RECEIVED
12 JUL 18 PM 4:26
AIR PERMITS SECTION
6PD-R

INVISTA™

Via Email and FedEx

July 16, 2012

INVISTA S.a r.l.
Victoria Site
2695 Old Bloomington Rd N
Victoria, TX

361-572-1200 Tel
www.INVISTA.com

Melanie Magee
Air Permit Section
U.S. Environmental Protection Agency, Region VI
1445 Ross Avenue, Suite 1200
Dallas, TX 75202-2733

Re: Response to EPA Letter Dated May 29, 2012
In Support of INVISTA S.a r.l. Victoria Site's West Powerhouse
Greenhouse Gas Prevention of Significant Deterioration Permit Application
Required by Consent Decree between EPA and INVISTA, entered July 28, 2009

Dear Ms. Magee:

This letter is in response to your May 29, 2012, letter, requesting additional information in support of INVISTA S.a r.l.'s Victoria, TX Site (INVISTA Victoria) West Powerhouse (WPH) Prevention of Significant Deterioration (PSD) Permit Application, submitted March 16, 2012 and as a follow up to our discussions of May 30, 2012. The scope of the WPH Project includes the installation of the SNCR, as well as Low NOx Burners (LNB), for NOx control on the four existing, hazardous waste boilers in the West Powerhouse. In addition, boiler retubing and other boiler refurbishment and modernization improvements will be performed as part of the overall project.

As you are aware, the WPH Project is driven by the requirement to install NOx controls (SNCR or SCR depending on the results of pilot testing) on the WPH boilers, with the installation on the first boiler required to be completed by December 31, 2013, pursuant to the Consent Decree between EPA and INVISTA, dated July 28, 2009. To meet this deadline, INVISTA must begin construction by May 1, 2013, and requests EPA Region VI issue this permit before that date.

Limits of energy efficiency improvements. Throughout the attached response, INVISTA has addressed the specific questions raised by EPA, clarifying the information provided in the original application. As additional explanation, INVISTA provides this overall summary regarding the issue of energy efficiency as applied to this unique project and the WPH boilers. In evaluating the BACT for this project, the scope and purpose of the project, as well as the function and design of these existing boilers must be considered.

The primary purpose of this project is to install NOx controls on the four, existing WPH boilers pursuant to the Consent Decree between EPA and INVISTA. The function of these boilers is to take process waste streams generated in the manufacture of organic and inorganic chemicals at the INVISTA Victoria site and recover the energy in these waste streams. Energy recovery from waste streams is an inherently efficient design. Due to the characteristics of the liquid and gaseous waste streams, these boilers are subject to RCRA and MACT EEE requirements, which mandate very high destruction and removal efficiencies (e.g., > 99.99% DRE for organic compounds) and place certain restrictions on the boilers (e.g., minimum combustion temperatures, minimum residence time, etc.). While these restrictions negatively impact energy efficiency, they are nonetheless inherent in the design and purpose of the boilers. Modifying the boilers to incorporate energy efficiency measures beyond those described in our attached response would constitute "redefining the source," which, as discussed in INVISTA's original application, is not appropriate.

Additionally, while one aspect of energy efficiency is a reduction in greenhouse gas emissions, another aspect is cost savings through a reduction in fuel necessary to produce, in this case, each pound of steam. As a result, INVISTA Victoria has, over the history of these boilers, taken various measures to maximize the energy efficiency of these boilers to the extent economically and technically feasible, while still meeting the requirements of RCRA and MACT EEE regarding destruction and removal efficiencies. As part of this project, INVISTA will be repairing and upgrading certain energy efficiency elements (e.g., repairing of the air preheaters and improving insulation). As addressed specifically in questions 3 and 5 of the Attachment, INVISTA believes it has previously installed or included in this project all available energy efficiency steps, given the additional constraints of the installation of the NOx control measures and the requirements of RCRA and MACT EEE on these boilers. Additional energy efficiency measures would be inconsistent with the underlying requirements of the Consent Decree and existing environmental requirements, and should not be included in Step 1 of the Best Available Control Technology (BACT) top-down approach because they would improperly redefine the goal, objectives, purpose, or basic design of the project.

Completeness of application. Finally, while this letter responds to EPA's request for additional information to make a completeness determination, we believe that EPA's guidance on what constitutes a complete application demonstrates that a complete application was submitted on March 16, 2012. Specifically, the original application included each of the following elements of a complete application listed in EPA Region IV's "Prevention of Significant Deterioration Permit Application Requirements," updated February 2010.

(1) Applicant information (such as company name and contact information);
(2) A description of the project (e.g., location, 4-digit SIC code, description of processes, description of emission control systems, etc.);
(3) Information needed to make an applicability determination (potential to emit, enforceable restrictions, etc.);
(4) BACT analyses for each emission unit that emits pollutants that are emitted from the project in a "significant amount";

(5) Ambient air quality and meteorological conditions, if applicable;
(6) Source impact analyses, if applicable (air quality, visibility, soils and vegetation, growth, Class I); and
(7) Emission rates in tpy.

It is our hope that this letter and the associated Attachment have addressed EPA Region VI's questions regarding INVISTA Victoria's WPH GHG PSD Permit Application. We look forward to continuing to work closely with EPA towards issuance of this permit.

In the event that you have additional questions or would like to discuss further, please contact Pete Buckman at 361-580-5954 or Bharat Contractor at 281-690-4704.

Sincerely,

Stephen W. Harvill
INVISTA Victoria, Site Manager

SWH/rj

Attachment

cc: Jeff Robinson – EPA Region VI
Bonnie Braganza – EPA Region VI
Pete Buckman
Bharat Contractor

INVISTA Response to EPA Letter of May 29, 2012

Process Description

1. **On page 3, the application indicates that there are four tangentially fired water-tube boilers (Combustion Engineering Model VU-60). Please provide additional numerical energy efficiency rating(s). Please provide additional numerical technical data and benchmarking data to detail each boiler's capacity and energy efficiency rating(s).**

   The West Powerhouse original boiler design capacities and original design energy efficiency ratings are provided below:

Boiler	*Vintage*	*Original Design Capacity (MPPH Steam)[1]*	*Original Design Energy Efficiency Rating (%)[2]*
1	*1965*	*300*	*83.2*
2	*1965*	*300*	*83.2*
3	*1966*	*400*	*83.0*
4	*1973*	*400*	*83.1*

(1) MPPH = thousand pounds per hour of 550 psig superheated steam

(2) Efficiency rating based on firing 100% natural gas at full steaming rate

Although the West Powerhouse boilers were designed to primarily combust various liquid and gaseous fuels with natural gas as a supplementary fuel, the original boiler design manuals provided energy efficiency ratings for combustion of natural gas. Energy efficiency ratings were not provided for the boilers firing such various combinations of liquid and gaseous fuels. Due to the characteristics of the liquid and gaseous fuels and combinations of liquid and gaseous fuels fired in the West Powerhouse boilers, specific energy efficiency ratings are difficult to determine.

In addition, as described in Sections 2.0 and 4.0 of the INVISTA West Powerhouse GHG permit application, in order to combust the liquid fuels, the West Powerhouse boilers must meet strict emissions standards and destruction efficiency requirements as dictated by the facility's RCRA permit and by Hazardous Waste Combustion MACT (40 CFR Part 63, subpart EEE). The West Powerhouse boilers have relatively large fireboxes that provide the increased residence times necessary to provide complete combustion of the waste fuels (> 99.99% DRE) at the expense of optimal energy efficiency for any one given fuel. By contrast, boilers designed to combust natural gas only, because the fuel does not vary, are typically designed to maximize energy efficiency. Since the West Powerhouse boilers are waste fired boilers, it is not appropriate to compare their efficiencies to those of natural gas fired boilers.

As described in Section 1.0 of the permit application, combusting the waste fuels is inherently energy efficient. Were the Victoria facility to dispose of the wastes in a different manner (e.g. send to a fuel blender or incinerator) they would be combusted anyway, and the West

Powerhouse boilers would need to make up for the loss in steam generation by increasing use of natural gas or other liquid fossil fuels (i.e., diesel fuel).

Finally, as described in Sections 1.0, 1.3, and 3.0 of the INVISTA West Powerhouse GHG permit application, the purpose of the West Powerhouse project is to install NOx emission controls, including Selective Non-Catalytic Reduction (SNCR) as required by INVISTA's Consent Decree with EPA and low-NOx burners (LNB). The objective of the NOx control installation is to optimize NOx reduction efficiency. The LNB are designed to reduce NOx emissions and, therefore, are not necessarily the most energy efficient burners available. In addition, water used to dilute and provide optimal mixing of urea for SNCR necessarily has an adverse impact on efficiency due to the additional energy needed to vaporize the water in the firebox. Therefore, the impact of the required NOx controls that are the driving force for the project must be considered when comparing the predicted West Powerhouse boiler efficiencies to baseline data or to any other boiler efficiency data.

2. **In your process description, please clarify if each boiler is dedicated to a specific fuel or fuel blends and if this design configuration was optimized to provide the most efficient results. To assist in the drafting of the permit, please provide additional information about boiler operations. Specifically, if a boiler is dedicated to run high BTU or low BTU fuel and any additional operational restrictions that may need to be included from additional regulatory standards from the Clean Air Act or Resource Conservation and Recovery Act (RCRA).**

Although a number of different liquid and gaseous fuels are combusted in the boilers, the fuels can be grouped into four basic categories: liquid waste fuels, high BTU gaseous fuels, low BTU gaseous fuels, and natural gas. Each of the four boilers may be operated on a combination of the four fuel types. As a result, the efficiency for each boiler varies depending on the particular fuel mix combusted and load at any given time.

The boilers can combust the following fuels:

Boilers	*Fuel Category*	*Fuel*[1]
1 and 2	*Liquid Waste*	*Adipic Acid/C12 Non-Volatile Residue (NVR)* *ADN Low Boiler Waste (LBW)*
	High BTU Gas	*Natural Gas* *ADN and C12 Regeneration Gas*
	Low BTU Gas	*Adipic Acid Off Gas* *C12 Low BTU Off Gases* *Nitric Acid Fume Sweep*
3 and 4	*Liquid Waste*	*Adipic Acid/C12 Non-Volatile Residue (NVR)* *ADN Low Boiler Waste (LBW)* *C12 "A" Oil (Boiler 3 only)*
		C12 Wiped Film Evaporator (WFE) Tails
	High BTU Gas	*Natural Gas* *ADN and C12 Regeneration Gas* *C12 High BTU Vent Gas* *ADN Unit Off Gas*
	Low BTU Gas	*Adipic Acid Off Gas* *Nitric Acid Fume Sweep* *Adipic Acid Scrubber Off Gas (SOG)* *C12 Low BTU Off Gases*

(1): At any given time, fuels are combusted in different combinations and quantities by each boiler.

Boiler efficiency is typically calculated by dividing the heat content of the steam produced by the heat content of the fuel supply. The efficiencies of the West Powerhouse boilers vary due in part to the varying heat content of the liquid waste fuels and process gas fuels and the varying combinations of such fuels that are combusted. The combination of fuels combusted in any given boiler at any given time is based on fuel availability, boiler availability, fuel compatibility, and steam demand. As indicated in the above table, other than natural gas, the fuels fired in the boilers are generated by four separate process units (ADN, Adipic Acid, C12, and Nitric Acid). The *process unit production rates determine the rate at which each fuel is generated and the steam demand for each unit. The process unit operations also determine the heat content of the liquid waste fuels and process gas fuels that are combusted. The fuels are shifted among the boilers so that each boiler can operate in its normal operating range. This method of operation is generally more efficient than operating one or more boilers at very low or very high firing rates.*

Additionally, some waste fuels are not compatible and must be combusted in different boilers. Therefore, unlike traditional fossil fuel fired units, at any given time, each boiler may be firing a different fuel mix. During periods when higher than normal quantities of low BTU gaseous fuels are sent to the boilers, the low BTU gaseous fuels must be blended with a high BTU gaseous fuel or liquid waste fuel to provide sufficient heat value to support proper combustion and to generate steam. As described in Sections 2.0 and 4.1.5 of the INVISTA West Powerhouse GHG permit application, if sufficient liquid waste and process derived gaseous fuels are not available to meet process unit steam demand, additional supplemental natural gas is fed to the boilers to make up the difference.

As described above, and in in Sections 2.0 and 4.0 of the INVISTA West Powerhouse GHG permit application, the West Powerhouse boilers are subject to a RCRA permit and to MACT EEE standards. These regulations require destruction of organic compounds and HAPs at 99.99%, necessitating longer residence times in the fireboxes and, consequently, larger fire boxes than boilers constructed to maximize thermal efficiency. Additionally, these boilers are subject to periodic testing under these regulations which establishes various limits the boilers must comply with whenever firing waste liquid fuels (e.g., minimum combustion temperature, maximum combustion air flow rate, maximum hazardous waste feed rates, etc.) . Although those limits and other RCRA and MACT EEE requirements impact boiler operations, they do not need to be included in the Greenhouse Gas permit because they are currently enforceable under those other programs.

Additional Impacts Analysis

3. **40 C.F.R. Part 52.21(o), Additional Impacts Analysis, requires an applicant to provide an analysis of the impairment to the soils and vegetation that would occur as a result of the modification. Please provide an assessment to support this requirement.**

   As explained in Section 3.3 of the INVISTA West Powerhouse GHG permit application, according to EPA's PSD Guidance for Greenhouse Gases, "EPA believes it is not necessary for applicants or permitting authorities to assess impacts from GHGs in the context of the additional impacts analysis or Class I area provisions of the PSD regulations."[1] *Of course, as EPA explained when it adopted the Tailoring Rule, "if a facility triggers [PSD] review for regulated NSR pollutants that are non-GHG pollutants for which there are established NAAQS or increments, the air quality, additional impacts, and Class I requirements would apply to those pollutants."*[2]

   As explained in Section 3.0 of INVISTA's permit application, "[t]he proposed project/changes to the [West Powerhouse] will not result in any criteria pollutant (NO_X, CO, $PM/PM_{10}/PM_{2.5}$, VOC and SO_2) emission rate increases that are greater than the PSD significance thresholds." Therefore, because it is not necessary to assess impacts from GHGs in the context of the additional impacts analysis, and because the project does not trigger PSD review for any other pollutant, an additional impacts analysis is not required.

---

1 U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Air Quality Policy Division, *PSD and Title V Permitting Guidance for Greenhouse Gases* (March 2011) at 48.

2 75 Fed. Reg. 31,520 (June 3, 2010).

BACT for the Boilers

4. **On page 10, the BACT analysis for the boilers notes that a search was completed of EPA's RACT/BACT/LAER Clearinghouse (RBLC) for similar sources. This is not the only source of information for BACT determinations. BACT determinations should be based on current technology available for similar units and from most recent regulatory decisions made in actual issued permits by State and Federal permitting authorities as well as additional sources of information from literature searches. Please identify and clarify if additional sources of information were reviewed as comparable available control options, and if none reviewed, please provide such an analysis.**

   In addition to the RBLC, INVISTA has reviewed Greenhouse Gas BACT analyses from more than 75 permit applications or final permits issued by approximately 20 state permitting authorities and 9 EPA regions to determine if the sources covered by those permits were similar to INVISTA's West Powerhouse boilers, and as such could be appropriate for consideration in the BACT analysis for this permit application. In addition, as described in various parts of Section 4 of the INVISTA West Powerhouse GHG permit application, we have reviewed the following information:

   1. *"Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Industrial, Commercial, and Institutional Boilers," U.S. EPA Office of Air and Radiation, October 2010.*
   2. *"Report of the Interagency Task Force on Carbon Capture and Storage"*
   3. *The U.S. Department of Energy National Energy Technology Laboratory (NETL) document "Estimating Carbon Dioxide Transport and Storage Costs"*
   4. *"Industrial Design and Optimization of CO2 Capture, Dehydration, and Compression Facilities" by A. Aboudheir and G. McIntyre.*

   In reviewing these materials, including other GHG permit applications and permits, INVISTA did not identify any similar liquid/gas waste fuel fired boilers for which BACT for greenhouse gases has been established. INVISTA did review and consider the information with respect to how energy efficiency BACT was applied to other combustion sources in general, and INVISTA has applied any such technically feasible measures to its boilers (see response to #5 below).

5. **The BACT analysis for the boilers notes on page 15 of the application that the boilers "already employ energy efficiency measures." The application continues by stating "Refurbishing and modernizing the boilers will restore and improve the energy efficiency measures that are already in place." Please explain what is meant by refurbishing and modernizing the boilers and if they will be considered as "reconstructed" for NSPS purposes. Also, please provide a numerical efficiency for each boiler and the anticipated numerical efficiency associated with each GHG emission reduction measure included as a BACT analysis. Additionally, please provide any numerical technical analysis that may have been completed to ensure that the most efficient boiler configuration was considered.**

Because these are existing boilers, INVISTA Victoria already employs several of the energy efficiency measures described in the permit application at the West Powerhouse boilers and throughout the Victoria site. The boilers will be "refurbished" in that they will receive significant maintenance, including retubing and repairs to existing components. The boilers are planned to be "modernized" in that they will be outfitted with modern burner management systems and other measures to meet current National Fire Protection Association (NFPA) boiler codes. Based upon cost analyses, the boiler projects will not trigger reconstruction as defined in 40 CFR 60.15.

Because of the number of fuels combusted in each boiler and the variability in fuel composition and heat value, the efficiency of each boiler is difficult to measure. In order to calculate boiler efficiencies, the measured flow of each fuel combusted and an estimated fuel composition and heat value of the fuel are used. Given the number of fuels, the accuracy of flow and heat value data, and the combination of fuels to each boiler at any time, calculating boiler efficiency is an approximation only. Over a long-term (annual) averaging period, the boilers are estimated to operate in the range of 75% - 78% efficient as a group, although the estimated efficiency range for each individual boiler or for any short-term period varies much more widely.

The specific numerical efficiency gained from each individual energy efficiency measure is difficult to determine as there are several measures that will be employed in combination, or that will be employed in an improved or enhanced manner, and the efficiency gains are not necessarily additive. However, a summary of the energy efficiency improvement range typically anticipated for each improvement to be implemented at the West Powerhouse Boilers is provided in the table below. A table of existing energy efficiency measures that are already implemented in the West Powerhouse boilers is also provided below.

Table of West Powerhouse Boiler Improved Energy Efficiency Measures

GHG Emission Reduction Measure	Efficiency Improvement [1,2] (%)	Notes/Issues [1]	INVISTA Boilers 1-4
Replace/ Upgrade Burners	Up to 4-5%.	Site-specific considerations (retrofit ability)	Installing Low NOx burners for NOx control [3]
Optimization	0.5% – 3.0%	Neural network-based	CD requires boilers to be optimized for NOx control [3]
Instrumentation & Controls	0.5% – 3.0% (in addition to optimization)	System integration, calibration, and maintenance	Improved burner management systems to be installed
Air Preheater	A 300°F decrease in gas temperature represents about 6% improvement	Use in large boilers, not widely used in ICIs due to increase in NOx	Existing air preheater will be repaired
Insulation	Dependent on surface temperature	Radiation losses increase with decreasing load	Existing insulation to be repaired /upgraded
Reduce slagging and fouling of heat transfer surfaces	1% to 3%; Site specific; fuel quality/operating condition have large impact	Downtime/economic factors, regain lost capacity	Existing soot blowers will be replaced

1. *The efficiency ranges are estimated from Table 1 in "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Industrial, Commercial, and Institutional Boilers," U.S. EPA Office of Air and Radiation, October 2010. The Notes/Issues are based on the same source. The EPA document states "[i]n many cases, the impacts of these measures are highly site specific and benefits will vary."*
2. *Generally, efficiency gains are a function of the difference between the new and old technologies or processes and are expressed in percent.*
3. *As stated in the response to Item 1, the Low NOx burners are designed to reduce NOx emissions and, therefore, are not necessarily the most energy efficient burners available. In addition, water used to dilute and provide optimal mixing of urea for SNCR necessarily has an adverse impact on efficiency due to the additional energy needed to vaporize the water in the firebox.*

Table of West Powerhouse Boiler Existing Energy Efficiency Measures

GHG Emission Reduction Measure	Efficiency Improvement [1, 2] (%)	INVISTA Boilers 1-4
Tuning	CO from 1000-2000 to < 200 ppm Unburned carbon (UBC) from 20-30% to 10-15%	CO currently managed under 100 ppm per RCRA/MACT EEE
Economizer	40°F decrease in flue gas temperature = 1% improvement	No economizer, however, stage heaters pre-heat boiler feed water with any excess steam
Reduce air leakages	1.5 – 3% potential (similar to reducing excess air)	RCRA/MACT EEE require monthly monitoring for air leaks and repairs
Capture energy from boiler blowdown	Site specific depending on steam conditions; Up to ~ 7%	Already implemented
Condensate return system	Site specific - depends on condensate temperature and % recovery	INVISTA Victoria has an extensive condensate recovery system
Insulating jackets	Dependent on surface temperature	Utilized throughout the steam system on critical pieces of equipment
Reduce steam trap leaks	Dependent on leak rates	INVISTA Victoria has a program to maintain and repair steam traps

1. *The efficiency ranges are estimated from Table 1 in "Available and Emerging Technologies for Reducing Greenhouse Gas Emissions from Industrial, Commercial, and Institutional Boilers," U.S. EPA Office of Air and Radiation, October 2010. The Notes/Issues are based on the same source. The EPA document states "[i]n many cases, the impacts of these measures are highly site specific and benefits will vary."*
2. *Generally, efficiency gains are a function of the difference between the new and old technologies or processes and are expressed in percent.*

Refurbishment is expected to return the boilers to a more efficient condition through, for example, clean boiler tubes, fresh insulation, and repaired air preheaters. The cumulative range of expected benefit from refurbishing the boilers is difficult to predict; however, an average improvement of 1 to 3 percent is expected as compared with historical efficiency. As noted earlier, the NOx controls reduce energy efficiency and may offset the efficiencies gained from *refurbishment. Of course, without boiler refurbishment, energy efficiency losses from NOx controls would be worse.*

Regarding an analysis to ensure that the most efficient boiler configuration was selected, such an analysis is not applicable to the existing West Powerhouse boilers whose primary purpose is to recover energy from process-generated waste fuels. As discussed previously in this document and in Section 1.0 of the INVISTA West Powerhouse GHG permit application, recovering energy from a waste that would otherwise be disposed of (i.e., waste liquid fuels and waste gases) is inherently energy efficient. Were the Victoria facility to dispose of the wastes in a different manner (e.g. send liquid fuels to a fuel blender or incinerator, or gaseous fuels to a flare or thermal oxidizer), the fuels would be combusted anyway, and the West Powerhouse boilers would need to make up for the loss in steam generation by increasing use of natural gas or other fossil liquid fuels, resulting in an overall increase in emissions of both criteria pollutants and greenhouse gases. The configuration of the boilers and the slate of fuels fired has been optimized to ensure complete combustion (as required by RCRA and MACT EEE), meet the energy demand of the site, and accommodate the variability of available fuels inherent to process generated waste fuel streams, all in an efficient manner.

6. **In addition to the longer-term CO2e emissions limit provided in the application, please provide a proposed BACT limit for each boiler based on the unit's efficiency or short term emission limits. If an emission limit is not possible to establish, please provide a technical justification to support your conclusion.**

As discussed in the cover letter to this response, the CO2e emission limits proposed in the original permit application are adequate to consider this application complete. As is typical in all permitting actions, final determination of compliance limits and compliance demonstration methodology are negotiated during the permitting process. INVISTA is anticipating working cooperatively with EPA to establish appropriate permit conditions as part of this permitting process.

During the preparation of the original application and the development of this response, INVISTA has relied heavily on upon EPA's "PSD and Title V Permitting Guidance for Greenhouse Gases," dated March 2011, ("GHG Permitting Guidance") and other GHG permits, draft and final, issued by or commented on by the various EPA regions.

Short Term Emission Limits

Based upon the GHG Permitting Guidance, page 46, which states "... since the environmental concern with GHGs is with their cumulative impact in the environment, metrics should focus on longer-term averages ... rather than short-term averages ...,"and due to the high variability in short-term fuel mix inherent in the INVISTA West Powerhouse Boiler operation, INVISTA is not proposing short-term emission limits.

West Powerhouse Compliance

As described above and in Section 1.0 of the INVISTA West Powerhouse GHG permit application, the Victoria waste-fired boilers are unique in their operation and, based upon INVISTA's review, the first hazardous waste combustors to seek a GHG permit. Energy efficiency, fuel heat value, and fuel combinations can vary widely. In addition, the fuels vary widely in carbon content and some fuels contain nitrogen compounds, including N_2O. The NOx reduction technology required by the EPA Consent Decree to be installed on these boilers, SNCR, also contributes to some additional GHG emissions via increased CO_2 and N_2O emissions and efficiency reduction inherent in operation of that technology. Given the large number of variables that impact GHG emissions, determination of an appropriate BACT limit is difficult.

For these reasons, INVISTA proposed in its permit application in Section 4.1.5 to implement the BACT energy efficiency measures by meeting an annual CO_2e emission limit based on boiler firing rate, efficiency and fuels. Also, since the combination of fuels combusted in each boiler can vary and each set of boilers shares a common stack, a boiler specific BACT limit is not appropriate. An annual (12-month or 365-day rolling) total West Powerhouse CO_2e emission limit is an *appropriate limit for the unique operation of these boilers. Any emission limit for individual stacks or individual boilers, as opposed to one limit across all four boilers, would necessarily need to be set at a high level to address the worst-case fuel slate at each compliance point independently. INVISTA believes that its proposal for a limit set to reflect a realistic overall mix of fuels for the four boilers together is most appropriate and meets the requirements for BACT.*

Output-based or Efficiency Limits

INVISTA has reviewed numerous draft and final permits. The BACT limits included in the various permits can generally be grouped into four classes:

- *Output based limits (i.e., lbs of CO2e/MW, lbs of CO2e/lbs of steam or production);*
- *Mass limits (i.e., tons per year of CO2e);*
- *Mass limits in combination with output based limits; or*
- *Mass limits in combination with efficiency limits (i.e., % efficiency).*

Numerous permits have been issued with mass limits only. INVISTA has provided, in Attachment 1, a listing of those permits by permitting authority. INVISTA is proposing a mass only limit for the WPH Boilers based upon the following technical justification.

First, an assumption regarding the efficiency of the boilers is inherent in the annual CO2e emissions calculations when determining the amount of heat required to produce a unit of steam. In the case of the WPH Boilers, INVISTA has assumed an efficiency at maximum capacity for those calculations. The actual efficiency of the boilers varies over the operating range of the boilers based on steam demand and available fuels. The assumed efficiency at maximum capacity also takes into considerations the improvements in energy efficiency discussed above in response to question #5, as well as the reduction in efficiency inherent in the NOx control measures, as discussed above in response to question #1. Because energy efficiency is inherent in the annual emission estimate, an additional annual requirement for boiler efficiency is redundant.

Second, as discussed in detail in response to Questions 1 & 2, due to the wide variability in heating value and fuel mix of the various fuels sent to the WPH Boilers, development of a meaningful (not overly conservative) output based limit or boiler efficiency limit is not practical. The WPH Boilers, as hazardous waste boilers with a highly varied fuel mix, are distinguishable from all other combustion sources for which GHG permits have been issued to date.

Finally, while an efficiency measure may be appropriate for natural gas or coal-fired boilers, it is not appropriate for hazardous waste boilers. Unlike traditional boilers, hazardous waste boilers are not designed with energy efficiency as the paramount concern. Rather, ensuring complete destruction of the hazardous constituents in the waste fuels is the primary purpose. Therefore, as discussed previously, these boilers employ higher temperatures and longer residence times than traditional boilers, necessarily reducing their efficiency. The INVISTA boilers are equipped with numerous energy efficiency measures, as discussed in response to Question #5, to make *them as efficient as possible. However, implementation of a measure, such as a maximum flue gas temperature, to monitor energy efficiency is contrary to the primary purpose of the hazardous waste boilers, whose operation under RCRA and MACT EEE require a* ***minimum*** *combustion gas temperature to ensure appropriate destruction efficiency.*

For the above reasons, it is technically impractical to include boiler efficiency limits in the INVISTA WPH GHG Permit. As such, INVISTA is proposing, consistent with EPA GHG Permitting Guidance and various issued GHG Permits, an annual (12-month or 365-day rolling) CO2e mass-based emission limit for the WPH Boilers, using a CO2 CEMS and appropriate calculations for non-CO2 GHGs (e.g., methane and N2O).

Basis of Emission Calculations

7. **On page 19 of the permit application, the projected actual emission rate from the boilers was calculated based on the projected actual emission rates. To establish whether a new or modified source is major, the maximum capacity of a stationary source to emit a pollutant under its physical and operational design must be established. Please provide the potential to emit calculations for the various emission units within the permit application.**

   The projected actual emissions are the potential to emit or "PTE" for GHG emissions from the four West Powerhouse boilers. The PTE rates were based on all four boilers operating at full rated steam capacity, 8760 hours per year, with a combination of waste fuel rates that is expected to result in the maximum GHG emissions and sufficient supplemental natural gas to operate the boilers at full capacity. The PTE calculations were provided in Section 6 of the permit application submitted March 13, 2012.

Attachment 1

FINAL PSD GHG PERMITS ISSUED WITH ONLY GHG MASS LIMITS

Facility/Project Name	Permitting Authority / Issuance Date	Type of Project	Emission Unit(s)/ Fuel Source	GHG BACT Limits (Emission Limits and Work Practices)
Effingham County Power	Georgia Department of Natural Resources 5/30/2012	Modification -- Expansion of existing power plant	Auxiliary Boiler	• 2,528 tpy CO2e (12 consecutive months) • 2,500 hours of operation (12 consecutive months) • Use of pipeline quality natural gas with a sulfur content not to exceed 0.5 grains per 100 standard cubic feet (12 consecutive months)
			Combustion turbine and duct burner	• Combustion Turbines firing natural gas: 863,953 tpy per turbine • Combustion Turbines firing fuel oil, with fuel oil combustion limited to 1,000 hours and 159,603 tpy CO2e per turbine • Each duct burner firing natural gas limited to 4,000 hours and 111,837 tpy CO2e per duct burner
			Fuel Gas Heater	• 4,560 tpy CO2e (12 consecutive months) • Good Combustion Practice • Pipeline quality natural gas
Indiana Gasification	Indiana Department of Environmental Management 6/26/2012	New Construction -- New facility to convert coal and petroleum coke into synthetic natural gas and liquefied CO2	Emergency diesel engines and firewater pumps	• 84 tpy CO2 (12-month rolling average)
			AGR vents	• 4,690,000 tpy CO2 during first year of operation (12-month rolling average) • 6,430,000 tpy CO2 during second year of operation (12-month rolling average) • 1,290,000 tpy CO2 thereafter (12-month rolling average)
			Wet Sulfuric Acid Plant	• 474,000 tpy CO2 (12-month rolling average)
			Auxiliary boiler	• 88,167 tpy CO2 (12-month rolling average)

Facility/Project Name	Permitting Authority / Issuance Date	Type of Project	Emission Unit(s)/ Fuel Source	GHG BACT Limits (Emission Limits and Work Practices)
				• Use of natural gas or SNG • Energy efficient boiler design • 81% thermal efficiency
			Gasifier preheat burners	• 6,438 tpy CO2 (12-month rolling average) • Good engineering design • Natural gas or SNG
			Zero Liquid Discharge Spray Dryer	• 2,884 tpy CO2 (12-month rolling average) • Good engineering design • Natural gas or SNG
			Electrical circuit breaker	• Use of pressurized SF6 circuit breakers with leak detection
			Natural gas and SNG piping	• LDAR program including weekly audio/visual inspection of the CO2 compressors in any week in which there are at least 24 hours of operation • Repair of leaks within time frames specified in 40 CFR 63.164(g)
			Syngas hydrocarbon and acid gas flare	• Flare Minimization Plan
Westlake Vinyls Co.	Louisiana Department of Environmental Quality 12/06/2011	Modification -- Add new process to cogeneration plant at SOCMI facility	Turbines and duct burners (natural gas)	• 55,576.77 lb/hr CO2e (hourly maximum) • 243,426.26 tpy CO2e (established in Title V permit) • Use of natural gas as fuel and good combustion practices
			Heat Recovery Steam Generator Engines (natural gas)	• 1,509.23 lb/hr CO2e (hourly maximum) • 39.24 tpy CO2e (established in Title V permit) • Use of natural gas as fuel and good combustion practices
Sabine Pass LNG Terminal	Louisiana Department of Environmental	Modification -- Construct 4 natural gas	Standby Generator Engines (natural gas)	• 412 tpy CO2e (annual maximum) • Use of natural gas as fuel and good

Facility/Project Name	Permitting Authority / Issuance Date	Type of Project	Emission Unit(s)/ Fuel Source	GHG BACT Limits (Emission Limits and Work Practices)
	Quality 12/06/2011	liquefaction trains for LNG export at existing facility		combustion/operating practices
			• Simple and Combined Cycle Refrigeration Compressor Turbines (natural gas) • Simple Cycle Generation Turbines	• 4,872,107 tpy CO_2e (annual maximum from the facility-wide emissions) • Good combustion/operating practices and use natural gas fired GE LM2500+G4 turbines
			Acid Gas Vents	• 39.29 lb/hr CO_2e (hourly maximum) • 172.09 tpy CO_2e (annual maximum)
			Marine Flare (natural gas)	• 2,909 tpy CO_2e (annual maximum) • Proper plant operations to minimize flare gas
			Wet/Dry Gas Flares (natural gas)	• 133 tpy CO_2e (annual maximum) • Proper plant operations to minimize flare gas
			Fugitive Emissions	• 89,629 tpy CO_2e (annual maximum) • Implementing a LDAR program to minimize methane emissions
Essar Steel Minnesota	Minnesota Pollution Control Agency 4/6/2012	Modification -- Modify a project under construction for previously permitted Minnesota Steel Industries	Pellet Furnace (natural gas)	• 710,000 tpy CO_2e (12-month rolling sum)
US Steel Keetac	Minnesota Pollution Control Agency 12/06/2011	Modification -- Reactivate phase 1 indurating furnace	Induration – Phase III (fluid bed scrubber, ESP, grate kilns, duct burners)	• 114,000 tpy CO_2 (12-month rolling sum) • 186,400 tpy CO_2e (12-month rolling sum) • Fuel usage of 26,100 tpy (12-month rolling sum)
Showa Denko	South Carolina	Modification	Facility-wide	• Maximum production rate =

Facility/Project Name	Permitting Authority / Issuance Date	Type of Project	Emission Unit(s)/ Fuel Source	GHG BACT Limits (Emission Limits and Work Practices)
	Department of Health and Environmental Control 6/8/2012	-- Expand graphite electrode manufacturing facility	Limits	85,000 tpy of graphite electrodes • All combustion sources (except for the diesel emergency generator) are permitted to burn only natural gas or propane as fuel
			Pitch Impregnation – Preheater	• 7,424 tpy CO2e (12-month rolling sum) • Good Combustion Practices • Natural gas and propane as sole fuels • Annual Tune Up
			Pitch Impregnation – Hot Oil Heater	• 3,093 tpy CO2e (12-month rolling sum) • Good Combustion Practices • Natural gas and propane as sole fuels • Annual Tune Up
			Autoclave/spray cooler/cooling bath thermal oxidizer	• 8,973 tpy CO2e (12-month rolling sum) • Good Combustion Practices • Natural gas and propane as sole fuels • Annual Tune Up
			Carbottom Furnaces	• 200,009 tpy CO2e • Good Combustion Practices; Natural gas and propane as sole fuels • Annual Tune Up • Thermal Oxidizer • Process optimization
			Graphitizing Furnaces	• 32,852 tpy CO2e insulating media carbon content 90% • Insulating media carbon content of 90% or less • Process optimization
			Emergency	• Good Combustion Practices

Facility/Project Name	Permitting Authority / Issuance Date	Type of Project	Emission Unit(s)/ Fuel Source	GHG BACT Limits (Emission Limits and Work Practices)
			Generator (diesel)	• 100 hours per year operation
U.S. Nitrogen	Tennessee Division of Air Pollution Control 1/4/2012	New Construction -- New facility to manufacture nitric acid, ammonia, and liquid ammonium nitrate solution	Anhydrous ammonia production plant	• 135,592 tpy CO2e (12-month rolling total)
			Nitric acid plant	• 9,021 tpy CO2e (12-month rolling total)
			Flare	• 2,851 tpy CO2e (12-month rolling total)
			Boiler	• 50,110 tpy CO2e (12-month rolling total)
			Diesel fueled emergency firewater pump	• 24 tpy CO2e (12-month rolling total)
Kennecott Repowering Project	Utah Department of Environmental Quality 11/22/2011	Modification -- Replace 3 coal-fired boilers with a new combined-cycle, natural gas fired combustion turbine	Turbine (natural gas)	• 1,090,736 tpy CO2e (12-month rolling period)