

11. CHP plant thermal efficiency shall be calculated using the inputs from Special Condition No. 10 and the following equation:

Thermal efficiency = [(d x e) - (f x g) + c x 0.00341443] / [(a + b) x LHV of fuel] x 100%

Where

f	=	Hourly feedwater flow rate (lb/hr);
g	=	Hourly feedwater enthalpy (MMBtu/lb);
d	=	Hourly steam flow rate (lb/hr);
e	=	Hourly steam enthalpy (MMBtu/lb);
c	=	Gross hourly energy output of CT (kwh);
a	=	CT fuel input – volumetric measurement of fuel flow converted into mass (lb/hr) and energy flow (MMBtu/hr);
b	=	DB fuel input – volumetric measurement of fuel flow converted into mass (lb/hr) and energy flow (MMBtu/hr);
LHV	=	Lower heating value of fuel.

12. Permittee shall determine the hourly CO_2 emission rate in accordance with 40 CFR Part 98 Subpart C § 98.33(a)(3)(iii).

13. Permittee shall calculate the CH_4 and N_2O emissions on a 12-month rolling basis to be updated by the last day of the following month. Permittee shall determine compliance with the CH_4 and N_2O emissions limits contained in this section using the default CH_4 and N_2O emission factors contained in Table C-2 and equation C-8 of 40 CFR Part 98 and the HHV (for natural gas), converted to short tons.

14. Permittee shall calculate the CO_{2e} emissions on a 12-month rolling basis, based on the procedures and Global Warming Potentials (GWP) contained in Greenhouse Gas Regulations, 40 CFR Part 98, Subpart A, Table A-1, as published on November 29, 2013 (78 FR 71948). The record shall be updated by the last day of the following month.

C. Combined Heat and Power Plant (Option 1 EPN: CTG) BACT Emission Limits:

1. On or after the date of initial startup, Permittee shall maintain a minimum thermal efficiency for the CHP plant of 60% on a 12-month rolling average. To determine this BACT emission limit, Permittee shall calculate the limit based on the measured hourly thermal efficiency. The

Commented [ER4]: The efficiency value given in the BACT table is stated on a lower heating value basis

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Commented [ER5]: We recommend renumbering to match condition 10.

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calculated hourly rate is averaged monthly.

2. Within 180 days of the date of initial startup of the combustion turbine, the Permittee shall perform an initial emission test for CO_2 and use emission factors from 40 CFR Part 98. To verify compliance with the BACT emission limit, the Permittee shall calculate the limit based on the measured hourly thermal efficiency of the CHP plant. If the CT does not meet the BACT emissions limit, the Permittee may continue operation of the CT in order to perform necessary corrective actions and to continue plant operations. Once corrective actions have been made, the Permittee will schedule a follow-on emissions test and will make appropriate notifications to the EPA.

3. On or after initial performance testing, Permittee shall use the combustion turbines, and waste heat recovery units energy efficiency processes, work practices and designs as represented in the permit application.

D. Auxiliary Boilers (Option 1 EPNs: AUXBLRA1 and AUXBLRB or Option 2 EPNs: AUXBLRA1, AUXBLRA2, and AUXBLRB) Work Practice Standards, Operational Requirements, and Monitoring:

1. Boilers shall combust only pipeline quality natural gas.

2. Permittee shall measure and automatically record the fuel flow rate using an operational data acquisition and handling system.

3. Permittee shall calibrate and perform a preventative maintenance check of the fuel gas flow meters and document annually.

4. Permittee shall perform a preventative maintenance check of oxygen control analyzers and document annually.

5. Permittee shall perform maintenance of the burners, at a minimum of, annually.

6. The maximum firing rate for the AUXBLRA1 and AUXBLRA2 shall not exceed 445 MMBtu/hr (HHV).

7. The maximum firing rate for the AUXBLRB shall not exceed 250 MMBtu/hr (HHV).

8. The one-hour maximum firing rates shall be calculated daily to demonstrate compliance with the firing rates in Special Condition III.D.6. and 7. The rolling 12-month basis shall be calculated monthly for Special Condition III.D.7.

9. Permittee shall install, operate, and maintain an automated air/fuel control system.

10. Permittee shall calibrate and perform preventative maintenance on the air/fuel control analyzers, at a minimum, annually.

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11. Permittee shall calculate the amount of CO_2 (mass basis) emitted for the boilers in tons per year (tpy) on a 12-month rolling total based on metered fuel consumption and using the Tier III methodology in accordance with 40 CFR Part 98 Subpart C §98.33(a)(3)(iii).

12. Permittee shall calculate the CH_4 and N_2O emissions on a 12-month rolling basis to be updated by the last day of the following month. Permittee shall determine compliance with the CH_4 and N_2O emissions limits contained in this section using the default CH_4 and N_2O emission factors contained in Table C-2 and equation C-8 of 40 CFR Part 98 and the HHV (for natural gas), converted to short tons.

13. Permittee shall calculate the CO_{2e} emissions on a 12-month rolling basis, based on the procedures and Global Warming Potentials (GWP) contained in Greenhouse Gas Regulations, 40 CFR Part 98, Subpart A, Table A-1, as published on November, 29,2013 (78 FR 71948). The record shall be updated by the last day of the following month.

E. Auxiliary Boilers (Option 1 EPNs: AUXBLRA1 and AUXBLRB or Option 2 EPNs: AUXBLRA1, AUXBLRA2, and AUXBLRB) BACT Emission Limits:

1. The Permittee shall maintain a minimum overall thermal efficiency of 77% (LHV) or greater on a 12-month rolling average basis, calculated monthly, for each boiler (AUXBLRA1, AUXBLRA2, and AUXBLRB).

2. Auxiliary boiler thermal efficiency (AUXBLRA1, AUXBLRA2, and AUXBLRB) shall be calculated using the following equation:

Thermal efficiency = [(a x b) - (c x d)] / [e x LHV of fuel] x 100%

Where

a = Hourly steam flow rate (lb/hr);
b = Hourly steam enthalpy (MMBtu/lb);
c = Hourly feedwater flow rate (lb/hr);
d = Hourly feedwater enthalpy (MMBtu/lb);
e = Boiler fuel input – volumetric measurement of fuel flow converted into mass (lb/hr) and energy flow (MMBtu/hr);
LHV = Lower heating value of fuel.

Deleted: The boilers (AUXBLRA1, AUXBLRA2, and AUXBLRB) will be continuously monitored for exhaust temperature, input fuel temperature, and stack oxygen. Thermal efficiency for heaters will be calculated monthly from these parameters using equation G-1 from American Petroleum Institute (API) methods 560 (4th ed.) Annex G.

F. Natural Gas Piping and Metering Equipment Leak Components (EPN: NG-FUG) Work Practice Standards, Operational Requirements, and Monitoring

1. The Permittee shall implement an audio/visual/olfactory (AVO) monitoring program to monitor for leaks.

2. AVO monitoring shall be performed on a weekly basis.

3. The Permittee shall maintain a file of all records, data measurements, reports and documents related to the fugitive emission sources including, but not limited to, the following: all records or reports pertaining to maintenance performed, the date and time that assessments

were made and documentation of repairs attempted and achieved, including when the component was restored to proper operation.

G. Natural Gas Piping and Metering Equipment Leak Components (EPN: MSS-FUG) Work Practice Standards, Operational Requirements, and Monitoring

1. The Permittee shall implement work practices that minimize venting of any greenhouse gas from any fuel supply system during de-inventory of such system for maintenance, startup, shutdown, or repair purposes. Such practices may include but are not limited to minimizing the run of piping required to be de-inventoried to that which must be de-inventoried to achieve the needed safe conditions necessary to affect repairs or maintenance activities. Venting to atmosphere is not permitted when such vented emissions could safely be routed to their ordinary control device, if any.

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2. Documentation of the steps taken to minimize the volume of gas vented, including the best estimate of speciation of the gas vented and a good engineering practice based estimate of the quantity of GHG gas so vented. Such documentation shall be made for each such venting event.

3. The Permittee shall maintain a file of all records, data measurements, reports and documents related to venting to atmosphere of natural gas and other GHG containing fuel system feed lines, other GHG containing lines authorized by this permit, and components, including, but not limited to, the following: all records or reports pertaining to the reason the venting event was required, any maintenance performed or repairs affected, the duration of the event, an estimate of the quantity of CO_2e vented during the event, and the date and time of restoration to proper operation.

H. Continuous Emissions Monitoring Systems (CEMS)

1. As an alternative to Special Conditions III.B.12 and III.D.11, Permittee may install a CO_2 CEMS and volumetric stack gas flow monitoring system with an automated data acquisition and handling system for measuring and recording CO_2 emissions discharged to the atmosphere, and use these values to show compliance with the annual emission limit in Table 1.

2. Permittee shall ensure that all required CO_2 monitoring system/equipment are installed and all certification tests are completed on or before the earlier of 90 unit operating days or 180 calendar days after the date the unit commences operation.

3. Permittee shall ensure compliance with the specifications and test procedures for CO_2 emission monitoring system at stationary sources, 40 CFR Part 98, or 40 CFR Part 60, Appendix B, Performance Specification numbers 1 through 9, as applicable.

IV. RECORDKEEPING AND REPORTING

1. In order to demonstrate compliance with the GHG emission limits in Table 1A or 1B, the Permittee will monitor the following parameters and summarize the data on a calendar month

basis.

a. The natural gas fuel usage rate (scf) for all combustion sources, using non-resettable elapsed fuel flow monitors; and

b. Monthly fuel sampling.

2. Permittee shall maintain all records, data, measurements, reports, and documents related to the operation of the affected combustion units, including, but not limited to, the following:
   all records or reports pertaining to significant maintenance performed on any affected combustion unit;
   duration of maintenance, startup, shutdown events and the initial startup period for the affected combustion units;
   malfunctions that may result in excess GHG emissions;
   all records relating to performance tests, calibrations, checks, and monitoring of affected combustion equipment;
   duration of an inoperative monitoring devices and affected combustion units with the required corresponding emission data; and
   all other information required by this permit recorded in a permanent form suitable for inspection. The records must be retained for not less than five years following the date of such measurements, maintenance, reports, and/or records

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3. Permittee shall maintain records of all CO_2 emission certification tests and monitoring and compliance information required by this permit.

4. Permittee shall maintain records and submit a written report of all excess emissions to EPA semi-annually, except when: more frequent reporting is specifically required by an applicable subpart; or the Administrator or authorized representative, on a case-by-case basis, determines that more frequent reporting is necessary to accurately assess the compliance status of the source. The report is due on the 30th day following the end of each semi-annual period and shall include the following:

   a. Time intervals, data and magnitude of the excess emissions, the nature and cause (if known), corrective actions taken and preventive measures adopted;

   b. Applicable time and date of each period during which the monitoring equipment was inoperative (monitoring down-time);

   c. A statement in the report of a negative declaration; that is; a statement when no excess emissions occurred or when the monitoring equipment has not been inoperative, repaired or adjusted; and

   d. Any failure to conduct any required source testing, monitoring, or other compliance activities.

5. Excess emissions shall be defined as any period in which the facility emissions exceed a maximum emission limit set forth in this permit.

6. Excess emissions indicated by GHG emission source testing as required by Special Condition V, Performance Testing, or compliance monitoring shall be considered violations of the applicable emission limit for the purpose of this permit.

7. All records required in Special Condition III.G related to maintenance, startup, and shutdown related venting of GHG to atmosphere, including, based on the records kept, a rolling 12-month total estimate of the CO_2e emissions thus vented.

8. All records required by this PSD Permit shall be retained and remain accessible for not less than 5 years following the date of such measurements, maintenance, and reporting.

V. PERFORMANCE TESTING

1. The Permittee shall perform stack sampling and other testing to establish the actual pattern and quantities of air contaminants being emitted into the atmosphere from the stacks of the Combustion Turbine/Duct Burner Unit (EPN: CTG), and the Auxiliary Boilers (EPNs: AUXBLRA1, AUXBLRA2, and AUXBLRB) to determine the initial compliance with the CO_2 emission limits established in this permit. Sampling shall be conducted in accordance with 40 CFR § 60.8 and EPA Method 3a or 3b for the concentration of CO_2.

2. The Permittee shall multiply the CO_2 hourly average emission rate determined under maximum operating test conditions by 8,760 hours for comparison to the units' CO_2 emission limit (TPY) in Table 1.

3. If the above calculated CO_2 emission total does not exceed the tons per year (TPY) specified on Table 1, no compliance strategy needs to be developed.

4. If the above calculated CO_2 emission total exceeds the tons per year (TPY) specified in Table 1, the facility shall:

   a. Document the potential to exceed in the test report; and

   b. Explain within the report how the facility will assure compliance with the CO_2 emission limit listed in Table 1.

5. Within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup of the facility, performance tests(s) must be conducted and a written report of the performance testing results furnished to the EPA. Additional sampling may be required by EPA.

6. Permittee shall submit a performance test protocol to EPA no later than 30 days prior to the test to allow review of the test plan and to arrange for an observer to be present at the test. The performance test shall be conducted in accordance with the submitted protocol, and any changes required by EPA.

7. Fuel sampling for emission units CTG, AUXBLRA1, AUXBLRA2, and AUXBLRB shall be conducted in accordance with 40 CFR Part 75 and Part 98.

8. The combustion turbine shall be tested at or above 90% of maximum load operation. The permit holder shall present at the pretest meeting the manner in which stack sampling will be executed in order to demonstrate compliance with the emissions limits contained in Section II.

9. Performance tests must be conducted under such conditions to ensure representative performance of the affected facility. The owner or operator must make available to the EPA such records as may be necessary to determine the conditions of the performance tests.

Commented [ER7]: This test requirement is inconsistent with the test requirement at condition III.C.2. which is based on Part 98

10. The owner or operator must provide the EPA at least 30 days' prior notice of any performance test, except as specified under other subparts, to afford the EPA the opportunity to have an observer present and/or to attend a pre-test meeting. If there is a delay in the original test date, the facility must provide at least 7 days prior notice of the rescheduled date of the performance test.

11. The owner or operator shall provide, or cause to be provided, performance testing facilities as follows:

    a. Sampling ports adequate for test methods applicable to this facility,

    b. Safe sampling platform(s),

    c. Safe access to sampling platform(s), and

    d. Utilities for sampling and testing equipment.

12. Unless otherwise specified, each performance test shall consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the applicable standard. For purposes of determining compliance with an applicable standard, the arithmetic mean of the results of the three runs shall apply.

VI. Agency Notifications

Permittee shall submit GHG permit applications, permit amendments, and other applicable permit information to:

Multimedia Planning and Permitting Division
EPA Region 6
1445 Ross Avenue (6PD-R) Dallas, TX 75202
Email: Group R6AirPermits@EPA.gov

Permittee shall submit a copy of all compliance and enforcement correspondence as required by this Approval to Construct to:

Compliance Assurance and Enforcement Division
EPA Region 6
1445 Ross Avenue (6EN) Dallas, TX 75202

Statement of Basis
Draft Greenhouse Gas Prevention of Significant Deterioration Preconstruction Permit
for the M&G Resins USA, L.L.C., Utility Plant

Permit Number: PSD-TX-1354-GHG

Sept 4 2014 Draft

This document serves as the Statement of Basis (SOB) for the above-referenced draft permit, as required by 40 CFR 124.7. This document sets forth the legal and factual basis for the draft permit conditions and provides references to the statutory or regulatory provisions, including provisions under 40 CFR 52.21, that would apply if the permit is finalized. This document is intended for use by all parties interested in the permit.

I. Executive Summary

In February 2013, two separate companies, M&G Resins USA LLC (M&G Resins), and NRG Development Company, Inc (NRG) each notified the EPA and the Texas Commission on Environmental Quality (TCEQ) by way of Prevention of Significant Deterioration (PSD) permit application submittals that they were planning to develop a common greenfield location near Corpus Christ, Nueces County, Texas into a new chemical process plant with a utility support facility that will together constitute a major stationary source for new source review purposes See 40 CFR 52.21(b)(5), (6). M&G Resins planned to build a new resin manufacturing complex (or, the PET Plant, from "polyethylene terephthalate") while NRG intended to build a collocated combined heat and power utility plant (the Utility Plant) to exclusively serve the steam and electrical demands of M&G Resins' PET plant. The entire project bears the label "Project Jumbo." In March of 2014, M&G Resins acquired ownership of the Utility Plant from NRG and revised the Utility Plant permit application to authorize two optional plant configurations: Option 1: the construction of the combined heat and power plant as originally proposed by NRG, or Option 2: the construction of boiler facilities to provide steam but not to provide power. The company would be obligated to select only one of the two mutually exclusive options under which to construct and operate. Notably, in the Option 2 configuration, the Utility Plant would not be regulated under the proposed action, "Greenhouse Gas Emissions from New Stationary Sources: Generating Units", (79 FR 1430, January 8, 2014), because it would not meet the applicability criteria set forth in that proposal. Under Option 1, the gas turbine would potentially meet the applicability criteria for size under the proposed 40 CFR 60 KKKK, and would by its design meet the Best System of Emissions Reductions by the nature of the proposed facility, by operating at a rate well below the standard required.[1] However, the company is not planning to sell power to the grid, therefore, the source is not subject to the proposed KKKK.[2]

[1] Specifically, M&G Resins LLC would be subject to KKKK and would meet the 1000 lb/MWh limit as found in Table 2 of 40 CFR § 60.4326, as the estimated emissions, calculated in accordance with the relevant proposed KKKK methodology, would equal 682.4 lb/MWh without duct firing, and would equal 603.4 lb/MWh with duct burner firing, both turbine and duct burners firing natural gas.
[2] The company represents that under Option 1, it will not meet the criteria of the proposed (79 FR 1430) 40 CFR § 60.4305(c)(5), which reads "(5) Was constructed for the purpose of supplying, and supplies, one-third or more of its potential electric output and more than 219,000 MWh net-electrical output to a utility distribution system on a 3 year rolling average basis."

While these two plants, the PET plant and the Utility Plant, together constitute a single stationary source for PSD purposes, the applicant requests that the applicable requirements for the Best Available Control Technology (BACT) be addressed through separate proposed PSD permits. Consistent with the state-submitted PSD permit applications, TCEQ is similarly proposing separate PSD permits to address all non-GHG pollutants. This SOB addresses the PSD requirements and associated terms and conditions for GHG emissions from emissions units at the proposed Utility Plant. GHG emissions from the PET plant are addressed via the separately proposed PSD permit PSD-TX-1352-GHG and its supporting statement of basis. While the analysis of Carbon Capture and Storage (CCS) considers the major emitting units for the site as whole (as part of a logical grouping of emission units), this SOB otherwise conducts a BACT review only for the emissions attributable to Utility Plant emissions units and operations. The SOB for the proposed PET plant PSD permit should be consulted for the full BACT review that applies to PET plant emissions and emissions units.

The TCEQ is currently developing the combined PSD and minor source permit (PSD-TX-1354/108819, respectively) for criteria pollutants from the proposed Utility Plant.

After reviewing the application, EPA Region 6 has prepared the following statement of basis and a draft air permit to apply GHG PSD requirements to the construction of the Utility Plant.

This SOB documents the information and analysis EPA used to support the decisions EPA made in drafting the air permit. It includes a description of the proposed facility, the applicable air permit requirements, and an analysis showing how the applicant will comply with the requirements.

EPA Region 6 concludes initially that M&G’s application is complete and provides the necessary information to demonstrate that the proposed project meets the applicable air permit regulations. EPA's initial conclusions rely upon information provided in the permit application, supplemental information requested by EPA and provided by M&G, and EPA's own technical analysis. EPA is making all this information available as part of the public record.

II. Applicant

M & G Resins USA, L.L.C.
450 Gears Rd Ste 240
Houston, Texas 77067-4513

Facility Physical Address:
M&G Resins USA, LLC Utility Plant
7001 Joe Fulton International Trade Corridor, Suite 200
Corpus Christi, Texas 78409

Technical Contact:
Ms. Allana Whitney, Project Manager – Chemtex International Inc. (910) 509-4451

III. Permitting Authority

On May 3, 2011, EPA published a Federal Implementation Plan (FIP) that makes EPA Region 6 the PSD permitting authority for the pollutant GHGs. 75 FR 25178 (promulgating 40 CFR § 52.2305).

The GHG PSD Permitting Authority for the State of Texas is:

EPA, Region 6
1445 Ross Avenue
Dallas, TX 75202

The EPA, Region 6 Permit Writer is:

Brad Toups
Air Permitting Section (6PD-R)
1445 Ross Avenue
Dallas, TX 75202
(214) 665-7258

IV. Facility Location

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Thomas Sullivan (tsullivan@zephyrenv.com)

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V. Applicability of Prevention of Significant Deterioration (PSD) Regulations

EPA Region 6 implements a GHG PSD FIP for the State of Texas under the provisions of 40 CFR 52.21 (except paragraph (a)(1)). *See* 40 CFR § 52.2305. On June 23, 2014, the United States Supreme Court issued a decision addressing the application of stationary source permitting requirements to greenhouse gases (GHG). *Utility Air Regulatory Group (UARG) v. Environmental Protection Agency* (EPA) (No. 12-1146). The Supreme Court said that the EPA may not treat greenhouse gases as an air pollutant for purposes of determining whether a source is a major source required to obtain a Prevention of Significant Deterioration (PSD) or title V permit. However, the Court also said that the EPA could continue to require that PSD permits, otherwise required based on emissions of conventional pollutants, contain limitations on GHG emissions based on the application of Best Available Control Technology (BACT). Pending further EPA engagement in the ongoing judicial process before the District of Columbia Circuit Court of Appeals, the EPA is proposing to issue this permit consistent with EPA's understanding of the Court's decision.

The source will constitute a new major source because the facility (a chemical process plant under 40 CFR 52.21(b)(1)(i)(a) with an accompanying support facility) has the potential to emit more than 100 tons per year of CO and VOC. (The applicant has estimated approximately 350 tpy VOC, and greater than 500 tpy CO for the entire project [3].) In this case, the applicant represents that TCEQ, the permitting authority for regulated NSR pollutants other than GHGs, will determine the project is subject to PSD review for these pollutants as well as any other regulated NSR pollutants determined to equal or exceed the rates set forth in 40 CFR 52.21(b)(23).

The applicant also estimates that this same project emits or has the potential to emit in excess of 1,000,000 tpy CO_2e of GHGs, which well exceeds the 75,000 ton per year CO_2e threshold in EPA regulations. 40 C.F.R § (49)(iv); *see also*, *PSD and Title V Permitting Guidance for Greenhouse Gases* (March 2011) at 12-13). Since the Supreme Court recognized EPA's authority to limit application of BACT to sources that emit GHGs in greater than *de minimis* amounts, EPA believes it may apply the 75,000 tons per year threshold in existing regulations at this time to determine whether BACT applies to GHGs at this facility.

Accordingly, this project continues to require a PSD permit that includes limitations on GHG emissions based on application of BACT. The Supreme Court's decision does not materially limit the FIP authority and responsibility of Region 6 with regard to this particular permitting action. Accordingly, under the circumstances of this project, the TCEQ will issue the non-GHG portion of the permit and EPA will issue the GHG portion.[4]

EPA Region 6 proposes to follow the policies and practices reflected in EPA's PSD and Title V Permitting Guidance for Greenhouse Gases (March 2011). For the reasons described in that

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[3] It is anticipated that the PET State/PSD permit for criteria pollutants for PET Plant will be proposed as State/PSD permit 108446/PSD-TX-1352 while the State/PSD permit for criteria pollutants from the Utility plant will be proposed as permit 108819/PSD-TX-1354.

[4] See EPA, Question and Answer Document: Issuing Permits for Sources with Dual PSD Permitting Authorities, April 19, 2011, http://www.epa.gov/nsr/ghgdocs/ghgissuedualpermitting.pdf

guidance, we have not required the applicant to model or conduct ambient monitoring for GHGs, nor have we required any assessment of impacts of GHGs in the context of the additional impacts analysis or Class I area provisions. Instead, EPA believes that compliance with the BACT analysis is the best technique that can be employed at present to satisfy the additional impacts analysis and Class I area requirements of the rules related to GHGs. We note again, however, that the project has regulated NSR pollutants that are non-GHG pollutants, which are addressed by the PSD permit to be issued by TCEQ.

VI. Project Description

M&G Resins USA, L.L.C. (M&G Resins) is proposing the construction of a new Utility Plant that will either be composed of a Combined Heat and Power (CHP) Plant (Option 1) or three auxiliary boilers with no power production (Option 2). The equipment will support a new plastic resins manufacturing facility located in Corpus Christi, Nueces County, Texas. The Utility Plant will provide steam to M&G Resins' new polyethylene terephthalate (PET) Plant and new terephthalic acid (PTA) unit located on the same site. Power will also be supplied by the CHP plant, if constructed.

The new CHP plant (Option 1) will generate approximately 49 megawatts (MW) of gross electrical power in addition to high and low pressure steam for use in the PET plant. Power generating equipment, as well as ancillary equipment, is listed below:

- One General Electric LM6000 natural gas-fired combustion turbine equipped with lean pre-mix low-NO_x combustors
- One heat recovery steam generator (HRSG) with 263 million British thermal units per hour (MMBtu/hr) natural gas-fired duct burner system containing a selective catalytic reduction system (SCR)
- One 445 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler A1)
- One 250 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler B)
- Natural gas venting
- Natural gas piping and metering

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The three Auxiliary Boilers (Option 2) will produce high and low pressure steam for use in the PET plant. Boilers, as well as ancillary equipment, are listed below:

- One 445 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler A1)
- One 445 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler A2)
- One 250 MMBtu/hr natural gas-fired boiler (Auxiliary Boiler B)
- Natural gas venting
- Natural gas piping and metering

While not falling under the terms and conditions of the proposed Utility Plant Permit, the following emissions units are part of the PET Plant:

- Four process heaters (EPNs: E7-A thru E7-D, approximately 28% of sitewide CO_2e emissions)

- Two regenerative thermal oxidizers (RTOs, EPNs: E1, E2, approximately 10.5% of sitewide CO_2e emissions)
- A Biogas Flare (EPN: Flare, approximately 1% of sitewide CO_2e emissions)
- Two diesel fuel-fired emergency electrical generator engines (EPNs: E85-A, E85-B)
- Two diesel fuel-fired fire water pump engines (EPNs: E87-A, E87-B)
- Piping fugitives (EPNs: FUGPTA, FUGPET)

The contribution of GHG to the site wide totals by the various emissions units are depicted in Tables 1a, 1b, and 1c, below.

Table 1a M&G Project Jumbo GHG Emissions- PET Plant

PET Plant (Comprised of PTA and PTE Units)							CO_2 Mass Emissions		
FIN	EPN	Description	GHG Mass Basis: GHG	GHG Mass Basis: TPY	TPY CO_2e	BACT Requirements	of Site		of Plant
E7-A	E7-A	Heat Transfer Fluid (HTF) Heater-On Nat.Gas	CO_2	72,622	72,622	Limit the exhaust gas temperature from the HTF Heaters to 320°F. See permit condition III.A.6	290,488		290,488
			CH_4	1.37	34.25		25.2%	of Opt 1	70.1%
			N_2O	0.14	41.72		28.0%	of Opt 2	
E7-B	E7-B	Heat Transfer Fluid (HTF) Heater-On Nat.Gas	CO_2	72,622	72,622	Limit the exhaust gas temperature from the HTF Heaters to 320°F. See permit condition III.A.6			
			CH_4	1.37	34.25				
			N_2O	0.14	41.72				
E7-C	E7-C	Heat Transfer Fluid (HTF) Heater-On Nat.Gas	CO_2	72,622	72,622	Limit the exhaust gas temperature from the HTF Heaters to 320°F. See permit condition III.A.6			
			CH_4	1.37	34.25				
			N_2O	0.14	41.72				
E7-D	E7-D	Heat Transfer Fluid (HTF) Heater-On Nat.Gas	CO_2	72,622	72,622	Limit the exhaust gas temperature from the HTF Heaters to 320°F. See permit condition III.A.6			
			CH_4	1.37	34.25				
			N_2O	0.14	41.72				
E7-A to D [1]	E7-A to D	Heat Transfer Fluid (HTF) Heaters-On Fuel Gas (3)	CO_2	9,581	9,581	Limit the exhaust gas temperature from the HTF Heaters to 320°F. See permit condition III.A.6			
			CH_4	0.21	5.13				
			N_2O	0.02	6.26				
FLARE [2]	FLARE	Biogas Flare-Flaring Biogas and including nat gas pilot	CO_2	8,942	8,942	Good combustion and maintenance practices. See permit condition III.B	8,942		8,942
			CH_4	13.60	340.00		0.8%	of Opt 1	2.2%
			N_2O	0.09	26.52		0.9%	of Opt 2	
		Biogas Flare-On Nat.Gas for flare pilot	CO_2	31	31	Good combustion and maintenance practices. See permit condition III.B			
			CH_4	5.89E-04	0.01				
			N_2O	5.89E-05	0.02				
E1 [3]	E1	Regenerative Thermal Oxidizer 1 (RTO1)-On Waste Gas (4)	CO_2	54,495	54,495	Maintain a minimum combustion temperature as determined by initial compliance testing. See permit condition III.C.	108,990		108,990
			CH_4	83	2,075		9.5%	of Opt 1	26.3%
			N_2O	0.54	160.92		10.5%	of Opt 2	
		Regenerative Thermal Oxidizer 1 (RTO1)-On Nat.Gas	CO_2	9,103	9,103	Maintain a minimum combustion temperature as determined by initial compliance testing. See permit condition III.C.			
			CH_4	0.17	4.25				
			N_2O	0.02	5.96				
E2 [3]	E2	Regenerative Thermal Oxidizer 2 (RTO2)-On WasteGas (4)	CO_2	54,495	54,495	Maintain a minimum combustion temperature as determined by initial compliance testing. See permit condition III.C.			
			CH_4	83	2,075				
			N_2O	0.54	160.92				
		Regenerative Thermal Oxidizer 2 (RTO2)-On Nat.Gas	CO_2	9,103	9,103	Maintain a minimum combustion temperature as determined by initial compliance testing. See permit condition III.C.			
			CH_4	0.17	4.25				
			N_2O	0.02	5.96				
E85-A	E85-A	Emergency Diesel Generator	CO_2	2,577	2,577	Low annual capacity factor and annual routine maintenance as prescribed by NSPS. See permit condition III.D.	5,650		5,650
			CH_4	0.1	2.5		0.5%	of Opt 1	1.4%
			N_2O	0.02	5.96		0.5%	of Opt 2	
E85-B	E85-B	Emergency Diesel Generator	CO_2	2,577	2,577	Low annual capacity factor and annual routine maintenance as prescribed by NSPS. See permit condition III.D.			
			CH_4	0.1	2.5				
			N_2O	0.02	5.96				
E87-A	E87-A	Fire Water Pump Diesel Generator	CO_2	248	248	Low annual capacity factor and annual routine maintenance as prescribed by NSPS. See permit condition III.E.			
			CH_4	0.01	0.25				
			N_2O	0.002	0.596				
E87-B	E87-B	Fire Water Pump Diesel Generator	CO_2	248	248	Low annual capacity factor and annual routine maintenance as prescribed by NSPS. See permit condition III.E.			
			CH_4	0.01	0.25				
			N_2O	0.002	0.596				
FUGPTA	FUGPTA	Combined Plant Fugitives	CO_2	0.72	0.72	Implementation of LDAR/AVO program. See permit condition III.F.			
FUGPET	FUGPET		CH_4	20.27	506.75				
Totals			**CO_2**	**414,101**	**CO_2e**	**Opt 1: 36.2% of sitewide emissions**			
			CH_4	**185**	**419,262**	**Opt 2: 40.2% of sitewide emissions**			
			N_2O	**2**					

Notes:

1 Waste gas is normally routed to any of the four heaters simultaneously, or to the flare, but not to both the flare and heaters concurrently. The emissions for the heaters include the maximum contribution of waste gas which offsets heater natural gas use.

2 Waste gas may be routed to the flare, but if so, won't be routed to any heater. Monitoring provisions assure compliance.

3 RTOs use natural gas for startup and supplementally as needed to maintain proper operating temperature,, but the heating value necessary to properly operate the RTO normally is supplied by the biogas (predominately methane) being treated by the RTO, therefore the emissions attributable to waste gas include the natural gas supplementally fired.

Table 1b M&G Project Jumbo GHG Emissions- Utility Plant
Utility Plant: Option 1

FIN	EPN	Description	GHG Mass Basis GHG	GHG Mass Basis TPY[2]	TPY CO_2e	BACT Requirements	CO_2 Mass Emissions of Site	CO_2 Mass Emissions of Plant
CTG	CTG	General Electric LM6000 CT with 245 MMBtu/hr Duct Burner and HRSG	CO_2	363,652	363,652	Minimum Thermal Efficiency of 60% (LHV basis). See Special Condition III.E.1. and 2.	363,652	363,652
			CH_4	6.86	171.50		31.5%	49.2%
			N_2O	0.69	205.62			
AUXBLRA1	AUXBLRA1	Auxiliary Boiler A1	CO_2	247,281	247,281	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.	247,281	247,281
			CH_4	4.66	116.50		21.4%	33.5%
			N_2O	0.47	140.06			
AUXBLRB	AUXBLRB	Auxiliary Boiler B	CO_2	127,992	127,992	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.	127,992	127,992
			CH_4	2.41	60.25		11.1%	17.3%
			N_2O	0.24	71.52			
NG-FUG	NG-FUG	Natural Gas Fugitives	CO_2	1	1	Implementation of AVO monitoring program. See Special Condition III.I.1. and 2.		
			CH_4	20.27	506.75			
			N_2O					
MSS-FUG	MSS-FUG	MSS Natural Gas Venting	CO_2	0	0	Implementation of AVO monitoring program. See Special Condition III.I.1. and 2.		
			CH_4	0.106	2.65			
			N_2O					
Totals			**CO_2**	**738,926**	**CO_2e**			
			CH_4	**34.3**	**740,201**	**63.8% of sitewide emissions**		
			N_2O	**1.4**				

Table 1c M&G Project Jumbo GHG Emissions- Utility Plant
Utility Plant: Option 2

FIN	EPN	Description	GHG Mass Basis GHG	GHG Mass Basis TPY[2]	TPY CO_2e	BACT Requirements	CO_2 Mass Emissions of Site	CO_2 Mass Emissions of Plant
AUXBLRA1	AUXBLRA1	Auxiliary Boiler A1	CO_2	247,281	247,281	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.	494,562	494,562
			CH_4	4.66	116.50		47.7%	79.4%
			N_2O	0.47	140.06			
AUXBLRA2	AUXBLRA2	Auxiliary Boiler A2	CO_2	247,281	247,281	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.		
			CH_4	4.66	116.50			
			N_2O	0.47	140.06			
AUXBLRB	AUXBLRB	Auxiliary Boiler B	CO_2	127,992	127,992	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.	127,992	127,992
			CH_4	2.41	60.25		12.3%	20.6%
			N_2O	0.24	71.52			
NG-FUG	NG-FUG	Natural Gas Fugitives	CO_2	1	1	Implementation of AVO monitoring program. See Special Condition III.I.1. and 2.		
			CH_4	20.27	506.75			
			N_2O					
MSS-FUG	MSS-FUG	MSS Natural Gas Venting	CO_2	0	0	Implementation of AVO monitoring program. See Special Condition III.I.1. and 2.		
			CH_4	0.106	2.65			
			N_2O					
Totals			**CO_2**	**622,555**	**CO_2e**			
			CH_4	**32.1**	**623,709**	**59.8% of sitewide emissions**		
			N_2O	**1.2**				

As discussed previously, this SOB addresses the emissions units that are part of the Utility Plant. The PET Plant authorization basis and requirements are found in the companion permit. The PET Plant emissions are shown for sitewide completeness.

VII. General Format of the BACT Analysis

The BACT analyses for this draft permit were conducted in accordance with EPA's *PSD and Title V Permitting Guidance for Greenhouse Gases* (March 2011), which outlines the steps for conducting a "top-down" BACT analysis. Those steps are listed below.

(1) Identify all available control options;
(2) Eliminate technically infeasible control options;
(3) Rank remaining control options;
(4) Evaluate the most effective controls (taking into account the energy, environmental, and economic impacts) and document the results; and
(5) Select BACT.

VIII. Applicable Emission Units and BACT Discussion

As can be seen by reviewing the data in Tables1b and 1c, the majority of the contribution of GHGs associated with the project, and indeed, from the site, is from combustion sources (i.e., combustion turbine, duct burners, and boilers). The project has some fugitive emissions from piping components which contribute a relatively insignificant amount of GHGs. Fugitive emissions account for 20 TPY of CO_2e, or less than 0.01% of the project's total CO_2e emissions. Stationary combustion sources primarily emit CO_2, and small amounts of N_2O and CH_4. The following equipment at the site are subject to this GHG PSD permit:

Option 1 (CHP Facility) Equipment

FIN	EPN	Description
CTG	CTG	Natural Gas-Fired General Electric LM6000 Combustion Turbine. The unit has a nominal base-load gross electric power output of approximately 49 MW vented to a 263 MMBtu/hr duct-fired HRSG for steam generation (Combustion Unit). The Combustion Unit is equipped with SCR and exhausts through a single flue gas stack.
AUXBLRA1	AUXBLRA1	Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 445 MMBtu/hr.
AUXBLRB	AUXBLRB	Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 250 MMBtu/hr.
NG-FUG	NG-FUG	Natural Gas Piping and Metering Equipment Leak Components.
MSS-FUG	MSS-FUG	Natural Gas Venting related to Turbine Startup and Shutdown and Equipment Maintenance.

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Option 2 (Three Auxiliary Boilers) Equipment

FIN	EPN	Description
AUXBLRA1	AUXBLRA1	Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 445 MMBtu/hr.
AUXBLRA2	AUXBLRA2	Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 445 MMBtu/hr.
AUXBLRB	AUXBLRB	Natural Gas-Fired Boiler. The unit has a maximum heat input capacity of 250 MMBtu/hr.
NG-FUG	NG-FUG	Natural Gas Piping and Metering Equipment Leak Components.
MSS-FUG	MSS-FUG	Natural Gas Venting related Startup and Shutdown and Equipment Maintenance.

IX. Combustion Unit (Option 1 EPN: CTG)

The combustion turbine and steam generator proposed by M&G Resins is being installed in a combined heat and power (CHP) configuration. The turbine will utilize a high efficiency aeroderivative design. It will be equipped with a dry low-NOx burner (DLNB). The combustion turbine will burn pipeline natural gas to rotate an electrical generator to generate electricity. The main components of a combustion turbine generator consist of a compressor, combustor, turbine, and generator. The compressor pressurizes combustion air to the combustor where the fuel is mixed with the combustion air and burned. Hot exhaust gases then enter the turbine where the gases expand across the turbine blades, driving a shaft to power an electric generator. The exhaust gas will exit the combustion turbine and be routed to the HRSG for steam production.

Heat recovered in the HRSG will be utilized to produce steam. Steam generated within the HRSG will be supplied to the PET plant. The HRSG will be equipped with duct burners for supplemental steam production. The duct burners will be fired with pipeline-quality natural gas. The duct burners have a maximum heat input capacity of 263 MMBtu/hr per unit. The exhaust gases from the unit, including emissions from the CT and the duct burners, will exit through a stack to the atmosphere after passing through a Selective Catalytic Reduction (SCR) system and an Oxidation Catalyst (Ox-Cat). The DNLB and SCR are used to reduce NOx emissions while Ox-Cat is used to reduce CO and VOC emissions.

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Step 1 – Identification of Potential Control Technologies for GHGs

- *Carbon Capture and Storage (CCS)* – CCS is an available add-on control technology that is applicable for all of the site's combustion units. Comparatively, CO_2 emissions contribute the most volume (greater than 99%) to the overall emissions; therefore, additional analysis is not required for CH_4 and N_2O.
- *Efficient Combustion Turbine Design* – The turbine will utilize a high efficiency aeroderivative design. The combustion turbine and steam generator is being installed in a combined heat and power (CHP) configuration.
- *Instrumentation and Controls*– The turbine will use sophisticated instrumentation and controls to automatically control the operation of the combustion turbine.
- *Waste Heat Recovery* – Hot turbine exhaust gases are routed through a HRSG to produce steam that is used elsewhere in lieu of installing another fired boiler.
- *HRSG Design* - HRSG is designed to maximize heat transfer.
- *Minimizing Fouling of Heat Exchange Surfaces* - To minimize fouling, filtration of the inlet air to the combustion turbine is performed. Additionally, cleaning of the tubes is performed during periodic outages.

Step 2 – Elimination of Technically Infeasible Alternatives

All options identified in Step 1 are considered technically feasible for this project.

Carbon Capture and Storage (CCS)

Carbon capture and storage is a GHG control process that can be used by "facilities emitting CO_2 in large concentrations, including fossil fuel-fired power plants, and for industrial facilities with high-purity CO_2 streams (e.g., hydrogen production, ammonia production, natural gas processing, ethanol production, ethylene oxide production, cement production, and iron and steel manufacturing)."[5] CCS systems involve the use of adsorption or absorption processes to remove CO_2 from flue gas, with subsequent desorption to produce a concentrated CO_2 stream. The three main capture technologies for CCS are pre-combustion capture, post-combustion capture, and oxyfuel combustion (IPCC, 2005). Of these approaches, pre-combustion capture is applicable primarily to gasification plants, where solid fuel such as coal is converted into gaseous components by applying heat under pressure in the presence of steam and oxygen (U.S. Department of Energy, 2011). At this time, oxyfuel combustion has not yet reached a commercial stage of deployment for gas turbine applications and still requires the development of oxy-fuel combustors and other components with higher temperature tolerances (IPCC, 2005). Accordingly, pre-combustion capture and oxyfuel combustion are not considered available control options for the proposed facility; the third approach, post-combustion capture, is applicable to combustion turbines. With respect to post-combustion capture, a number of methods may potentially be used for separating the CO_2 from the exhaust gas stream, including adsorption, physical absorption, chemical absorption, cryogenic separation, and membrane separation (Wang et al., 2011). Many of these methods are either still in development or are not

[5] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *PSD and Title V Permitting Guidance for Greenhouse Gases*, March 2011, <http:/www.epa.gov/nsr/ghgdocs/ghgpermittingguidance.pdf> (March 2011)

suitable for treating power plant flue gas due to the characteristics of the exhaust stream (Wang, 2011; IPCC, 2005). Of the potentially applicable technologies, post-combustion capture with an amine solvent such as monoethanolamine (MEA) is currently the preferred option because it is the most mature and well-documented technology (Kvamsdal et al., 2011) and because it offers high capture efficiency, high selectivity, and the lowest energy use compared to the other existing processes (IPCC, 2005).
In a typical MEA absorption process, the flue gas is cooled before it is contacted counter-currently with the lean solvent in a reactor vessel. The scrubbed flue gas is cleaned of solvent and vented to the atmosphere while the rich solvent is sent to a separate stripper where it is regenerated at elevated temperatures and then returned to the absorber for re-use. Fluor's Econamine FG Plus process operates in this manner, and it uses an MEA-based solvent that has been specially designed to recover CO_2 from oxygen-containing streams with low CO_2 concentrations typical of gas turbine exhaust (Fluor, 2009).

Once CO_2 is captured from the flue gas, the captured CO_2 is compressed to 100 atmospheres (atm) or higher for ease of transport (usually by pipeline). The CO_2 would then be transported to an appropriate location for underground injection into a suitable geological storage reservoir, such as a deep saline aquifer or depleted coal seam, or used in crude oil production for enhanced oil recovery (EOR). There is a large body of ongoing research and field studies focused on developing better understanding of the science and technologies for CO_2 storage.[6]

EPA's recent proposed rule addressing Standards of Performance for Greenhouse Gas Emissions from New Stationary Sources: Electric Utility Generating Units concluded that CCS was not the best system of emission reduction for a nation-wide standard for natural gas combined-cycle (NGCC) turbines based on questions about whether full or partial capture CCS is technically feasible for the NGCC source category. 79 Fed. Reg. 1430, 1485 (Jan. 8, 2014). While recognizing that the combustion turbine generator would potentially be responsible for only approximately 32% of the GHG from the project, EPA is evaluating whether there is sufficient information to conclude that CCS is technically feasible at this specific NGCC source and will consider public comments on this issue. However, because the applicant has provided a basis to eliminate CCS on other grounds, we have assumed, for purposes of this specific permitting action, that potential technical or logistical barriers do not make CCS technically infeasible for this project and have addressed the economic feasibility issues in Step 4 of the BACT analysis in order to assess whether CCS is BACT for this project.

Step 3 – Ranking of Remaining Technologies Based on Effectiveness

- *Carbon Capture and Storage (CCS*
- *Efficient Combustion Turbine Design*
- *Instrumentation and Controls*
- *Waste Heat Recovery*
- *HRSG Design*

[6] U.S. Department of Energy, Office of Fossil Energy, National Energy Technology Laboratory Carbon Sequestration Program: Technology Program Plan, <http://www.netl.doe.gov/technologies/carbon_seq/refshelf/2011_Sequestration_Program_Plan.pdf>, February 2011

- *Minimizing Fouling of Heat Exchange Surfaces*

CO_2 capture and storage is capable of achieving 90% reduction of produced CO_2 emissions and thus considered to be the most effective control method. Efficient combustion turbine design, instrumentation and controls, waste heat recovery, HRSG design, and minimizing fouling of heat exchange surfaces are all considered effective and have a range of efficiency improvements which cannot be directly quantified; therefore, ranking is not possible.

Step 4 – Evaluation of Control Technologies in Order of Most Effective to Least Effective, with Consideration of Economic, Energy, and Environmental Impacts

<u>Carbon Capture and Storage</u>

M&G Resins developed a cost analysis for CCS for the site that provided the basis for eliminating the technology in step 4 of the BACT process as a viable control option based on economic costs and environmental impact. The analysis included the CO_2 streams from all the combustion processes except the flare listed in Tables 1a, 1b, and 1c, above, and not just the Utility Plant sources subject to this specific permit. Their analysis can be seen as Appendix B of the permit application update on March 15, 2014.

There are a number of other environmental and operational issues related to the installation and operation of CCS that must also be considered in this evaluation. First, operation of CCS capture and compression equipment would require substantial additional electric power. For example, operation of carbon capture equipment at a typical natural gas fired combined cycle plant is estimated to reduce the net energy efficiency of the plant from approximately 50% (based on the fuel higher heating value (HHV)) to approximately 42.7% (based on fuel HHV).[7]

To provide the amount of reliable electricity needed to power a capture system, M&G would need to significantly expand the scope of the utility plant proposed with this project to install one or more additional electric generating units, which are sources of conventional (non-GHG) and GHG air pollutants themselves. To put these additional power requirements in perspective, gas-fired electric generating units typically emit more than 100,000 tons CO_2e/yr and would themselves, require a PSD permit for GHGs in addition to non-GHG pollutants.

Likewise, M&G would need to construct a pipeline in order to transport the CO_2 for sequestration to suitable locations for long term storage/sequestration. Construction of such a pipeline would require procurement of right-of-ways which can be a lengthy and potentially difficult undertaking. Pipeline construction would also require extensive planning, environmental studies and possible mitigation of environmental impacts from pipeline construction. Therefore, the transportation of GHGs for this project would potentially result in negative impacts and disturbance to the environment in the pipeline right-of-way.

[7] US Department of Energy, National Energy Technology Laboratory, "Costs and Performance Baseline For Fossil Energy Plants, Volume 1 - Bituminous Coal and Natural Gas to Energy", Revision 2, November 2010

M&G Resins provided a cost analysis for capture and geological sequestration of CO_2 from the site (without any post-processing). The total capital cost of geological sequestration (without pretreatment) is projected to be approximately $683 million. The annual operating and maintenance costs were estimated to be approximately $56 million. Thus, the average annual CO_2 control cost, based on a 30-year period and an 8.5% interest rate applied to the capital costs, is estimated to be nearly $96 million.

EPA Region 6 reviewed M&G Resins' CCS cost estimates and believes it adequately approximates the cost of a CCS control for this project and demonstrates those costs are prohibitive in relation to the overall cost of the proposed project. The cost of CCS would potentially increase the capital cost of the project by as much as 68% for this billion dollar project (Project Jumbo, the combined PET and Utility plants), and thus, CCS has been eliminated as BACT because it is economically infeasible for this project.

Efficient Combustion Turbine Design

The CHP plant will include one General Electric (GE) LM6000 aeroderivative natural gas-fired combustion turbine (CT) exhausting to a heat exchanger for waste heat recovery (i.e. the HRSG). The combustion turbine proposed by M&G Resins is being installed in a combined heat and power (CHP) configuration. Since combustion turbine exhaust energy is being recovered and harnessed for use along with electrical energy from the generator, more of the fuel burned in a CHP application is recovered as useful energy than in a simple-cycle combustion turbine application. Waste heat will be recovered from the combustion turbine using a heat recovery system. The use of the waste gas heat recovery system will allow for production of steam to be used in M&G Resins' polyethylene terephthalate (PET) Plant and terephthalic acid (PTA) unit reducing the need for another fired steam generator. In addition, the transfer of most of the combustion turbine exhaust energy to HRSG increases the overall cycle efficiency of the combustion turbine in the combined heat and power configuration.

Instrumentation and Controls

Modern combustion turbines have sophisticated instrumentation and controls to automatically control the operation of the combustion turbine. The control system is a digital-type and is supplied with the combustion turbine. The distributed control system (DCS) controls all aspects of the turbine's operation, including the fuel feed and burner operations, to achieve efficient low-NOx combustion. The control system monitors the operation of the unit and modulates the fuel flow and turbine operation to achieve optimal high-efficiency low-emission performance for full load and partload conditions.

Waste Heat Recovery

In a simple cycle configuration, the hot combustion gases exiting the combustion turbine are exhausted to the atmosphere as "wasted" heat. In a cogeneration configuration, these same hot gases are routed through a HRSG to produce steam that is then supplied to the neighboring chemical manufacturing plant as usable thermal energy. Additional natural gas is burned in duct burners in the HRSG to generate additional steam.

HRSG Design

Efficient design of the HRSG improves overall thermal efficiency. Efficient design features of the HRSG includes the following: use of finned tubes to extend the heat transfer surface; modular type heat recovery surfaces for efficient, economical heat recovery; use of a heat exchanger to recover heat from the HRSG exhaust gas to preheat incoming HRSG boiler feedwater; use of a heat exchanger to recover heat from the HRSG blowdown to preheat boiler feedwater; use of hot condensate as feedwater which results in less heat required to produce steam in the HRSG, thus improving thermal efficiency; and application of insulation to the HRSG surfaces and steam and water lines to minimize heat loss from radiation.

Minimizing Fouling of Heat Exchange Surfaces

HRSGs are made up of a number of tubes within the shell of the unit that are used to generate steam from the combustion turbine exhaust gas waste heat. To maximize this heat transfer, the tubes and their extended surfaces need to be as clean as possible. Fouling of the tube surfaces impedes the transfer of heat. Fouling occurs from the constituents within the exhaust gas stream. To minimize fouling, filtration of the inlet air to the combustion turbine is performed. Additionally, cleaning of the tubes is performed during periodic outages. By reducing the fouling, the efficiency of the unit is maintained.

Step 5 – Selection of BACT

To date, other GHG BACT limits for combined heat and power turbines are summarized in the table below:

Project	Permit Number	Description	BACT
Westlake Vinyls Co., LP	PSD-LA-754 (12/06/2011)	Three cogeneration trains with GE LM6000 PF Sprint, 50 MW Gas Turbines with 70 MMBtu/hr Duct Fired Heat Recovery Steam Generators	Good Combustion Practices
BASF Fina Petrochemicals	PSD-TX-903-GHG (08/24/2012)	310.4 MMBtu/hr Duct Burners on existing gas turbine	60% Thermal Efficiency for Cogeneration Unit, 12-month rolling average, calculated as: [(Heat Content of Steam Produced) + (Heat Content of Power Produced)]/(Heat Content of Fuel Supply)
Air Liquide Large Industries US	No draft permit yet	Four GE 7EA (80 MW) Gas Turbines exhausting to existing duct-fired Heat Recovery Steam Generators (no steam turbine generator)	7,720 Btu(HHV)/kWh gross equivalent based on a 365-day rolling average.
Copano Processing LP	PSD-TX-104949-GHG (draft)	Solar Mars 100 Gas Turbines (15,000 hp) with Heat Recovery Steam Generators	40% Thermal Efficiency, 12-month rolling average

M&G Resins proposes as BACT for this project, the following energy efficiency processes, practices, and designs for the proposed combined heat and power combustion turbine:

- Efficient turbine design
- Instrumentation and controls
- Reduction in heat loss
- Efficient heat exchanger design
- Insulation of HRSG
- Minimizing Fouling of heat exchange surfaces

M&G Resins also proposes to meet a 12-month rolling average minimum thermal efficiency for the combined heat and power combustion turbine and duct fired heat recovery steam generator of 60%. The CHP Unit thermal efficiency will be calculated as follows:

> CHP Unit Efficiency = [(Heat Content of Steam Produced (MMBtu) + (Turbine Gross Electrical Output converted to MMBtu)] / [Turbine and Duct Burner fuel firing rate x Lower Heating Value of fuel (MMBtu)]

Commented [ER2]: The efficiency value given in the BACT table is stated on a lower heating value basis

Deleted: Gross Calorific Value (GCV)

Compliance with the permit emissions limitations will be demonstrated by monitoring GCV, carbon content of the fuel, and fuel gas flow and determining CO_2 emissions in accordance with 40 CFR Part 98 Subpart C § 98.33(a)(3)(iii). The emission associated with CH_4 and N_2O are calculated based on emission factors provided in 40 CFR Part 98, Subpart C, Table C-2, fuel usage, and the actual heat input (HHV).

X. Auxiliary Boilers A1, A2, and B (Option 1 EPN: AUXBLRA1 and AUXBLRA2 or Option 2 EPNs: AUXBLRA1, AUXBLRA2, and AUXBLRB1)

Auxiliary Boiler A1 and A2 are 445 MMBtu/hr (HHV) heat input and Auxiliary Boiler B is 250 MMBtu/hr (HHV) heat input. In Option 1 and Option 2, the boilers will only be used to provide process steam rather than run a steam turbine to generate electricity. All three boilers will have the potential to operate continuously and all will be fired on pipeline-quality natural gas. Each boiler will be controlled with an SCR system. Given the similarity in relative size and design, the BACT analysis is the same for each boiler.

Step 1 – Identification of Potential Control Technologies for GHGs

- *Carbon Capture and Storage (CCS)* – CCS is an available add-on control technology that is applicable for all of the site's affected combustion units. Comparatively, CO_2 emissions contribute the most volume (greater than 99%) to the overall emissions; therefore, additional analysis is not required for CH_4 and N_2O.
- *Efficient Boiler Design* - New boilers can be designed with efficient burners and refractory and insulation materials in the boiler walls, floor, and other surface to minimize heat loss and increase overall thermal efficiency.
- *Automated Boiler Air/Fuel Control* - Monitoring of oxygen concentration in the flue gas to be used to control air to fuel ratio on a continuous basis for optimal efficiency
- *Condensate Recovery* – Return of hot condensate for use as feedwater to the boilers. Use of hot condensate as feedwater results in less heat required to produce steam in the boilers, thus improving thermal efficiency.
- *Economizer* – Use of a heat exchanger to recover heat from the exhaust gas to preheat incoming boiler feedwater.
- *Boiler Blowdown Heat Recovery* – Use of a heat exchanger to recover heat from boiler blowdown to preheat feedwater results in an increase in thermal efficiency.
- *Use of Low Carbon Fuels* - Natural gas will be used for Auxiliary Boiler fuel.

Step 2 – Elimination of Technically Infeasible Alternatives

All options identified in Step 1 are considered technically feasible for this project.

Carbon Capture and Storage (CCS)

Refer to the explanation in Section IX above for a description of CCS which is considered demonstrated in practice and technically feasible for all the proposed combustion devices included in this permitting action (turbine/duct burner and the three auxiliary boilers) as well as relevant combustion sources from the PET plant permit.

Step 3 – Ranking of Remaining Technologies Based on Effectiveness

CCS is the most effective control technology available of the techniques identified in this BACT analysis for the boilers.

As all of the energy efficiency related processes, practices, and designs discussed in Step 1 are being proposed for the boilers, a ranking of those control technologies is not necessary for this application.

Step 4 – Evaluation of Control Technologies in Order of Most Effective to Least Effective, with Consideration of Economic, Energy, and Environmental Impacts

<u>Carbon Capture and Storage</u>

In the BACT analysis for the GTC we addressed the cost of CCS sitewide. In that analysis, we describe our conclusions when Option 1 was considered, as that was the option with the largest CO_2 emissions sitewide. Option 2 is an option that excludes a CTG in favor of an additional natural gas fired boiler and requires use of power purchased off site, but does supply plant steam. Such a configuration would result in approximately 4% less CO_2 emissions sitewide (as compared to Option 1), but would not likely substantially alter the cost of CO_2 extraction from the various exhaust streams, and thus would likely result in a comparable overall economic impact.

As stated earlier, EPA Region 6 reviewed M&G Resins' CCS cost estimate and believes it adequately approximates the cost of a CCS control for this project and demonstrates those costs are prohibitive in relation to the overall cost of the proposed project. The cost of CCS would potentially increase the cost of the project by as much as 68% for this billion dollar project (Project Jumbo, the combined PET and Utility plants), and thus, CCS has been eliminated as BACT for this project.

As all of the energy efficiency related processes, practices, and designs discussed in Step 1 of this application are being proposed for this project, an examination of the energy, environmental, and economic impacts of the efficiency designs is not necessary.

Step 5 – Selection of BACT

To date, other GHG BACT limits for boilers and heaters are summarized in the table below:

Project	Permit Number	Description	BACT
Port Dolphin Energy, LLC Project	DPA-EPA-R4001 (Issued by EPA Region 4 on 12/01/2011)	Four 278 MMBtu/hr Natural Gas Fired Boilers	117 lb CO2e/MMBtu. Tuning, optimization, instrumentation and controls, and turbulent flow within the fire tubes for GHG control (no thermal efficiency limit)
Entergy Louisiana LLC Ninemile Point Electric Generating Plant	PSD-LA-752 (08/16/2011)	338 MMBtu/hr Natural Gas fired Boiler	117 lb CO2e /MMBtu. Proper operation and good combustion practices. (no thermal efficiency limit)
BASF Final Petrochemicals	PSD-TX-903-GHG (08/24/2012)	425.4 MMBtu/hr Natural Gas Fired Steam Package Boilers	77% Thermal Efficiency, 12-month rolling average
Iowa Fertilizer Company	12-A-386-P (10/26/2012)	472.4 Natural Gas Fired Auxiliary Boiler	51,748 ton/yr CO2e (no thermal efficiency limit)
Chevron Phillips Chemical	PSD-TX-748-GHG (01/17/2013)	500 MMBtu/hr Very High Pressure Boiler (natural gas fired)	77% Thermal Efficiency, 12-month rolling average

M&G Resins proposes as BACT for this project, the following energy efficiency processes, practices, and designs for the proposed auxiliary boilers:

- Efficient boiler design
- Automated Boiler Air/Fuel Control
- Condensate Recovery
- Economizer
- Boiler Blowdown Heat Recovery
- Use of Low Carbon Fuel: Natural Gas

M&G Resins also proposes to meet a 12-month rolling average minimum thermal efficiency for each auxiliary boiler of 77%. The Auxiliary Boiler thermal efficiency will be calculated as follows.

Auxiliary Boiler Efficiency = [(Heat Content of Steam Produced (MMBtu)] / [Auxiliary Boiler fuel firing rate x Lower Heating Value of fuel (MMBtu)]

Commented [ER3]: Should reference auxiliary boilers, not CHP

Deleted: CHP Unit

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Compliance with permit emissions limitations (depending on what option is chosen) will be demonstrated by monitoring GCV, carbon content of the fuel, and fuel gas flow and determining CO2 emissions based on the Tier III methodology in accordance with 40 CFR Part 98 Subpart C §98.33(a)(3)(iii). The emissions associated with CH_4 and N_2O are calculated based on emission factors provided in 40 CFR Part 98, Subpart C, Table C-2, fuel usage, and the actual heat input (HHV).

XI. Natural Gas Fugitives (EPN: NG-FUG and MSS-FUG) under both Options 1 and 2

The proposed project will include natural gas piping components. These components are potential sources of methane and CO_2 emissions due to emissions from rotary shaft seals, connection interfaces, valve stems, and similar points. Emissions can occur when a fuel system or pipe run must be de-inventoried in association with any operational reason, including for safety purposes.

Step 1 – Identification of Potential Control Technologies for GHGs

- Implementation of leak detection and repair (LDAR) program using a hand held analyzer;
- Implementation of alternative monitoring using a remote sensing technology such as infrared cameras; and
- Implementation of audio/visual/olfactory (AVO) leak detection program.
- When equipment must be de-inventoried of GHG containing gasses, in order to safely perform necessary plant operations related to startup, shutdown, maintenance, or repair operations, and it is impossible that the vented emissions be controlled by the ordinary control device, the vented stream volume must be minimize, to the extent practicable and necessary to safely perform the necessary operations of the plant.

Step 2 – Elimination of Technically Infeasible Alternatives

All options identified in Step 1 are considered technically feasible for this project.

Step 3 – Ranking of Remaining Technologies Based on Effectiveness

The use of a LDAR program with a portable gas analyzer meeting the requirements of 40 CFR 60, Appendix A, Method 21, can be effective for identifying leaking methane.

Quarterly instrument monitoring with a leak definition of 10,000 part per million by volume (ppmv) (TCEQ 28M LDAR Program) is generally assigned a control efficiency of 75% for valves, relief valves, sampling connections, and compressors and 30% for flanges.

Quarterly instrument monitoring with a leak definition of 500 ppmv (TCEQ 28VHP LDAR Program) is generally assigned a control efficiency of 97% for valves, relief valves, and sampling connections, 85% for compressors, and 30% for flanges.

The U.S. EPA has allowed the use of an optical gas imaging instrument as an alternative work practice for a Method 21 portable analyzer for monitoring equipment for leaks in 40 CFR 60.18(g).

For components containing inorganic or odorous compounds, periodic AVO walk-through inspections provide predicted control efficiencies of 97% control for valves, flanges, relief valves, and sampling connections, and 95% for compressors.[8]

Step 4 – Evaluation of Control Technologies in Order of Most Effective to Least Effective, with Consideration of Economic, Energy, and Environmental Impacts

The frequency of inspection and the low odor threshold of mercaptans in natural gas make AVO inspections an effective means of detecting leaking components in natural gas, and since this method is equal in effectiveness to Method 21 for the compounds of interest, this option is the most cost effective of the monitoring program types.

With regard to the necessity of de-inventorying components or fuel systems in GHG service to assure the ongoing proper and safe operation of the source, minimization of the volume of the gasses so de-inventoried to atmosphere is the only practical workpractice standard that can be implemented to minimize the GHG from these events.

Step 5 – Selection of BACT

Due to the very low volatile organic compound (VOC) content of natural gas, the source will not be subject to any VOC leak detection programs by way of its State/PSD air permit, TCEQ Chapter 115 – Control of Air Pollution from Volatile Organic Compounds, New Source Performance Standards (40 CFR Part 60), National Emission Standard for Hazardous Air Pollutants (40 CFR Part 61); or National Emission Standard for Hazardous Air Pollutants for Source Categories (40 CFR Part 63). Therefore, any leak detection program implemented will be solely due to potential greenhouse emissions for the equipment within the Utility Plant. Since the uncontrolled CO_2e emissions from the natural gas piping represent less than 0.01% of the total site wide CO_2e emissions, any emission control techniques applied to the piping fugitives will provide minimal CO_2e emission reductions.

Based on this top-down analysis, M&G Resins will conduct weekly AVO inspections as BACT for piping components in natural gas. Likewise, the minimization of the volume of gasses de-inventoried or vented to atmosphere from fuel systems or piping and equipment components in GHG service is BACT for such events, where such emissions cannot be routed through their ordinary control device, if any, due to safety concerns.

XII. Endangered Species Act Placeholder language

8 Control Efficiencies for TCEQ Leak Detection and Repair Programs available at http://www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/control_eff.pdf (last accessed July 23, 2014)

Pursuant to Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1536) and its implementing regulations at 50 CFR Part 402, EPA is required to insure that any action authorized, funded, or carried out by EPA is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species or result in the destruction or adverse modification of such species' designated critical habitat.

To meet the requirements of Section 7, EPA is relying on a Biological Assessment (BA) prepared by the applicant, M&G Resins and its consultant xx, and adopted by EPA.

EPA has determined that issuance of the proposed permit will have no effect on any of the xxx listed species, as there are no records of occurrence, no designated critical habitat, nor potential suitable habitat for any of these species within the action area.

Because of EPA's "no effect" determination for the xxx species because they are not expected to occur in the geographical, no further consultation with the USFWS is needed.

Any interested party is welcome to bring particular concerns or information to our attention regarding this project's potential effect on listed species. The final draft biological assessment can be found at EPA's Region 6 Air Permits website at http://yosemite.epa.gov/r6/Apermit.nsf/AirP.

XIII. National Historic Preservation Act (NHPA) Placeholder language

Section 106 of the NHPA requires EPA to consider the effects of this permit action on properties eligible for inclusion in the National Register of Historic Places. To make this determination, EPA relied on and adopted a cultural resource report and pipeline addendum prepared by ZZZ, Inc, submitted in yyy.

On XXX, EPA sent letters to Indian tribes identified by the Texas Historical Commission as having historical interests in Texas to inquire if any of the tribes have historical interest in the particular location of the project and to inquire whether any of the tribes wished to consult with EPA in the Section 106 process. EPA received no requests from any tribe to consult on this proposed permit. EPA will provide a copy of the report to the State Historic Preservation Officer for consultation and concurrence with its determination. Any interested party is welcome to bring particular concerns or information to our attention regarding this project's potential effect on historic properties. A copy of the report may be found at http://yosemite.epa.gov/r6/Apermit.nsf/AirP.

XIV. Environmental Justice (EJ)

Executive Order (EO) 12898 (59 FR 7629 (Feb. 16, 1994)) establishes federal executive branch policy on environmental justice. Based on this Executive Order, the EPA's Environmental Appeals Board (EAB) has held that environmental justice issues must be considered in connection with the issuance of federal Prevention of Significant Deterioration (PSD) permits issued by EPA Regional Offices [See, e.g., *In re Prairie State Generating Company*, 13 E.A.D.

1,123 (EAB 2006); *In re Knauf Fiber Glass*, Gmbh, 8 E.A.D. 121, 174-75 (EAB 1999)]. This permitting action, if finalized, authorizes emissions of GHG, controlled by what we have determined is the Best Available Control Technology for those emissions. It does not select environmental controls for any other pollutants. Unlike the criteria pollutants for which EPA has historically issued PSD permits, there is no National Ambient Air Quality Standard (NAAQS) for GHG. The global climate-change inducing effects of GHG emissions, according to the "Endangerment and Cause or Contribute Finding", are far-reaching and multi-dimensional (75 FR 66497). Climate change modeling and evaluations of risks and impacts are typically conducted for changes in emissions that are orders of magnitude larger than the emissions from individual projects that might be analyzed in PSD permit reviews. Quantifying the exact impacts attributable to a specific GHG source obtaining a permit in specific places and points would not be possible [PSD and Title V Permitting Guidance for GHGs at 48]. Thus, we conclude it would not be meaningful to evaluate impacts of GHG emissions on a local community in the context of a single permit. Accordingly, we have determined an environmental justice analysis is not necessary for the permitting record.

XVII. Conclusion and Proposed Action

Based on the information supplied by M&G Resins, our review of the analyses contained in the TCEQ PSD Permit Application and the GHG PSD Permit Application, and our independent evaluation of the information contained in our Administrative Record, it is our determination that the proposed facility would employ BACT for GHGs under the terms contained in the draft permit. Therefore, EPA is proposing to issue M&G Resins a PSD permit for GHGs for the facility, subject to the PSD permit conditions specified therein. This permit is subject to review and comments. A final decision on issuance of the permit will be made by EPA after considering comments received during the public comment period.

APPENDIX

Annual emissions, in tons per year (TPY) on a 12-month rolling total, shall not exceed the following:

Permit Emissions Limitation Table 1A. Annual Emission Limits (Option 1)[1]

FIN	EPN	Description	GHG Mass Basis		TPY CO_2e[2,3]	BACT Requirements
				TPY[2]		
CTG	CTG	General Electric LM6000 CT with 263 MMBtu/hr Duct Burner and HRSG	CO_2 CH_4 N_2O	363,652 6.86 0.69	364,027	Minimum Thermal Efficiency of 60% (LHV basis). See Special Condition III.C.1. and 2.
AUXBLRA1	AUXBLRA1	Auxiliary Boiler A1	CO_2 CH_4 N_2O	247,281 4.66 0.47	247,537	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
AUXBLRB	AUXBLRB	Auxiliary Boiler B	CO_2 CH_4 N_2O	127,992 2.41 0.24	128,125	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
NG-FUG	NG-FUG	Natural Gas Fugitives	CH_4	No Emission Limit Established[4]	No Emission Limit Established[4]	Implementation of AVO monitoring program. See Special Condition III.F.1. and 2.
MSS-FUG	MSS-FUG	MSS Natural Gas Venting	CH_4	No Emission Limit Established[4]	No Emission Limit Established[4]	Implementation of AVO monitoring program. See Special Condition III.G.1. and 2.
Totals[5]			**CO_2** **CH_4** **N_2O**	**738,926** **34** **1**	**CO_2e 740,199**	

Deleted: 245

Commented [ER5]: In Section IX of the Statement of Basis, the thermal efficiency equation uses gross calorific value (HHV)

Deleted: E

1. Compliance with the annual emission limits (tons per year) is based on a 12-month, rolling total.
2. The TPY emission limits specified in this table are not to be exceeded for this facility and include emissions from the facility during all operations and include MSS activities.
3. Global Warming Potentials (GWP): CH_4 = 25, N_2O = 298, SF_6=22,800
4. Fugitive process emissions from EPNs NG-FUG and MSS-FUG are estimated to be 20 TPY of CH_4 and 511 CO_{2e}. The emission limit will be a design/work practice standard as specified in the permit.
5. The total emissions for CH_4 and CO_{2e} include the PTE for process fugitive emissions of CH_4. Total emissions are for information only and do not constitute an emission limit.

Permit Emissions Limitation Table 1B. Annual Emission Limits (Option 2)[1]

FIN	EPN	Description	GHG Mass Basis		TPY CO_2e[2,3]	BACT Requirements
				TPY[2]		
AUXBLRA1	AUXBLRA1	Auxiliary Boiler A1	CO_2	247,281	247,537	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
			CH_4	4.66		
			N_2O	0.47		
AUXBLRA2	AUXBLRA2	Auxiliary Boiler A2	CO_2	247,281	247,537	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
			CH_4	4.66		
			N_2O	0.47		
AUXBLRB	AUXBLRB	Auxiliary Boiler B	CO_2	127,992	128,125	Minimum Thermal Efficiency of 77% (LHV basis). See Special Condition III.E.1. and 2.
			CH_4	2.41		
			N_2O	0.24		
NG-FUG	NG-FUG	Natural Gas Fugitives	CH_4	No Emission Limit Established[4]	No Emission Limit Established[4]	Implementation of AVO monitoring program. See Special Condition III.F.1. and 2.
MSS-FUG	MSS-FUG	MSS Natural Gas Venting	CH_4	No Emission Limit Established[4]	No Emission Limit Established[4]	Implementation of AVO monitoring program. See Special Condition III.G.1. and 2.
Totals[5]			**CO_2**	**622,555**	**CO_2e 623,708**	
			CH_4	**32**		
			N_2O	**1**		

1. Compliance with the annual emission limits (tons per year) is based on a 12-month, rolling total.
2. The TPY emission limits specified in this table are not to be exceeded for this facility and include emissions from the facility during all operations and include MSS activities.
3. Global Warming Potentials (GWP): CH_4 = 25, N_2O = 298, SF_6=22,800
4. Fugitive process emissions from EPNs NG-FUG and MSS-FUG are estimated to be 20 TPY of CH_4, and 511 CO_{2e}. The emission limit will be a design/work practice standard as specified in the permit.
5. The total emissions for CH_4 and CO_{2e} include the PTE for process fugitive emissions of CH_4. Total emissions are for information only and do not constitute an emission limit.

Toups, Brad

From: Thomas Sullivan <tsullivan@zephyrenv.com>
Sent: Wednesday, August 27, 2014 3:02 PM
To: Toups, Brad
Cc: Larry Moon
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi
Attachments: removed.txt

Thanks Brad,

We can confirm that the utility plant will not supply more than, one-third or more of its potential electric output and more than 219,000 MWh net-electrical output to a utility distribution system on a 3 year rolling average basis. Therefore it will not be subject to the proposed KKKK requirements.

Regards,
Thomas

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Wednesday, August 27, 2014 1:54 PM
To: Thomas Sullivan
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Hi Thomas,
Not yet. I have sent one of the two projects, the utilities to them, but not the resins plant yet. I am still making some changes required of me here locally prior to sending it to them. I hope to get HQ the draft of the PET plant permit and SOB this week, which should enable us to get them to you next week. I was trying to send both permits at the same time, but as it is, I will forward them to you as I finish incorporating any changes required by HQ. That means that I should be able to send the utility permit to you next week for review and, hopefully, the PET plant as well. We still intend to make one public notice for both projects. We are in the process of setting up the newspaper and Public Hearing location now.

Brad

One last thing on the utility plant. In response to my inquiry, Larry sent me an explanation of how the source might be subject to the January 8 2014 proposed KKKK requirements, acknowledging the project potentially being subject to the proposed rule. However, I have always had the impression that the plant is a dedicated support facility, and as such is not planning to sell their electricity generated to the grid. If this is the case, then it seems like they would meet the proposed criteria of 60.4305 (c)(5) and not be subject. The language follows.

(5) Was constructed for the purpose of supplying, and supplies, one-third or more of its potential electric output and more than 219,000 MWh net-electrical output to a utility distribution system on a 3 year rolling average basis.

Can you all confirm this?
Thanks
Brad

From: Thomas Sullivan [mailto:tsullivan@zephyrenv.com]
Sent: Wednesday, August 27, 2014 9:28 AM
To: Toups, Brad; Larry Moon
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Hello Brad,

Has HQ Completed their review of the draft permits? M&G is anxious to move forward with their review and get to Public Notice. Please let us know if we will be able to see the drafts today.

Thanks,
Thomas

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Wednesday, August 20, 2014 9:00 AM
To: Larry Moon
Cc: Thomas Sullivan
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Hi Larry,
Thanks for the timely response. Do include the calculation; the write up is good as it is.
Thanks
Brad

From: Larry Moon [mailto:lmoon@zephyrenv.com]
Sent: Wednesday, August 20, 2014 8:38 AM
To: Toups, Brad
Cc: Thomas Sullivan
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Brad,

The proposed amendments to 40 CFR 60, Subpart KKKK (Standards of Performance for Stationary Combustion Turbines) published on January 8, 2014 provides that the applicability date will be based on effective date of the final rule approval (79 FR 1446, January 8, 2014). Therefore, the amended Subpart KKKK will be applicable to the proposed combined heat and power combustion turbine (EPN CTG) depending on whether the start of construction for the turbine is after the effective date of the final rule action. The maximum heat input to the combustion turbine (including duct firing) is greater than 250 MMBtu/hr but less than 850 MMBtu/hr, making the combustion turbine potentially subject to the 1,100 lb CO_2/MWh of gross output on a 12 month rolling average, as specified in proposed Table 2 to Subpart KKKK.

Since the combustion turbine is a combined heat and power unit, the total useful recovered thermal energy from the steam generation would be calculated in accordance with the equation in 40 CFR §60.4374(3)(ii) and added to the electrical output from the combustion turbine in accordance with the equation in 40 CFR §60.4374(3)(i) for purposes of demonstrating compliance with the 1,100 lb CO_2/MWh limit. The output based emissions for the proposed combustion turbine, calculated in accordance with 40 CFR §60.4374(3)(i) & (ii) will be well below 1,100 lb CO_2/MWh.

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Monday, August 18, 2014 1:59 PM
To: Thomas Sullivan
Cc: Larry Moon
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Yes, I believe that we are.   Can you folks update your Utility Plant application to address the NSPS proposed on January 8 of this year? I originally thought it would not be subject, but I am not sure that is true, given the revisions to the proposed KKKK that addresses combustion turbines?
Thanks
Brad

From: Thomas Sullivan [mailto:tsullivan@zephyrenv.com]
Sent: Monday, August 18, 2014 10:49 AM
To: Toups, Brad
Cc: Larry Moon
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Hello Brad,

Are we still on track to see the draft permits in the next week or so?

Thanks,

Thomas

Thomas Sullivan P.E. | Principal
Zephyr Environmental Corporation
2600 Via Fortuna, Ste 450 | Austin, TX 78746
Direct: 512.879.6632 | Cell: 512.650.7613 | tsullivan@zephyrenv.com
ZephyrEnv.com | HazMatAcademy.com

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Thursday, August 07, 2014 9:19 AM
To: Larry Moon
Cc: Thomas Sullivan
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Hi Larry,
The draft permits are still in review internally locally. Once I get the internal reviews done then they will be sent to HQ for review. Based on recent progress, I would expect the local reviews to be completed by mid next week (Wed, Aug 13) and then will be sent to HQ. Based on that, I think it is reasonable for you to expect to see both permits for review sometime between Aug 20 and Aug 27. We expect to publish PN for both permits in a single notice, and will set up hearings for both to occur on the same day, should a hearing be held. I have had no inquiries about the projects from anyone external to the agency, so it may be that there will be no hearings requested.

Hope it helps,
Brad

From: Larry Moon [mailto:lmoon@zephyrenv.com]
Sent: Thursday, August 07, 2014 9:13 AM
To: Toups, Brad

Cc: Thomas Sullivan
Subject: Status of M&G Resins GHG Applications - Corpus Christi

Brad,

What is the status of the two M&G Resins GHG applications in Corpus Christi? When can we expect to get draft permits?

Larry Moon P.E. | Principal
Zephyr Environmental Corporation
2600 Via Fortuna, Ste 450 | Austin, TX 78746
Direct: 512.879.6619 | lmoon@zephyrenv.com
ZephyrEnv.com | HazMatAcademy.com

Toups, Brad

From: Larry Moon <lmoon@zephyrenv.com>
Sent: Wednesday, August 20, 2014 4:10 PM
To: Toups, Brad
Cc: Thomas Sullivan
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

The maximum hourly combined turbine and duct burner heat input represented in the May 9, 2014 revision to the TCEQ application is 748 MMBtu/hr (HHV).

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Wednesday, August 20, 2014 1:48 PM
To: Larry Moon
Cc: Thomas Sullivan
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Thanks Larry,
Is the maximum heat input to the turbine still 710,000 mmbtu/hr as represented in the TCEQ permit or is different now?

Thanks
Brad

From: Larry Moon [mailto:lmoon@zephyrenv.com]
Sent: Wednesday, August 20, 2014 12:06 PM
To: Toups, Brad
Cc: Thomas Sullivan
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Brad,

Attached is an example calculation of the proposed NSPS Subpart KKKK output based CO_2 emissions on a lb CO_2/MWh basis. The turbine operating conditions used in this calculation are based on ambient conditions on a typical summer day, with and without duct burner firing. That operating condition does not necessarily produce the highest emissions on a lb CO_2/MWh basis but that is an operating condition at which the turbine will operate for a large portion of the year. The calculation shows the output based CO_2 emissions are well below the proposed 1,100 lb CO_2/MWh 12-month rolling average limit.

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Wednesday, August 20, 2014 9:00 AM
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Cc: Thomas Sullivan
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Hi Larry,
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Thanks
Brad

From: Larry Moon [mailto:lmoon@zephyrenv.com]
Sent: Wednesday, August 20, 2014 8:38 AM
To: Toups, Brad

Cc: Thomas Sullivan
Subject: RE: Status of M&G Resins GHG Applications - Corpus Christi

Brad,

The proposed amendments to 40 CFR 60, Subpart KKKK (Standards of Performance for Stationary Combustion Turbines) published on January 8, 2014 provides that the applicability date will be based on effective date of the final rule approval (79 FR 1446, January 8, 2014). Therefore, the amended Subpart KKKK will be applicable to the proposed combined heat and power combustion turbine (EPN CTG) depending on whether the start of construction for the turbine is after the effective date of the final rule action. The maximum heat input to the combustion turbine (including duct firing) is greater than 250 MMBtu/hr but less than 850 MMBtu/hr, making the combustion turbine potentially subject to the 1,100 lb CO_2/MWh of gross output on a 12 month rolling average, as specified in proposed Table 2 to Subpart KKKK.

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Cc: Larry Moon
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To: Toups, Brad
Cc: Thomas Sullivan
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Attachments: M&G NSPS Subpart KKKK Calc.pdf

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Direct: 512.879.6619 | lmoon@zephyrenv.com
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Table 3-8
Calculation of Typical Output Based CO2 Emissions per Proposed NSPS Subpart KKKK Methods
M & G Utility Plant

	Without Duct Firing	With Duct Firing
Turbine Electrical Output[1] (Pe_{CT}), MW	39.6	39.2
Gross Steam Flow[1] (Q_m) lb/hr	110,140	307,171
Steam Enthalpy (H) Btu/lb @ 1,280.3 psig and saturated conditions	1178.4	1178.4
Conversion factor[2], Btu/MWh	3.413E+06	3.413E+06
Usefull Thermal Output[2] (Pt_{PS}) MWh	38.0	106.1
Electric Tranmission and Distribution Factor[3] (T)	0.95	0.95
Gross Energy Output[3](Pgross) MWh	70.2	120.8
GT Fuel Input[1], MMBtu/hr	409.6	409.6
HRSG Fuel Input[1], MMBtu/hr	0.0	214.2
CO_2 Emissions (ton/hr)	23.9	36.5
lb CO_2/MWh (gross)	682.4	603.4

Notes
1. Typical turbine performance at base load conditions on a summer day.

2. $(Pt)_{PS} = \dfrac{Q_m \times H}{3.413 \times 10^6}$ Proposed rule 40 CFR §60.4374(a)(3)(ii)

3. $Pgross = \dfrac{(Pe)_{CT}}{T} + 0.75 \times (PT)_{PS}$ Proposed rule 40 CFR §60.4374(a)(3)(i)

Toups, Brad

From: Thomas Sullivan <tsullivan@zephyrenv.com>
Sent: Wednesday, July 02, 2014 5:43 PM
To: Toups, Brad
Cc: Larry Moon; Brett Davis
Subject: M&G Resins Netting Tables
Attachments: 2014 Utility Plant Table 1F 05-09-2014.pdf; M&G PET Plant Table 1f June 14.pdf

Brad,

Thank you for the update, attached are the two Table 1(f) for the project. As the Utility plant was originally under separate management, we maintained individual Table 1(f)s but combined the emissions for applicability. Hence several pollutants have emissions under 100 tpy separately but have PSD applicability indicated as a project. Please let us know if this will meet your needs.

Regards,
Thomas

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Tuesday, July 01, 2014 9:03 AM
To: Thomas Sullivan
Subject: RE: Would like an update to a site map for the M&G Resins

Hi Thomas,
Yes, I will share the draft with you as soon as I can. However, I doubt that it will be before we get guidance from headquarters on addressing the supreme court decision effects.

I am on track to start circulating the draft for internal review this week. If I can get the other parts of the agency to conduct their review then I will send it to you for comment at the conclusion of their review. However, because some of the same individuals are likely developing the response to the court decision, my guess is that they won't be able to review until that general response has been disseminated.

It is definitely a difficult time. When can you expect to get a copy for comment? I would guess late next week, and if you do then we should be able to go to notice (assuming the guidance is relatively prompt) by mid to late July.

I do think it would be prudent to get from you some additional information at this point. Specifically, can you send me the excerpt from your current version of the criteria pollutant emissions applications for both the resins and utility plants depicting your PSD full applicability analysis? I am pretty sure that however we go forward, that will need to be present in the permit application records available for public notice.
Thanks
Brad

From: Thomas Sullivan [mailto:tsullivan@zephyrenv.com]
Sent: Tuesday, July 01, 2014 8:49 AM
To: Toups, Brad
Cc: Larry Moon; Martha.Martinez@gruppomgus.com; Allana.ratliff@chemtex.com
Subject: Re: Would like an update to a site map for the M&G Resins

Brad,

We recognize some of the standard language will need to be adjusted due to the Supreme Court ruling, however we would like to see the draft permit as soon as the special conditions are completed. Could you let us know the current status and probably schedule?

Thanks,

Thomas I. Sullivan

On Jun 24, 2014, at 2:48 PM, "Toups, Brad" <Toups.Brad@epa.gov> wrote:

Hi Thomas,
Thanks. I believe that the drafts will be ready, but it may be that the supreme court decision effects may delay our delivery of the draft to you. Our attorneys are reading the court decision and evaluating how it affects our current projects, so I would not be surprised if we have to change some of the authorities references in our draft permits and statement of bases. However, since these are 'PSD anyway' sources, it may be that not much will need to be changed to be ready to go to notice.

Brad

From: Thomas Sullivan [mailto:tsullivan@zephyrenv.com]
Sent: Tuesday, June 24, 2014 2:25 PM
To: Toups, Brad
Cc: Larry Moon
Subject: RE: Would like an update to a site map for the M&G Resins

Brad,

Attached is the updated map you requested. Please let me know if it meets your expectations. Are we still on track for seeing the draft permits in the next few days? I am available if there are any questions.

Best regards,
Thomas

Thomas Sullivan P.E. | Principal
Zephyr Environmental Corporation
2600 Via Fortuna, Ste 450 | Austin, TX 78746
Direct: 512.879.6632 | tsullivan@zephyrenv.com
ZephyrEnv.com | HazMatAcademy.com

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Thursday, June 19, 2014 3:18 PM

TABLE 1F
AIR QUALITY APPLICATION SUPPLEMENT

Permit No.: 108446		Application Submittal Date: June 2014	
Company	M&G Resins USA, LLC		
RN:	1066154438	Facility Location:	
City	Corpus Christi	County: Nueces	
Permit Unit I.D.:	Various	Permit Name: PET Plant	
Permit Activity:	☑ New Major Source	☐ Modification	
Project or Process Description: New PET plant, PTA plant, and new combined cycle turbines			

Complete for all pollutants with a project emission increase.	**POLLUTANTS**							
	Ozone		**CO**	**PM**	**PM_{10}**	**$PM_{2.5}$**	**SO_2**	**H2SO4**
	VOC	**NOx**						
Nonattainment? (yes or no)	No	No	No	No	No	No	No	No
Existing site PTE (tpy)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Proposed project increases from M&G (tpy from 2F)[3]	349.56	70.80	344.44	85.85	23.52	23.51	24.38	0.00
Is the existing site a major source?[2] If not, is the project a major source by itself? (yes or no)	Yes							
If site is major, is project increase significant? (yes or no)	YES	YES	YES	YES	YES	YES	NO	NO
If netting required, estimated start of construction:	N/A							
5 years prior to start of construction:	N/A	Contemporaneous						
Estimated start of operation:	8/1/14	Period						
Net contemporaneous change, including proposed project, from Table 3F (tpy)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FNSR applicable? (yes or no)	YES	YES	YES	YES	YES	YES	NO	NO

1. Other PSD pollutants
2. Nonattainment major source is defined in Table 1 in 30 TAC 116.12(11) by pollutant and county. PSD thresholds are found in 40 CFR §51.166(b)(1).
3. Sum of proposed emissions minus baseline emissions, increases only. Nonattainment thresholds are found in Table 1 in 30 TAC 116.12(11) and PSD thresholds in 40 CFR §51.166(b)(23).

The presentations made above and on the accompanying tables are true and correct to the best of my knowledge.

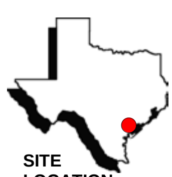
Signature Title Date

To: Thomas Sullivan
Subject: Would like an update to a site map for the M&G Resins

Hi Thomas,
I would like to use a single modified site map in each of the two permit projects. I have attached the existing one, and would like to see if you all can modify it to make it valid for both the Resins and the Utility plants. That is, eliminate the NRG references, etc. Could you provide the revised one as a jpeg file with image dimensions identical to that in the attached acrobat file? If not, then an acrobat file with the image dimensions just like the attached will do, I believe.

Thanks,
Brad

Datum:
GCS NAD 1983
Map Sources:
ESRI-Bing Hybrid
& Streets Basemaps



zephyr

AREA MAP

New Source Review Application

M&G RESINS USA, LLC
Corpus Christi, Texas

Drafted By:	Reviewed By:	Project No.:	Date:
J. Knowles	T. Sullivan	012453.002	06.23.2014

TABLE 1F
AIR QUALITY APPLICATION SUPPLEMENT

Permit No.:	108819/PSD-TX-1354	Application Submittal Date:	05/09/2014
Company	M&G RESINS USA, LLC		
RN:	RN106631427	Facility Location:	
City	Corpus Christi	County:	Nueces
Permit Unit I.D.:		Permit Name:	UTILITY PLANT
Permit Activity:	☑ New Major Source	☐ Modification	
Project or Process Description:	Construction of Combined Heat and Power Plant		

Complete for all pollutants with a project emission increase.	POLLUTANTS							
	Ozone		CO	PM	PM_{10}	$PM_{2.5}$	SO_2	H_2SO_4
	VOC	NOx						
Nonattainment? (yes or no)	No	No	No	No	No	No	No	No
Existing site PTE (tpy)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Proposed project increases from NRG Project (tpy from 2F)[3]	33.99	65.88	188.03	61.17	61.17	61.17	17.22	5.97
Total proposed project increase for site (tpy)	33.99	65.88	188.03	61.17	61.17	61.17	17.22	5.97
Is the existing site a major source?[2] If not, is the project a major source by itself? (yes or no)	Yes[4]							
If site is major, is project increase significant? (yes or no)	Yes[4]	Yes	Yes	Yes	Yes	Yes	No	No
If netting required, estimated start of construction:	N/A							
5 years prior to start of construction:	N/A	Contemporaneous						
Estimated start of operation:	N/A	Period						
Net contemporaneous change, including proposed project, from Table 3F (tpy)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
FNSR applicable? (yes or no)	Yes	Yes	Yes	Yes	Yes	Yes	No	N/A

1. Other PSD pollutants
2. Nonattainment major source is defined in Table 1 in 30 TAC 116.12(11) by pollutant and county. PSD thresholds are found in 40 CFR §51.166(b)(1).
3. Sum of proposed emissions minus baseline emissions, increases only. Nonattainment thresholds are found in Table 1 in 30 TAC 116.12(11) and PSD thresholds in 40 CFR §51.166(b)(23).
4. Including project emissions from the M&G PET Plant.

The presentations made above and on the accompanying tables are true and correct to the best of my knowledge.

Signature Title Date

Toups, Brad

From: Larry Moon <lmoon@zephyrenv.com>
Sent: Monday, June 02, 2014 3:33 PM
To: Sean O'Brien
Cc: Thomas Sullivan; Toups, Brad
Subject: RE: M&G Resins Utility Plant
Attachments: Supplemental Response Letter 031414.pdf

Sean,

Attached is a copy of the Carbon Capture and Storage (CCS) cost estimate summary that was submitted by M&G to EPA Region 6 on March 14, 2014. The annualized construction cost of the carbon capture and compression equipment was based on a 30 equipment life and a 8.5% interest rate. The CCS estimate was based upon the combined CO2 emissions from the M&G polyethylene terephthalate (PET) Plant and the adjoining Utility Plant. The CO2 emissions from the Utility Plant were based on the Option 1 scenario including the LM 6000 gas turbine, Auxiliary Boiler A1 and Auxiliary Boiler B. The emission totals for the Utility Plant used in the CCS cost estimate were the same as those emission rates submitted in the May 15, 2014 update to the Utility Plant GHG application. The Option 2 scenario for Utility Plant has total annual CO2 emissions that are approximately 16% lower than Option 1. Where there are multiple equipment options, the CCS cost estimate is normally based on the equipment option with the higher annual CO2 emissions because that results in the lowest cost per ton of CO2 avoided. Please call if you have any further questions.

Larry Moon P.E. | Principal
Zephyr Environmental Corporation
2600 Via Fortuna, Ste 450 | Austin, TX 78746
Direct: 512.879.6619 | lmoon@zephyrenv.com
ZephyrEnv.com | HazMatAcademy.com

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Friday, May 30, 2014 2:14 PM
To: Thomas Sullivan; Larry Moon
Cc: Sean O'Brien
Subject: RE: M&G Resins Utility Plant

Hi Larry,
Can you respond to Sean's request? Please cc me on the response.
Thanks
Brad

From: Sean O'Brien [mailto:Sean.OBrien@tceq.texas.gov]
Sent: Thursday, May 29, 2014 5:57 PM
To: Toups, Brad
Subject: M&G Resins Utility Plant

Brad,
I'm trying to finish the SOB but I'm missing a couple pieces. Attached is something I need from M&G. The red highlighted portions are not in the application. Also, for the

new Option 2 (three boilers, no turbine), I need them to perform a similar analysis for CCS as the attached.
Thanks,
Sean

March 14, 2014

Mr. Thomas H. Diggs
Associate Director
Air Programs Branch
U.S. EPA Region 6, 6PD
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

RE: EPA Application Completeness Determination and Request for Information
Greenhouse Gas PSD Permit Application
M&G Resins USA, LLC
Polyethylene Terephthalate and Terephathalic Acid Units
Corpus Christi, Nueces County, Texas

Dear Mr. Diggs:

This letter is a supplement to the March 10, 2014 response to your letter dated February 5, 2014, requesting supplemental information related to M&G Resin USA, LLC's Greenhouse Gas (GHG) Prevention of Significant Deterioration (PSD) permit application for the PET Plant. This supplement provides a site-specific cost per ton for a Carbon Capture and Storage (CCS) system, as requested in item 72 of the attached Matrix of Questions. It also responds to item 73 about site-specific safety and environmental impacts of a CCS system.

This letter does not address the questions in the February 5 letter related to process design. This information is being mailed, in hardcopy to your attention, today under an assertion of Confidential Business Information (CBI).

Should you have any questions regarding this application, please contact me at tsullivan@zephyrenv.com, or 512-879-6632, or Ms. Allana Whitney of Chemtex International, Inc. at Allana.Whitney@chemtex.com or 910-509-4451.

Regards,

Thomas I. Sullivan, P.E.

Attachment A: Matrix of Questions
Attachment B: Site Specific CCS Cost Estimate
Attachment B.1 Updated Capital Cost Estimate

cc: Ms. Allana Whitney, Chemtex International, Inc.
Mr. Mauro Fenoglio, M&G Resins USA, LLC
Ms. Martha Martinez, M&G Resins USA, LLC

ATTACHMENT A

Responses to Process Description, BACT Updates, and Supplemental Information Requests in February 5, 2014 EPA letter:

ZEC Counter	I-Letter No.	Instruction	Response
1	2.B	Hot vapor exiting the water removal column is superheated in the offgas preheater and then routed to the expander for energy recovery. Following the expander, the decompressed vapor is partially condensed in a WRC condenser. The discharge from the WRC condenser passes to the WRC reflux tank. The separated, uncondensed offgas stream is routed to the RTO preheater. What media is being used in the preheaters to preheat these streams?	The RTO preheater uses steam as the heating media.
2	2.B	What media is being used in the scrubber to convert the residual bromine containing species	The bromine scrubber utilizes water with caustic and bisulfite as the scrubbing media and has no contribution to or reduction in the GHG emissions of the RTOs
3	2.B	Show the inlet and outlet streams to the waste scrubber with labeling. What is the material converted to?	The bromine scrubber utilizes water with caustic as the scrubbing media and has no contribution or reduction to the GHG emissions of the RTOs. Bromine is converted to bromine salts and bromates in caustic solution.
4	2.B	The application states that during normal operation the heat release of the offgas is sufficient for the RTO to operate auto-thermally, i.e. supplementary heat input is not required. Should the heat release from the offgas decrease, natural gas will be supplied to the RTOs to sustain proper firebox temperature. During what times of plant operation would M&G Resin (M&G) expect that natural gas will need to be supplied to the RTOs?	Natural gas would be required during startup and as needed to maintain a temperature set point during low production periods. Actual production thresholds for autothermal operation will change based on variability in the process emissions.
5	2.B	Is natural gas added to the RTOs automatically or manually?	Natural gas is added automatically to maintain a temperature set point.
6	2.B	What is the proposed compliance strategy for the operation of the RTOs?	Good production practices involve utilizing the minimum amount of natural gas in order to operate the RTO in compliance with its regulated role as a control device. For GHG emission compliance, the RTO will not exceed the natural gas combustion rates represented in the application.
7	2.B	For the operation of the RTOs, what will be monitored and recorded?	Temperature in the oxidation chamber, natural gas fuel usage, exhaust gas flow and oxygen level will be measured and recorded.
8	2.C	Is fuel or steam added to the acetic acid vaporizer?	Steam is used in the acetic acid vaporizer.
9	2.C	It is stated that the high pressure vaporized mixture of acetic acid and water fed to the WRC is used to increase the enthalpy input to the WRC, thereby increasing acetic acid/water fractionating capacity. Does this method of operation conserve energy usage or demand (fuel, steam, etc.) of the WRC that would otherwise be needed to accomplish the same result?	Acetic acid is used to increase slurry temperature inside the digester to complete oxidation from para-xylene to terephtalic acid. This is not an energy recovery system.

Responses to Process Description, BACT Updates, and Supplemental Information Requests in February 5, 2014 EPA letter:

ZEC Counter	I-Letter No.	Instruction	Response
10	2.C	Excess underflow is cooled in a train of heat exchangers and steam generators for energy recovery. Is this a design strategy that is common to PET and PTA production or is it unique to M&G Resin?	This design is unique to the PTA process licensed for use by M&G.
11	2.C	Excess underflow is cooled in a train of heat exchangers and steam generators for energy recovery. Can this reduction of energy demand be quantified?	At full capacity production, the electricity demand of the PTA plant is expected to be met by the heat recovery steam generator production. This energy recovery is an integral part of the plant design and is reflected in the annual GHG emission calculations. This is accounted for in the natural gas combustion represented in the permit application.
12	2.D	The process flow diagram indicates at the beginning of the process a "catalyst and feed preparation" unit. Please update the process description to include a summary of this unit	The catalyst and feed preparation unit consists of a simple process vessel for mixing of the materials. There are no GHG emissions associated with this operation.
13	2.E.v	After crystallization, product slurry is flash-cooled and sent to the PTA filters which separate the PTA from the acetic acid/catalyst liquid. Where is this liquid-mix directed? Does it go to the wastewater treatment plant (WWTP)?	The liquid mixture is routed to filtrate tanks and recycled back into the process. This is not a potential GHG source.
14	2.E.vi	The wet PTA cake is sent to the respective PTA dryers, which are heated by steam. Is this steam produced from the energy recovery mentioned on page 17 when the underflow from the WRC is cooled?	The facility steam system includes multiple steam headers that operate at different pressures. The steam headers receive steam generated both by the utility plant boilers and process heat recovery operations. There are no direct GHG emissions from the steam system.
15	2.E.ix	The off-spec silo located in the PTA unit process area is used to store off-spec material for further re-processing. Where is off-spec material re-introduced in the process?	The off-specification PTA silo is located in the PET area; off-specification material is reintroduced to vacuum flash tank V-0600. There are no GHG emissions associated with this operation.
16	2.E.x	All the pneumatic transport systems of the PTA unit are operated using nitrogen in a closed loop. Please confirm if product conveyance is enclosed. Are the vents from this enclosed system directed to the flare, RTOs or scrubber system?	The closed loop system description refers to the use of nitrogen return lines that allow for the recycling of the nitrogen. The nitrogen has a cost and is not vented directly to atmosphere, except during maintenance. There are no GHG emissions associated with this operation.
17	2.E.x	Are the vents from this enclosed system directed to the flare, RTOs or scrubber system?	See answer number 16 above

Responses to Process Description, BACT Updates, and Supplemental Information Requests in February 5, 2014 EPA letter:

ZEC Counter	I-Letter No.	Instruction	Response
18	2.E.x	If the product conveyance is not enclosed, is this a potential GHG emission source? Typically CO2 emissions are associated with combustion pollutants and CH4 is associated with VOC pollutants, therefore if M&G believes that such emission sources do not have the potential to experience a change in the amount of GHG pollutants emitted as a result of this project, please provide an explanation.	See answer number 16 above
19	2.F.iii	M&G proposes a numerical energy efficiency based BACT limit for maximum exhaust gas temperature of 320°F. The proposed BACT does not appear to include the thermal efficiency of the heaters. Please provide supplemental technical data that includes the thermal efficiency of the process gas heaters.	The preliminary vendor specified efficiency of the HTF heater is greater than 80%. The efficiency value is referred to the design air temperature and according to ASME Test Code PTC 4.1 Ed 88 (Abbreviated) and based on fuel lower heating value (LHV).
20	2.F.v	From the prepolymerization system onward, all equipment is maintained under vacuum conditions to promote reactions and to remove the reaction side products. The vacuum is maintained in each CP line through a system of glycol vapor ejectors with three inter-condensers and a liquid ring vacuum pump. Vapor streams from the liquid ring vacuum pump bubble into the esterifier seal pot. Please provide supplemental information that explains how make-up liquid is provided back into the vacuum liquid ring pump seal pots to ensure proper operation of the pump. What will be implemented to alert on-site personnel to problems?	This is an integral part of the PET process that M&G operates at several plants around the world. The plant will be operated to maximize online time. There are no GHG emissions associated with this operation.
21	2.F.v	Is there continuous monitoring of the system?	This is an integral part of the PET process that M&G operates at several plants around the world. The plant will be operated to maximize online time. There are no GHG emissions associated with this operation.
22	2.F.v	Are there low/high level alarms?	This is an integral part of the PET process that M&G operates at several plants around the world. The plant will be operated to maximize online time. There are no GHG emissions associated with this operation.
23	2.F.v	Is the ethylene glycol system a potential GHG source?	There are no GHG emissions associated with the ethylene glycol system operation.
24	2.F.v	Does the ethylene glycol system impact the potential GHG emissions from other equipment?	The ethylene glycol system does not impact the GHG emissions associated with other equipment.
25	2.F.v	Besides monitoring the liquid level of the ethylene glycol system, will there be continuous monitoring of other operating parameters (e.g., pressure) of the process equipment?	This is an integral part of the PET process that M&G operates at several plants around the world. The plant will be operated to maximize online time. There are no GHG emissions associated with this operation.

Responses to Process Description, BACT Updates, and Supplemental Information Requests in February 5, 2014 EPA letter:

ZEC Counter	I-Letter No.	Instruction	Response
26	2.F.v	What is the proposed compliance strategy for ensuring that the vacuum system is properly functioning?	This is an integral part of the PET process that M&G operates at several plants around the world. The plant will be operated to maximize online time. This is not a GHG source and does not require a GHG compliance plan.
27	2.F.v	What operating parameters will be monitored to ensure the maintaining of a vacuum around the CP system and no venting to the atmosphere?	This is an integral part of the PET process that M&G operates at several plants around the world. The plant will be operated to maximize online time. There are no GHG emissions associated with this operation.
28	2.F.v	Will there be concerns for solid carry-over or plugging around the vapor ejectors or other vacuum equipment?	This is an integral part of the PET process that M&G operates at several plants around the world. The plant will be operated to maximize online time. There are no GHG emissions associated with this operation. Solids are separated before entering into the vapor ejectors. Vapor ejectors as operated by M&G are not normally affected by fouling by solids.
29	2.F.v	Please confirm the design type for the inter-condensers. (i.e., direct-contact, shell and tube, etc)	The inter-condensors are direct contact. This is an integral part of the PET process that M&G operates at several plants around the world. The plant will be operated to maximize online time. There are no GHG emissions associated with this operation.
30	2.F.viii	It is stated that during instances when off-spec material is produced, silos are used to store off-spec material. Also, the amorphous PET chips produced as feedstock for the SSP unit are stored in silos. Is this a potential GHG source? Please provide an explanation.	Off-specification PET will not emit CO2, CH4 or other GHGs. This is not a potential source of GHG emissions.
31	2.F.ix	The CP unit is designed to recover scraps coming from the PET production plant (both from CP and SSP) and further recycling in the process. Is this recycling process enclosed?	Off-specification PET will not emit CO2, CH4 or other GHGs. This is closed process and is not a potential source of GHG emissions.
32	2.F.ix	If not, are fugitive or dust suppressants necessary and is it utilized?	Off-specification PET will not emit CO2, CH4 or other GHGs. This is closed process and is not a potential source of GHG emissions.

Responses to Process Description, BACT Updates, and Supplemental Information Requests in February 5, 2014 EPA letter:

ZEC Counter	I-Letter No.	Instruction	Response
33	2.F.x	Provide supplemental technical data that includes the design efficiency of the heat transfer fluid system.	The HTF fluid system is an integral part of the PET process that M&G operates at several plants around the world. The HTF heaters are designed to match the performance specifications for the HTF fluid system. The compliance of the HTF fluid systems is demonstrated by the performance of the HTF , as represented in the permit application. The plant will be operated to maximize online time. There are no separate GHG emissions associated with the HTF fluid systems.
34	2.F.x	What parameters will be monitored and recorded to ensure this system is operating as designed?	The HTF heaters performance demonstrates the operating performance of the HTF fluid systems. There are no separate GHG emissions associated with the HTF fluid systems.
35	2.F.x	What is the proposed compliance strategy for the heat recovery system?	See response to number 34.
36	2.F.x	The process gas for the crystallization system uses nitrogen. The fluidizing nitrogen leaving the fluid bed heater(s) passes through multi-cyclones and a filter. Then, the nitrogen is heated and sent back to the crystallizer in closed loop. How is heat transferred to the nitrogen?	Heat Transfer Fluid (HTF) is used as the source of heat.
37	2.F.x	What is used to heat the nitrogen?	HTF is used to heat the nitrogen, in a non-contact tube/fin heat exchanger.
38	2.F.xi	In the GTU, the gas is heated and sent to a catalytic bed reactor, where the oxidation of volatile organic compounds coming from the crystallization and SSP reaction units takes place. Where are the vents from the catalytic bed directed?	There is no vent stream. The gas continues to be recycled in the process. The catalytic bed reactor is used to convert organics in the recycled gas stream and eliminate potential build up of VOCs within the system. Any CO2 emissions are accounted for in the fugitive calculations.
39	2.F.xi	Is heat recovery from this vent stream possible?	The heat stays within the process as the gas steam is continuously recycled.

Responses to Process Description, BACT Updates, and Supplemental Information Requests in February 5, 2014 EPA letter:

ZEC Counter	I-Letter No.	Instruction	Response
40	2.F.xi	Is the heat from this vent stream recouped by preheating the gas before it is fed to the catalytic bed reactor?	The heat stays within the process as the gas stream is continuously recycled.
41	2.F.xi	What is used to preheat the inert gas used in the molecular sieve drier?	The gas passed through the molecular sieve is not heated, on the contrary it is cooled down before being fed to the molecular sieve bed.
42	2.F.xi	After removal of by-products, the "clean gas" leaving the GTU is then heated up, and sent to the SSP unit. What is used to heat the "clean gas"?	The process stream passing through the GTU is used to preheat the gas, before it is fed to the GTU through a shell and tube heat exchanger. After heat recovery, the stream leaving the GTU unit is recycled.
43	2.F.xii	The SSP reaction section comprises a horizontal inclined rotating cylinder (SSP reactor) in which inert gas is flowing counter current with respect to the chips flow direction. How is this accomplished?	The chips flow through the inclined rotary cylinder by gravity and through rotation of the reactor. The SSP reactor system is very much like a cement kiln.
44	2.F.xii	Does the inert gas suspend the chips?	No, see answer to number 43 above.
45	2.F.xii	Are the chips on some type of conveyor system?	No, see answer to number 43 above.
46	2.F.xiii	After the SSP reactor, chips are cooled in a fluidized bed that is operated with air. Is it possible to recover heat from the air used to cool the chips?	No, the chips are at approximately 440 deg F at that point in the process and the process air temperature is approximately 220 degF, which is too low to efficiently recover usable heat.
47	2.G	The proposed project will include the installation of a cooling tower that will be comprised of 10 modules which will supply cooling water to both the PET plant and the utility plant. Is it possible for GHG emissions to be present in the process water cooling towers due to process equipment leaks into the system or CO_2 entrainment? Please provide an explanation.	There are no GHG emissions associated with the cooling towers.
48	2.G	If there is a possibility for GHG emissions, please supplement the BACT analysis with an evaluation of leak repair and monitoring technologies and a proposal of what M&G would propose as BACT.	There are no GHG emissions associated with the cooling towers.
49	2.G	What is the proposed compliance strategy for the cooling tower?	There are no GHG emissions associated with the cooling towers.
50	2.G	Does the process include direct-contact coolers/condensers?	There are no GHG emissions associated with the cooling towers.

Responses to Process Description, BACT Updates, and Supplemental Information Requests in February 5, 2014 EPA letter:

ZEC Counter	I-Letter No.	Instruction	Response
51	2.H	PET chips are conveyed within the plant units and to/from the rail yard. Ambient air is filtered and then pressurized at the desired value using oil-free, water cooled centrifugal compressors. What drives these compressors (i.e., electric, steam)?	The compressors are driven by electric motors.
52	2.I	The liquid stream from the tank farm scrubber is sent to the WWTP. Is the tank scrubber a potential GHG source?	There are no GHG emissions associated with tank scrubber operation.
53	2.I	If so, a BACT analysis should be developed for the tanks to be installed for the project.	Not Applicable
54	2.J	Dock, rail yard and truck loading and unloading of product and raw materials is included. Are any of these potential GHG sources?	There are no GHG emissions associated with the stationary equipment. Barge, truck and rail car unloading racks GHG emissions would only be from the mobile vehicles, not the tanks or loading operations.
55	2.J	If so, a BACT analysis should be developed for the identified method of loading and/or unloading of product and/or raw materials. Please include the pollution controls that were evaluated.	Not Applicable
56	2.J	Will there be operating or work practice standards implemented to minimize GHG emissions generated during the truck loading operation? Please provide supplemental information that details these procedures.	Not Applicable
57	2.K	Please provide design efficiency data for the emergency generator and fire pump engines.	The final engine models have not been selected. They will be new Caterpillar diesel engines that will meet the requirements of 40 CFR 60 Subpart IIII, for Compression Ignition Internal Combustion Engines. A review of typical engines in the design range provides an approximate efficiency of 33-35%.
58	3	M&G is proposing to select a PET process that eliminates the second esterification step found in traditional CP units at PET plants and reduces the total energy required during the esterification unit operation by the number of heated vessels. If possible, please provide the number of heated vessels that will be reduced using the chosen technology instead of traditional technology.	One large esterification reactor, and its associated energy demand, is eliminated.
59	3	For single step esterification in the CP unit, if possible quantify the reduction in fuel and/or GHG emission production.	A comparison of technologies and their energy consumption is provided in Attachment B.
60	3	M&G is proposing to construct a SSP unit that eliminates the precrystallization and crystallization steps found in traditional SSP units. This is contradicted elsewhere. Please clarify statements made on page 28 that asserts its elimination.	The technology operated by M&G will eliminate the traditional precrystallization and crystallization steps and will require only one crystallization step before entering into the rotating reactor.

Responses to Process Description, BACT Updates, and Supplemental Information Requests in February 5, 2014 EPA letter:

ZEC Counter	I-Letter No.	Instruction	Response
61	3	Provide supplemental information that compares the efficiency gains in heat and electricity consumption or reduction in GHG emissions for chosen technology versus traditional PET technology.	A comparison of technologies and their energy consumption is provided in Attachment B.
62	3	Provide a copy of any technical resources used to evaluate the design decisions for the M&G facility and any benchmark comparison data of similar sources existing nationally or internationally, that may have been utilized in the design selection strategy.	A comparison of technologies and their energy consumption is provided in Attachment B.
63	3	Please provide technical resources, literature and calculations to substantiate the claimed efficiencies.	A comparison of technologies and their energy consumption is provided in Attachment B.
64	4	Please provide supplemental information that quantifies the amount of potential GHG emissions that will be minimized and reduces the amount of imported natural gas by using the biogas generated from the WWTP as fuel to the process heaters.	A comparison of technologies and their energy consumption is provided in Attachment B.
65	4	If possible please provide an estimate on how long the biogas will be flared.	The biogas may be flared for up to 8760 hours a year. The goal is to recover the heat content of the biogas in the HTF heaters for use in the process. The biogas will either be combusted in the flare or in the HTF heaters resulting in the same level of GHG emissions.
66	4	Please confirm if the biogas is the only vent stream directed to the flare.	Biogas is the only vent stream routed to the flare.
67	5	Please provide manufacturers data for the process heaters, RTOs, flare, emergency generator engine and fire pump engine.	The manufacturers final specifications have not been finalized at this date. The process parameters required for GHG emission calculation have been determined as part of the preliminary design package. Final specifications will not be available for approximately a year or more as the facility goes through detailed design.
68	5	If possible, please provide supplemental data comparing the energy efficiency and production of GHG emissions of the chosen equipment to similar or existing sources.	A separate discussion of overall process benchmarking is attached.
69	5	Please provide the technical assessment conducted to compare the performance of the equipment considered for this project.	A separate discussion of overall process benchmarking is attached.
70	6	Provide the production capacity for PET and PTA the proposed facility.	The PTA annual production rate is 1,440,000 metric tons (1,587,328 short tons). The PTE annual production rate is 1,200,000 metric tons (1,322,774 short tons).

Responses to Process Description, BACT Updates, and Supplemental Information Requests in February 5, 2014 EPA letter:

ZEC Counter	I-Letter No.	Instruction	Response
71	7	Please supplement the application by indicating whether your proposed BACT includes MSS emissions for the overall process, or provide supplemental information that details why a different BACT limit is needed during MSS along with a proposed BACT analysis for such startup/shutdown emissions.	The GHG emissions from this facility are due to combustion with a very minor contribution from the waste water treatment plant generated biogas and natural gas fugitives. The MSS emissions from all sources are expected to the same or less than normal operational emissions. A separate MSS limit is not required.
72	8	Please provide the site-specific parameters that were used to evaluate and eliminate CCS from consideration. Please include cost of construction, operation and maintenance, cost per ton of C02 removed by the technologies evaluated and include the feasibility and cost analysis for storage or transportation for these options.	See Attachment B of the March 14, 2014 supplemental response.
73	8	Please discuss in detail any site specific safety or environmental impacts associated with a CCS removal system.	No new safety considerations are expected from the carbon capture, separation and compression operations expected with a CCS system. The power demand of the CCS system will require new electricity generation, which will be generated using fossil fules increasing pollution from both conventional pollutants, such as CO, NOx and PM, and greenhouse gases. The amine system reboiler will require increased natural gas consumption, which also will increase pollution from conventional and nonconventional combustion byproducts.
74	9	M&G will utilize an energy efficient design for the heaters. Please provide supplemental information for the process heaters.	The manufacturers final specifications have not been finalized at this date. The process parameters required for GHG emission calculation have been determined as part of the preliminary design package. Final specifications will not be available for approximately a year or more as the facility goes through detailed design. Preliminary specifications are as provided in the response to number 19.
75	9	If possible, please provide benchmark data that compares similar industries with existing or similar heaters that utilize the same technology.	The HTF heaters are an integrated part of the PET plant design that has been operated successfully at installations in Brazil and Mexico in the two largest PET plants in the world. Alternative heater designs are not considered a reasonable technical option for this facility.
76	10	Provide updated emission tables using the new GWPs so that EPA can cross-check its own calculations.	Revised GHG calculations are attached.

ATTACHMENT B

zephyr

ATTACHMENT B

M&G Resins GHG PSD Permit Application

Response to CCS question #8 in EPA letter dated February 5, 2014.

> *8. Please provide the site-specific parameters that were used to evaluate and eliminate CCS from consideration. Please include cost of construction, operation and maintenance, cost per ton of CO2 removed by the technologies evaluated and include the feasibility and cost analysis for storage or transportation for these options. Please discuss in detail any site specific safety or environmental impacts associated with a CCS removal system.*

For the economic analysis of CCS, M&G Resins assumed that an amine based scrubbing system and associated compressors would be used. While not fully proven on gas-fired turbine flue gas or process heater exhaust, amine based scrubbing systems are the most mature technology potentially available for CCS. To calculate the cost of CCS, M&G Resins used cost information from a DOE-NETL study from 2010 to determine the capital cost of the amine scrubbing system and associated compressors. Costs were revised assuming a 12-inch diameter, 440-mile long pipe to deliver the compressed CO2 to the SACROC CO2 pipeline manifold in Scurry County, TX. CO2 injection in enhanced oil recovery (EOR) projects is cannot be considered as sequestration due to the inherent differences in the goals of EOR. However, there is a market for CO2 for EOR project and the pipelines originating in Scurry County supply the majority of exiting EOR projects in the Permian Basin. This destination is the most likely to be able to receive and distribute additional CO2. Note that EOR revenues cannot be guaranteed nor can available capacities in current EOR pipelines. EOR projects are driven by the recovery of oil and will end when the cost of oil recovery no longer makes financial sense, therefore the long term viability of EOR as a CO2 destination is not assured.

A 12-inch pipe is conservatively small and underestimates the costs for constructing the pipeline as a similar length pipeline project in Texas has an estimated $1 Billion cost (BridgeTex Pipeline 450 miles from Permian Basin to Houston).
http://articles.chicagotribune.com/2013-05-31/news/sns-rt-usa-pipelineoil-factboxl2n0ec1r6-20130531_1_eagle-ford-shale-oil-pipeline-enbridge-inc-origin-destination/3

Note also that the liability and property issues related to underground CO2 storage have not been fully resolved. CCS cost estimates provided by DOE-NETL did not include an escalation factor to account for increasing costs as available sinks begin to fill up or the ongoing monitoring costs associated with a sequestration project.

An updated capital cost estimate is included as Attachment B.1 to this submittal.

ATTACHMENT B.1

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M&G PET PLANT
CARBON CAPTURE AND STORAGE SYSTEM
COST ESTIMATE
Scaling Factors

Scaling Factor Calculations
Utilizing DOE-NETL Combined-Cycle Gas Turbine Cost Example

Years of Operation for Levelization: 30

Cost Type	Units	Cost (millions $)	Reference
Carbon Capture Systems - Capital Expense Estimation			
CO2 Removal System	$ (million)	215.943	[1]
CO2 Compression System		24.39	[1]
Cooling Water System		8.483	[1]
Accessory Electric Plant		11.151	[1]
Instrumentation and Control		1.828	[1]
Total Costs		**261.80**	
Owner's Costs		6.76	[1]
Inventory Capital		1.458	[1]
Initial Cost for Chemicals		0.823	[1]
Other Owner's Costs		38.45	[1]
Financing Costs		6.921	[1]
Total Overnight Costs		**316.21**	
Carbon Capture Systems-Operational Expense Estimation			
Annual Electrical Power Requirements	MWh/yr	714,028	[1]
Electrical Power Unit Cost	$/MWh	58.00	[1]
Annual Electrical Power Costs	$ (million/yr)	41.41	[1]
Annual Fixed Operating Costs		7.14538	[1]
Annual Variable Operating Costs		3.582561	[1]
Subtotal		**52.14**	
Total Capture Expense Estimation			
Annual Tons of CO2 Sequestered	Short Tons/yr	1,495,489	[1]
Total CO2 Tons Sequestered Throughout Lifespan	Short Tons	44,864,670	[1]
Capital Recovery Factor		0.093	
Indirect Annual Cost (CRF * TCI)	$ (million)/yr	29.42	[1]
Annual Operating Expense	$ (million)/yr	52.14	[1]
Per CO2 Ton Capital Expense	$/Ton CO2 Avoided	19.67	[1]
Per CO2 Ton Operating Expense	$/Ton CO2 Avoided	34.87	[1]
	$/Ton CO2 Captured and Compressed	**54.54**	

Reference [1]: DOE-NETL Report: Cost and Performance Baseline for Fossil Energy Plants
Volume 1: Bituminous Coal and Natural Gas to Electricity
Revision 2a, September 2013
Natural Gas Combined Cycle Plants

M&G Annual CO2 Tons Sequestered	Short Tons/Yr.	1,028,342	<90% of Carbon Dioxide Captured
CCGT Annual CO2 Tons Sequestered	Short Tons/Yr.	1,495,489	<90% of Carbon Dioxide Captured
Adjustment Factor	**M&G/NRG Tons/CCGT Tons**	**0.69**	**< Will be utilized to scale the CAPEX and OPEX expenditures for M&G**

M&G PET PLANT
CARBON CAPTURE AND STORAGE SYSTEM
COST ESTIMATE
Carbon Capture and Compression

Adjusted Cost Factors
For M&G Facility

Years of Operation: 30

Cost Type	Units	Value	
Carbon Capture Systems - Capital Expense Estimation			
CO2 Removal System		148.49	
Collection System Duct Work		100.00	
CO2 Compression System		16.77	
Cooling Water System		5.83	
Accessory Electric Plant		7.67	
Instrumentation and Control		1.83	<Non-scaled value
Total Costs	$ (million)	**280.59**	
Owner's Costs		4.65	
Inventory Capital		1.00	
Initial Cost for Chemicals		0.57	
Other Owner's Costs		26.44	
Financing Costs		4.76	
Total Overnight Costs		**318.00**	
Carbon Capture Systems-Operational Expense Estimation			
Annual Power Requirements	MWh/yr	490,986	
Cost of Power	$/MWh	58.00	
Annual Power Costs		28.48	
Annual Fixed Operating Costs	$ (million/yr)	4.91	
Annual Variable Operating Costs		2.46	
Subtotal		**35.85**	
Capture/Compression Expense Estimation			
Annual Tons of CO2 Sequestered	Short Tons/yr	1,028,342	
Total CO2 Tons Sequestered Throughout Lifespan	Short Tons	30,850,258	
Capital Recovery Factor		0.093	
Indirect Annual Cost (CRF * TOC)	$ (million)/yr	29.59	
Annual Operating Expense	$ (million)/yr	35.85	
Per CO2 Ton Capital Expense	$/Ton CO2 Avoided	28.77	
Per CO2 Ton Operating Expense	$/Ton CO2 Avoided	34.87	
$/Ton CO2 Captured and Compressed		**63.64**	

M&G PET PLANT
CARBON CAPTURE AND STORAGE SYSTEM
COST ESTIMATE
Carbon Transport Calcs

Transport Costs for Compressed CO_2 From M&G Facility in Corpus Christi to Scurry County TX

Scurry County Transport Costs			
Pipeline Distance	miles	440.94	
CO2 Daily Flow Rate	short tons/day	2,817	90% of daily CO2 Production
Pipeline Diameter	inches	12	
Pipeline Capital Cost	Million $	354	
CO2 Surge Tank		1.15	
Pipeline Control System		0.11	
Total Pipeline Capital Cost		**355.63**	
Capital Recovery Factor		**0.093**	
Annual Capital Cost	Million $/yr	**33.09**	
Annual O&M Costs		**3.81**	
Annual Cost for Transport		**36.90**	
Total $/ton of CO2 Transported	**$/Ton CO2 Transported**	**35.88**	

Reference: [2] DOE-NETL Report 2010/1447
Estimating Carbon Dioxide Transport and Storage Costs
March 2010

Scurry County TX Pipeline Distances and Capital Costs, Reference: Kinder Morgan Pipeline Cost Metrics			
Terrain	**Capital Cost ($/inch-Diameter/mile)**	**No. Miles of Each Terrain**	**Adjusted Capital Costs**
Flat, dry	$50,000	256.00	$153,600,000
Mountainous	$85,000	141.00	$143,820,000
Marsh, Wetland	$100,000	5.18	$6,216,000
River	$300,000	1.76	$6,338,182
High Population	$100,000	37.00	$44,400,000
Offshore (150'-200' depth)	$700,000	0.00	$0
	Totals:	**440.94**	**$354,374,182**

M&G PET PLANT
CARBON CAPTURE AND STORAGE SYSTEM
COST ESTIMATE
Storage Calcs

Geologic Storage Capital Costs		
	Capital Costs	
Site Screening and Evaluation	$	$4,738,488
No. of Injection Wells (approx 1 per 10K daily CO_2 t	No. of Wells	1
Injection Well Cost	$	$647,041
Injection Equipment	$	$483,032
Liability Bond	$	$5,000,000
Total:	**Million $**	**$10.87**
Capital Recovery Factor		**0.124**
Annual Capital Cost of Storage	**Million $/yr**	**$1.35**
Annual Capital Cost of Storage/ton CO_2 stored	**$/Ton CO_2 Stored**	**$1.31**

	Declining Capital Funds	
Pore Space Acquisition	**$/ton CO_2**	**$0.334**
Annual Cost of Pore Space Acquisition	**$/yr**	**$343,466**
Total Cost of Pore Space Acquisition	**Million $**	**$10.30**

Storage O&M		
Normal Annual Expenses (Fixed O&M)	Million $/yr	$4.22
Annual Consumables (Variable O&M)	Million $/yr	$8.44
Annual Surface Maintenance (Fixed O&M)	Million $/yr	$0.12
Annual Subsurface Maintenance (Fixed O&M)	Million $/yr	$3.19
Annual Storage O&M:	**Million $/yr**	**$15.97**
Annual Storage O&M/ton CO_2 stored:	**$/ton CO_2**	**$15.53**
$/ton of CO_2 stored:	**$/Ton CO_2 Stored**	**$17.18**

M&G PET PLANT
CARBON CAPTURE AND STORAGE SYSTEM
COST ESTIMATE
Daily CO2 Rate Calcs

GHG Annual Emissions per Unit **Natural Gas Combustion**

Unit	Annual Emissions per Unit (short tons)	No. of Units	Total Emissions (CO2) Combined	
HTF Heaters (natural gas)	72,622	4	290,488	
HTF Heaters (all) (other fuel streams)	7,310	1	7,310	
RTO1	52,932	1	52,932	
RTO2	52,932	1	52,932	
GE LM-6000 Natural Gas Turbine and Duct Burner	363,659	1	363,659	
Auxiliary Boiler A	247,286	1	247,286	
Auxiliary Boiler B	127,995	1	127,995	
Total	**924,736**		**1,142,602**	**TPY**
			3,130	**TPD**

Pipe Diameter Based on TPD Value: 12 inches

NOTE: Small sources and flare emissions are not included in the totals for CCS computations.

NOTE: RTOs may get excluded due to their ultra-low CO2 concentrations.

M&G PET PLANT
CARBON CAPTURE AND STORAGE SYSTEM
COST ESTIMATE
Summary

Summary Costs for CO2 Capture, Compression, Transport and Storage	Scurry County, TX
CO2 Capture Costs	
Estimated Capitol Cost of Carbon Capture and Compression Construction ($ million)	$318.0
Annualized Cost of CO2 Capture Equipment Construction ($ million/yr)	$29.6
Annual Operating Costs of CO2 Capture Equipment ($ million/yr)	$35.9
Carbon Capture and Compression ($/ton CO2 avoided)	$63.6
CO2 Transport Costs	
Estimated Capitol Cost of CO2 Transport Construction ($ million)	$354.4
Annualized Cost of CO2 Transport Construction ($ million/yr)	$33.1
Annual Operating and Maintenance Costs for CO2 Transport ($ million/yr)	$3.8
Transport ($/ton CO2 avoided)	$35.9
CO2 Storage Costs	
Estimated Capitol Cost of CO2 Storage Construction ($ million)	$10.9
Annualized Cost of CO2 Storage Construction ($ million/yr)	$1.3
Annual Operating and Maintenance Costs for CO2 Storage ($ million/yr)	$16.0
Storage ($/ton CO2 avoided)	$17.2
Summary	
Annual CO2 Emissions from M&G/NRG Plants (tons CO2/yr)	1,142,602
Total CCS Cost ($/ton CO2 Avoided @ 90% recovery)	$116.7
Total CCS Capitol Cost ($ million)	$683.2
Total CCS Capitol Cost (Percentage Increase in Project Capitol Cost, base project approx. $1 Billion)	68%

Toups, Brad

From: Larry Moon <lmoon@zephyrenv.com>
Sent: Wednesday, May 28, 2014 10:50 AM
To: Sean O'Brien (Sean.OBrien@tceq.texas.gov)
Cc: Toups, Brad; Thomas Sullivan
Subject: RE: Application Revision and Response to Questions for GHG application PSD-TX-1354-GHG
Attachments: removed.txt; Table 3-4 Revised 05-28-2014.pdf

Sean,

As we stated in the May 15, 2014 application revision, the proposed annual operating schedule for Auxiliary Boiler B was increased to 8760 hours per year. The annual GHG calculations on Table 3-4 for Auxiliary Boiler B was correct but the footnote did not get updated. Attached is a revised Table 3-4 with corrected footnotes.

From: Toups, Brad [mailto:Toups.Brad@epa.gov]
Sent: Wednesday, May 28, 2014 10:12 AM
To: Larry Moon; Thomas Sullivan
Subject: FW: Application Revision and Response to Questions for GHG application PSD-TX-1354-GHG

Hi All,
Can you address Sean's concern? Please cc me on the response.
Thanks
Brad

From: Sean O'Brien [mailto:Sean.OBrien@tceq.texas.gov]
Sent: Wednesday, May 28, 2014 9:31 AM
To: Toups, Brad
Subject: FW: Application Revision and Response to Questions for GHG application PSD-TX-1354-GHG

Brad,
Table 3-4 is calculated wrong. They used 8760 hr/yr rather than 500 hr/yr as noted in the footnote. They'll need to recalculate.
Sean

From: Larry Moon [mailto:lmoon@zephyrenv.com]
Sent: Thursday, May 15, 2014 9:10 AM
To: Magee.Melanie@epamail.epa.gov
Cc: toups.brad@epa.gov; Sean O'Brien; Thomas Sullivan; mauro.fenoglio@gruppomg.com; Flavio Assis (Flavio.Assis@gruppomg.com.br); Whitney Allana (allana.whitney@chemtex.com); Martha.Martinez@gruppomgus.com
Subject: Application Revision and Response to Questions for GHG application PSD-TX-1354-GHG

Melanie,

Please find enclosed this application revision and response to your questions in your February 5, 2014 letter regarding GHG application PSD-TX-1354-GHG for M&G Resins USA, LLC, Corpus Christi, Nueces County, Texas. Please call if you have any questions regarding this submittal.

Larry Moon P.E. | Principal
Zephyr Environmental Corporation
2600 Via Fortuna, Ste 450 | Austin, TX 78746
Direct: 512.879.6619 | lmoon@zephyrenv.com
ZephyrEnv.com | HazMatAcademy.com

TABLE 3-4
AUXILIARY BOILER B GHG ANNUAL EMISSION CALCULATIONS
UTILITY PLANT

EPN	Average Heat Input (MMBtu/hr)	Maximum Heat Input (MMBtu/yr)	Pollutant	Emission Factor (kg/MMBtu)[1]	GHG Mass Emissions (tpy)	Global Warming Potential[2]	CO_2e (tpy)
AUXBLRB	250	2,190,000	CO_2	53.02	127,992.24	1	127,992.2
			CH_4	1.0E-03	2.414	25	60.4
			N_2O	1.0E-04	0.2414	298	71.9
				Totals	**127,994.9**		**128,124.5**

Notes

1. Factors based on natural gas values in Table C-1 and C-2 of 40 CFR Part 98, Mandatory Greenhouse Gas Reporting.
2. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation, CO_2e:

GHG Mass Emissions (ton/yr) = 0.001 tons/kg x 2190000 MMBtu/yr x 0.001 kg/MMBtu = 2.41 tpy
CO2e (ton/yr) = 2.41 tpy x 25 = 60.4 tpy CO2e

zephyr

consulting ♦ training ♦ data systems

May 13, 2014 via Federal Express

Mr. Wren Stenger
Director, Multimedia Planning and Permitting Division
U.S. EPA Region 6, 6PD
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

RE: Permitting Authority for PSD Air Quality Permit for GHG Emissions
PSD-TX-1352-GHG - M&G Resins USA, LLC, Project Jumbo, Corpus Christi, TX and
PSD-TX-1354-GHG - M&G Resins USA, LLC, Utility Plant, Corpus Christi, TX formerly
NRG Corpus Christi Combined Heat and Power Plant

Mr. Stenger:

On behalf of M&G Resins USA (M&G), Zephyr Environmental Corporation (Zephyr) is submitting this response to your March 27, 2014 letter to Mr. Mauro Fenoglio of M&G. That letter instructed M&G to notify EPA of its preferred permitting authority for the Greenhouse Gas (GHG) Prevention of Significant Deterioration (PSD) permit application for Project Jumbo (PSD Permit Number PSD-TX-1352-GHG), by May 15.

Please be advised that M&G requests that EPA remain the permitting authority for PSD Permit Number PSD-TX-1352-GHG.

In addition, as Mr. Jeff Robinson, EPA, was notified in a letter dated March 27, 2013, M&G now has ownership of the air permit applications for the former NRG Texas Power (NRG) Corpus Christi Combined Heat and Power Plant Project (PSD Permit Number PSD-TX-1354-GHG). Therefore, this letter is also the response to your March 27, 2014 letter to Mr. Craig Eckberg of NRG, which also included an instruction to notify EPA of the preferred permitting authority for the GHG PSD permit application for the CHP project.

Please be advised that M&G requests that EPA remain the permitting authority for PSD Permit Number PSD-TX-1354-GHG, as well.

If you have any questions regarding this registration, please contact me, at 512-879-6632 or tsullivan@zephyrenv.com, or Allana Whitney, of Chemtex, at (910) 509-4451 or Allana.Whitney@chemtex.com. Please note that Chemtex is a wholly owned subsidiary of M&G and serves as the engineering arm of M&G for Project Jumbo.

Sincerely,
Zephyr Environmental Corporation

Thomas Sullivan, P.E.
Principal

cc: Allana Whitney, Chemtex
Mauro Fenoglio, M&G
Mike Wilson, P.E., Director, Air Permits Division, TCEQ, Austin