UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TX 75202-2733

Mr. Yoshiaki Izawa
Chief Financial Officer
Alpha Olefin Chemical Company, LLC
3000 Town Center, Suite 2820
Southfield, Michigan 48075

FEB 18 2014

RE Completeness Determination for Alpha Olefin Chemical Company, LLC
Greenhouse Gas Prevention of Significant Deterioration (PSD) Permit Application
Freeport Alpha Olefins Plant

Dear Mr. Izawa:

The EPA has reviewed your Greenhouse Gas (GHG) Prevention of Significant Deterioration (PSD) permit application, including supporting documentation, for Alpha Olefin Chemical Company, LLC that was received by the EPA on May 17, 2013, and a revision that was received January 28, 2014, and determined that your application is incomplete at this time. A list of the information needed from you so that the EPA can continue its completeness review is enclosed (see Enclosure). Please notify us if a complete response is not possible by March 7, 2014.

The requested information is necessary for EPA to develop a Statement of Basis and Rationale for the terms and conditions for any proposed permit. As we develop our preliminary determination, it may be necessary for EPA to request additional clarifying or supporting information. If the supporting information substantially changes the original scope of the permit application, an amendment or new application may be required.

The EPA may not issue a final permit without determining that there will be no effects on threatened or endangered species or their designated critical habitat, or until it has completed consultation under Section 7(a)(2) of the Endangered Species Act (16 USC § 1536). In addition, the EPA must undergo consultation pursuant to Section 106 of the National Historic Preservation Act (NHPA) (16 USC § 470f). As a reminder, NHPA implementing regulations require that EPA provide information to the public with an opportunity for participation in the Section 106 process. 36 CFR § 800.2(d). If you have not already submitted the Biological Assessment and Cultural Resources Reports that you have agreed to prepare for EPA, we look forward to receiving these reports and continuing to work with you to comply with these statutes.

If you have any questions regarding the review of your permit application, please contact Bonnie Braganza of my staff at (214) 665-7340 or braganza.bonnie@epa.gov.

Sincerely yours,

Thomas H. Diggs

Thomas H. Diggs
Associate Director
Air Programs Branch

ENCLOSURE

EPA Information Request for Alpha Olefin Chemical Company LLC
Application for Greenhouse Gas Prevention of Significant Deterioration Permit
Freeport Alpha Olefin Facility

1. The process description should closely follow the process diagram that is provided and identify all emission points that emit GHG emissions or have the potential to emit. It should also include non-GHG sources, but please identify the source as a non-GH source, if integral to the process that feed a GHG source. It is suggested that additional pages be created and provided to EPA to represent the process to avoid overcrowding and confusion. Please supplement the Alpha Olefin Chemical Company (AOCC) process flow diagram with the following information:

   A. Please update the process flow diagram to show both hot oil heaters, including the heat transfer fluid that is heated by the heaters, the heat transfer fluid distribution, and the emission point identification numbers (EPNs) for the heaters.
   B. On page 1 of the application, it is indicated that analyzer vents will be a source of air emissions. Is this a GHG emission source? If so, please update the process flow diagram to show the emission source with the associated EPN. Please provide supplemental information on where the vent analyzers will be installed and what vent streams they will be analyzing. Will the analyzer vents be directed to the flare or the thermal oxidizer? If the combustion of the analyzer vents could potentially generate GHG emissions, a BACT analysis should be performed for the analyzers. Please include the different designs and factors that were considered, the reasons for elimination, and the design elements that were implemented to reduce or minimize vents to the flare or the thermal oxidizer.
   C. On page 16 of the application, it is stated that fresh catalyst along with cyclohexane is fed into the reactors, and cyclohexane emissions due to leaks are the only emissions of concern during catalyst preparation. What is involved in the catalyst preparation process? Is the catalyst activated? Is some type of fuel or heat input necessary? Is cyclohexane fed to the catalyst preparation and then fed to the reactors along with the catalyst? If so, please update the process flow diagram to show this accurately. How is the catalyst conveyed to the reactors? Please provide a detailed description of this mechanism. It is also stated that cyclohexane emissions due to leaks from the $C_{14=}$ seal pot are the only emissions of concern during catalyst preparation. Emissions due to leaks from the $C_{14=}$ seal pot will be vented to the thermal oxidizer. Please update the process flow diagram to show the seal pot and the vent stream directed to the thermal oxidizer. What is the proposed compliance strategy for this seal pot? What operating parameters are monitored and recorded? If the combustion of this vent stream will potentially produce GHG emissions, a BACT analysis should be developed for leaks to the thermal oxidizer. Please include in the BACT analysis design technologies that were evaluated to reduce and/or minimize this vent stream to the thermal oxidizer. Also, include operation and maintenance standards that will be employed to minimize this vent stream to the thermal oxidizer.
   D. On page 17 of the permit application, it is stated that an external heat exchanger system, which is comprised of water and steam, is used to remove the heat of reaction produced by

the formation reaction of alpha olefins (AO) from ethylene. Please update the process flow diagram to show this heat recovery and the steam distribution. The application also states that dissolved ethylene is recovered from the reactor effluent before it's fed to the deactivation section. Please update the process flow to show this ethylene recycle stream.

E. Please update the process flow diagram to show the fuel distribution system, which includes the streams that will comprise the fuel system and where fuel will be distributed. On page 33 of the application, it is indicated that fuel for the hot oil heaters will include fuel gas (similar in composition to natural gas) and off gas from the light distillation section. Please provide a compositional analysis of each fuel to be combusted in the hot oil heaters, including a comparison to natural gas.

F. On page 17 of the permit application, it is stated that the active catalyst remains in the effluent, which is a mixture of AO and cyclohexane. The catalyst is deactivated and removed in the deactivation section. Effluent is fed into a deactivator with water to deactivate the catalyst. What type of equipment is the deactivator? Is it a packed or trayed column? If it is a packed column, what type of packing is present in the column? Does it require regeneration? Does this equipment vent to the flare or thermal oxidizer? The application also states that washing and oil-water separation steps are repeated and catalyst components are removed from the oil phase. The washed mixture is then fed to the light distillation section, and the wash water is fed to a stripper. Liquid recovered from the stripper is recycled back to the catalyst deactivation section. The process description indicates more steps and equipment than is shown on the process flow diagram. Please update the process flow diagram to include the equipment discussed in the process description (i.e., washing and separation, stripper, liquid recovered from stripper recycled back to catalyst deactivation section). Does the washing in the deactivation section involve only water or does it include ammonia or caustic as was previously mentioned in the original application? Please update the process flow diagram to reflect was is used. On page 18 of the application, it is stated that the AO plant will generate one wastewater stream from the deactivation section. This wastewater stream will contain deactivated catalyst and will be hard-piped to an onsite wastewater holding tank before being routed by pipeline to an existing offsite wastewater treatment plant. Is the catalyst dissolved in the ammonia water? What type of additional treatment is required for the outlet wastewater stream? Is "used" catalyst recovered for reuse in the process? Is the onsite wastewater holding tank a potential GHG source? Please update the process flow diagram to show this tank and the associated EPN. Will the tank vapors be directed to the flare or thermal oxidizer? If so, the combustion of the tank vapor has a potential to generate GHG emissions; therefore, a BACT analysis should be developed for the tank. Please be sure to incorporate into the tank BACT analysis the factors that were considered when comparing internal (IFR) or external (EFR) floating roof and fixed roof. Please provide any other additional information for the tanks, including whether the applicant chose to have the tanks painted white or another color of high refractive index to reduce vapor production.

G. On page 17 of the permit application, it is stated that the effluent from the deactivation section is fed to the distillation section. How many columns are in the light (LDS) and heavy (HDS) distillation sections? Please show all columns on the process flow diagram. Please label the feed, product, and interrelated streams between both sections. Does the distillation section utilize any type of heat recovery that reduces fossil fuel usage? It was previously stated in the original application that the bottom stream of the last distillation column is C30+, which will be used as fuel for the hot oil heaters. This option was not mentioned in the revised application. Please confirm if these options have been removed from the scope of the project and update the process description and the process flow diagram, if applicable. Also, if the bottom stream is to be used as a fuel, results from an analysis should be provided for the bottom stream that includes constituent concentrations, carbon content and heat value. Also, emission calculations would need to account for this stream. The revised application states that light gas from the LDS overhead stream will be used as fuel to the hot oil heater no. 2. Please update the process flow diagram to show this stream directed to the appropriate hot oil heater as fuel. Please label accordingly. The original application stated that an option to transfer this light gas via pipeline to an existing facility for further reprocessing exists. Please confirm if this is still an option for the proposed project and update process description and the process flow diagram accordingly.

H. The permit application states that primary feeds to the AO process include ethylene, which is fed directly by pipeline from an existing plant and will not be stored on site. Catalysts will be stored at the proposed plant. Cyclohexane will be stored in a process holding tank and AO products will be stored in either spheres or storage tanks, depending on the type of AO. Please update the process flow diagram to show all the storage tanks proposed for this project with the associated EPN. Will any of the storage tanks have vapors directed to the flare or thermal oxidizer? If so, please indicate these storage vessels and the vent stream to the flare or thermal oxidizer on the process flow diagram. If these vent streams are directed to the flare or thermal oxidizer, its combustion could potentially produce GHG emissions, and a BACT analysis should be developed for the storage vessel to be installed for this project. Please be sure to incorporate into the tank BACT analysis the factors that were considered when comparing internal (IFR) or external (EFR) floating roof and fixed roof. Please provide any other additional information for the tanks, including whether the applicant chose to have the tanks painted white or another color of high refractive index to reduce vapor production.

I. The application states that raw materials to be unloaded at the plant include catalysts and cyclohexane. At initial startup, cyclohexane will be loaded from a ship or barge to a vertical fixed roof tank. After the start of operation, cyclohexane will be loaded from a tank truck to a vertical fixed roof tank. AO products will be loaded into barges, railcars, ships, and tank trucks. VOC emissions generated due to loading of lighter AOs will be vented to the thermal oxidizer. The application states that emissions generated due to the loading of heavier AOs and AO blends are "insignificant" due to low vapor pressures associated with these products and will therefore be directly vented to the atmosphere.

   i. Please update the process flow diagram to show the loading and unloading capabilities that are proposed for this project with associated EPN.
   ii. Since the VOC emissions from the lighter AO product loading will be directed to the thermal oxidizer and the combustion of the vapors might generate GHG emissions, a BACT analysis should be developed for the loading operation to be installed for the project. Can several railcars/trucks/ships/barges be loaded simultaneously?

iii. Please include the pollution controls that were evaluated for the reduction and/or minimization of GHG emissions during loading and the reasons for eliminating these controls from consideration. Please provide details on the loading system and how emissions will be captured and directed to the thermal oxidizer.

iv. 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.

v. Is the loading of heavier AO products and blends a potential source for GHG emissions? Typically, CO_2 emissions are associated with combustion pollutants, and CH_4 pollutant is associated with VOC pollutants. Have these emissions been accounted for in the proposed annual emission limit. EPA needs to permit these emissions or they are unauthorized. Typically, we permit these emissions by either establishing a separate alternative BACT that applies during these events, or we roll the emissions into each emission point as part of our BACT determination for that unit with the expectation that the unit will meet BACT at all times.

J. The permit application states that the AO plant will utilize a single cooling tower. The cooling water system is considered to be a potential source of VOC emissions as well as particulate matter (PM) emissions. Since CH_4 emissions are typically associated with VOC pollutants, a BACT should be developed for the cooling tower. The BACT analysis should include an evaluation of leak repair and technologies and a proposal of what AO would implement as BACT. What is the proposed compliance strategy for the cooling tower? Please update the process flow diagram to show the cooling tower with associated EPN.

K. On page 18 of the permit application, it is stated that the AO plant will utilize a multi-stage ground flare for the control of intermittent process vent streams and control of emergency releases. It will also be utilized during process clearing and venting for routine maintenance, startup and shutdown. The proposed flare will have 12 stages, and each with 2 pilots. The AO will also utilize a thermal oxidizer for the control of intermittent and continuous process vent streams such as the control of emissions due to loading and unloading operations at the proposed plant and control of working and breathing losses from storage tanks.

i. Please update the process flow diagram to show the process streams that are directed to the flare and the thermal oxidizer. Please update the process flow diagram to show the flare and thermal oxidizer with the associated EPN. Please label these process streams accordingly as continuous, intermittent and/or MSS only. If AO finds it helpful, EPA suggests the use of a separate process flow diagram to depict the flare header which shows the process streams tie-ins.

ii. On page 36 of the permit application, the BACT analysis for the flare indicates that, due to the intermittent nature of the process vent streams sent to the flare and frequency of MSS activities, it is technically infeasible to reroute the flare gas to the fuel system for combustion. Therefore, flare gas recovery is infeasible. Please provide a technical analysis to support this conclusion. Please supplement the BACT analysis with this information.

iii. Were different flare and thermal oxidizer designs evaluated? Please provide this supplemental information data that includes a summary of the technical evaluation and the comparison data of the design attributes that were considered for the proposed flare and thermal oxidizer. Is the thermal oxidizer regenerative?

iv. On page 37 of the permit application, the BACT analysis for the control of VOCs from product loading, intermittent vents and storage tanks indicates that vapor recovery units (VRUs) would not be feasible for VOC control, especially from loading operations due to the volume of vapors generated. Please provide a technical analysis to support this conclusion.

L. Please update the process flow diagram to show the process fugitive emissions with the associated EPN.

2. The application does not appear to include a plant design capacity for the proposed AO plant. Please provide this supplemental information.

3. The application does not appear to propose the installation of an emergency generator and fire water pump engines. Please confirm whether or not the proposed project includes the installation of emergency engines. If the project is to include the installation of an emergency generator and fire pump engine, please provide supplemental design information, a BACT analysis, and emission calculations.

4. On page 33 of the application, BACT analysis states that the hot oil heaters will be designed to achieve a maximum thermal efficiency of 90% without SCR. The installation of SCR would decrease the hot oil heater's thermal efficiency to 87%. Please provide the analysis that justifies these estimates. How will this efficiency be demonstrated? Please consider proposing a maximum limit of CO_2e mass per fuel volume processed for the hot oil heaters (e.g., lb/MMscf)

5. On page 39 of the application, it is stated that AOCC proposes to employ the TCEQ 28MID LDAR program for fugitive VOC emission control. Were other TCEQ LDAR programs evaluated for this project? Please supplement the 5-step BACT analysis with the LDAR programs that were evaluated for this project and a basis for the programs' elimination.

6. Were other AO plant designs (i.e., equipment and configuration) evaluated for the proposed project? If possible, please provide information that compares the efficiency gains in energy consumption (fuel, heat and electricity) or a reduction in GHG emission for the proposed AO plant design compared to similar or existing AO plant designs (internationally or nationally). Please provide any technical resources, literature and calculations to substantiate the claimed efficiencies. If technical benchmark data is not available, then please provide information detailing or projecting the potential efficiency gains that are expected utilizing these design strategies. Please include the basis for the rationale and supporting calculations and resources for this information.

7. Table B-2 presents approximate costs for construction and operation of a post-combustion carbon capture and sequestration system at the facility. The estimated cost to install, operate and maintain CCS is $19.3 million per year at the AOCC facility. The supporting calculations that

were used to derive this estimate were not included in the application. Please provide the site-specific parameters that were used to evaluate and eliminate CCS from consideration. This material should contain detailed information on the quantity and concentration of CO_2 that is in the waste stream and the specific equipment to be used. This site-specific cost calculations should include, but are not limited to, size and distance of pipeline to be installed, pumps, compressors, the amine solution to be used, and the equipment necessary to employ the chosen post-combustion technology. Please include cost of construction, operation and maintenance, cost per ton of CO_2 removed by the technologies evaluated, and feasibility and cost analysis for storage or transportation for these options. Please discuss in detail any site specific safety or environmental impacts associated with such a removal system.