Enterprise Products
Mont Belvieu PDH Project
GHG Permit Application
Supplemental Information
January 29, 2014

This document is submitted in response to comments from U.S. EPA in a January 21, 2014 e-mail from Mr. Robert Todd to Ed Bergmann of Enterprise and followup discussions.

1. CO_2 factor for natural gas – As shown in the attached revised Table A-1 from the permit application, Enterprise is using a CO_2 factor of 118.6 lb/MMBtu for natural gas. The basis for this factor is shown in the Carbon Factor Calculations section of the table. This composition is based on historical analyses of natural gas received at the Mont Belvieu Complex as indicated in the footnote that has been added to the table. Based on research of generally available source documents, this composition is well within the range expected for natural gas, and the compositions of the dominant carbon fractions (methane and ethane) are equal to "typical" values found for natural gas.
2. CO_2 factors for Process Offgas Fuels - There are three fuels that are off gases that will be produced by the PDH process. These include DeEthanizer Offgas, PSA Tail Gas, and LTRU Tail Gas. The CO_2 factors used for these fuels were calculated based on the compositions shown in Table A-1. These compositions were provided by Lummus, the licensor of the proposed technology, and are based on process simulations performed by Lummus. A footnote identifying this source has been added to the table.
3. CO_2 factor for ethane – Table A-1 shows a calculated CO_2 factor of 131.2 lb/MMbtu for ethane. This factor when converted to kg/MMBtu matches the factor in Table C-1 of Part 98. The calculation is simply based on the stoichiometry and published heating value of ethane. Note that the CO_2/MMBtu factor calculations for the other fuels is done in an identical manner, with the only difference being that the other fuels are not a single compound; thus, the calculation is the sum of the contributions from each of the fuel constituents.
4. Overall CO_2 factor – An overall CO_2e factor of 125.5 lb/MMBtu for the fuel combustion sources is included in Table A-1. This composite emission factor is simply the Plantwide total CO_2e in tpy divided by the Plantwide total firing rate MMBtu/yr, which is then multiplied by 2000 lb/ton to obtain lb/MMBtu.
5. Fuel burned per lb of production – Calculations showing the derivation of the btu of fuel per pound of propylene production are shown in the attached confidential table. This rate is considered to be business confidential and is not represented as a permit limit. It is based on process modeling performed by Lummus, the licensor of the proposed technology. The original value that Enterprise provided was on an LHV basis. Both LHV and HHV values are shown in the attachment. The original value was also based on "normal" operati6gn conditions, reflective of new equipment, and on a theoretical basis. An additional calculation is also included that provides a fuel consumption value that takes into account equipment aging and less than ideal conditions that can be expected during actual operation.
6. Flare Gas Recovery – GHG emissions from the proposed facility due to flaring will be an insignificant contribution to total plant GHG emissions. As such, even if technically and economically practical, flare gas recovery would not significantly reduce overall GHG emissions. As shown in Table A-3 of the application, the vent gas (to the atmosphere) that is fairly constant accounts for 2,812 tons of CO_2e annually. Attached is an analysis of the cost of compressing this stream in a recovery system and routing it to a fuel system. Additionally, the MSS portion of this stream has a heat value of approximately 300 btu/scf since it contains a large amount of nitrogen. This gas composition is unusable as a fuel and effectively doubles the cost of the recovery reduction. The pilot and purge representations are required flows to the flare and therefore cannot be included with flare gas recovery. The large volume startup/shutdown flows would require a very large compressor(s) and other supporting facilities that would sit idle over 99% of the time, and thus not practical for control. In addition, MSS shutdown streams contain hydrocarbon only in the initial phase of depressurization. The majority of this stream is nitrogen used to displace the hydrocarbon from process vessels. Disregarding these technical limitations and impracticality, the attached cost analysis shows that a

Add FGR discussion to SOB

flare gas recovery system would cost $179/ton of CO_2e controlled. This cost is not considered to be cost effective.

7. Global Warming Equivalents - All CO_2e emission rates have been revised to reflect the most recent Global Warming Equivalents for CH_4 and N_2O. Revised versions of all tables in the permit application that have changes as a result of this change are attached.