Anonymous Anonymous

Chris,

As requested in the January 25th webinar/refinery industry meeting, you'll find attached our comments and early feedback on Ecology's draft Four Factor Analysis issued on January 11, 2021. We look forward to continuing discussions and cooperation with you, your team and stakeholders developing the state's SIP on an issue so important to all. As requested by Colleen, I attempted to submit this through Ecology's e-comments site but since this is an informal comment period it may not have been available.

Please don't hesitate to contact me with any questions.

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February 16, 2021

Chris Hanlon-Meyer
Air Quality Program
Washington State Department of Ecology
PO Box 47600
Olympia, Washington 98504-7600

Subject: bp comments on the Regional Haze State Implementation Plan Revision – 2nd 10-Year Plan – Draft Four-Factor Analysis

Dear Mr. Hanlon-Meyer:

On behalf of bp America ("bp"), thank you for the opportunity to provide comments as the Washington State Department of Ecology ("Ecology") develops its draft Regional Haze State Implementation Plan (SIP) revision. This letter provides comments regarding Ecology's draft Four-Factor Analysis (Chapter 11 of the Regional Haze SIP Revision) that was issued on January 11, 2021 and presented to bp and other Washington refineries during Ecology's January 25, 2021 webinar. bp appreciates Ecology's request for early feedback on the draft Four-Factor Analysis (FFA). Provided below is a brief overview of bp's comments on Ecology's draft FFA; bp plans to submit more detailed comments in the future.

- **FFA Guidance**: Guidance provided by the Environmental Protection Agency (EPA) for the Second Implementation Period Regional Haze SIPs recommends that caution be exercised before accepting or rejecting controls based on generic cost estimates if adequately documented source-specific cost estimates are available.[1] In April 2020, bp provided Ecology with detailed retrofit cost estimates based on engineering information for selective catalytic reduction (SCR) systems specific to the Crude Heater, #1 Reformer Heaters, and #1 Hydrogen Plant Heaters. We believe the cost estimates bp provided to Ecology represent the most accurate estimates of the cost of compliance available. Furthermore, we believe that use of the generic Control Cost Manual methods and recommendations will not provide accurate estimates for application of SCR systems to the heaters in question.

[1] EPA Four Factor Analysis Guidance. Accessed at https://www.epa.gov/sites/production/files/2019-08/documents/8-20-2019_-_regional_haze_guidance_final_guidance.pdf in January 2021.

Based on the information provided in the January 2021 draft FFA, it appears that Ecology has decided to disregarded bp's detailed source-specific cost estimates and to rely on generic SCR estimates from an EPA cost model without exercising the caution recommended by EPA and conducting a complete review of bp's source-specific cost estimate.

- **EPA SCR Cost Model Deficiencies**: The cost estimation methodology presented by EPA in the SCR chapter of the Control Cost Manual is based on a Sargent and Lundy study of coal-fired electric utility boilers, which differ considerably from process heaters found at a petroleum refinery. In the Control Cost Manual, EPA notes the limitations of the simplistic study-level cost equation methodology provided, and states that the cost-effectiveness of SCR control should be based on a detailed engineering study and cost quotes from system vendors.[2] In response to comments on the SCR cost chapter, EPA again notes the limitations of their SCR cost estimate equations as a simplified approach to obtain a study-level cost estimate, and EPA notes that the cost equations are not intended to reflect site-specific project details.[3]

  South Coast Air Quality Management District (SCAQMD) has also noted the limitations of EPA's SCR cost equations as part of current rulemaking activities for petroleum refineries, where SCAQMD adjusted the study-level capital cost estimate equations with local refinery SCR cost estimate data.[4] However, it must be stressed that detailed engineering cost estimates, like the ones bp provided to Ecology, provide the source-specific cost information that EPA recommends be used to evaluate the cost of compliance when available.

- **Detailed SCR Cost Estimates**: The EPA's Control Cost Manual summarizes examples of source-specific conditions that affect SCR retrofit costs, including: space constraints, existing fan limitations, limitations of existing electrical distribution system, etc. These retrofit costs are not included in EPA's SCR cost calculation because they are project-specific. The detailed engineering cost estimates developed by bp were based on process flow diagrams (PFDs), piping and instrumentation diagrams (P&IDs), vendor supplied estimates, and process knowledge. Jacobs estimated the equipment, demolition, site work, pilings, buildings,

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[2] EPA Control Cost Manual, Section 4, Chapter 2 (Selective Catalytic Reduction), June 2019. Accessed at https://www.epa.gov/sites/production/files/2017-12/documents/scrcostmanualchapter7thedition_2016revisions2017.pdf in January 2021.

[3] EPA Response to Comments on Chapter 2 (SCR), of the Control Cost Manual. Accessed at https://www.epa.gov/sites/production/files/2020-07/documents/scr_costmanual_7thed_rtc.pdf in January 2021.

[4] SCAQMD adjustments to SCR installation total capital investment presented and discussed in December 12, 2019 working group meeting for Rule 1109.1 (Slide 21 on presentation accessible here: http://www.aqmd.gov/docs/default-source/rule-book/Proposed-Rules/1109.1/pr1109-1-wgm_9_final.pdf?sfvrsn=12)

concrete, structural steel, ducting, piping, insulation, instrumentation, electrical, painting, scaffolding, and fire protection requirements. The detailed engineering cost estimates provided to Ecology to retrofit the process heaters in question with SCR systems are similar to the actual costs of historic SCR retrofit projects completed by bp.

Ecology requested, and bp provided, cost-effectiveness calculations based on detailed engineering cost estimates to retrofit the Crude Heater, #1 Reformer Heaters, and #1 Hydrogen Plant Heaters with SCR systems. bp requests Ecology revise the draft FFA analysis to include the detailed engineering cost estimates provided in April 2020.

- **Capital Cost Escalation**: Cost estimators use various cost indices to develop reliable cost estimates for future projects. The Nelson Farrar Refinery Construction cost index is a common tool used to determine project costs at refineries. bp's cost estimators used the Nelson Farrar Refinery Construction cost index to calculate SCR retrofit project equipment (i.e., fans, instrumentation, electrical components, labor, etc.) cost estimates from 2007 dollars into 2020 dollars. Ecology's draft FFA states that the cost to install SCR systems has decreased since 2010, but does not provide references or evidence to support this statement. The SCR reactor is a single component of the capital cost associated with retrofitting an SCR system on an existing process heater. The engineering estimates bp provided to Ecology are more comprehensive and include total project costs to complete each SCR retrofit project (i.e., SCR reactor, ammonia system, safety instrumentation, ID and FD fan upgrades, electrical substation requirements, air preheater replacement, new stack and ducting, demolition, piles, concrete, structural steel, etc.). The escalated SCR retrofit cost estimates for Crude Heater were reviewed by a bp cost estimator and found to be within 10 percent of an actual SCR retrofit project for a similar source at another bp refinery.

  The SCR chapter of the Control Cost Manual (and the associated SCR cost spreadsheet) instructs escalating capital costs estimated by the cost manual equations from 2016 dollars to current dollars. Ecology's draft FFA states that Ecology considers the Reasonably Available Control Technology (RACT) cost threshold outdated, and that it should be updated using the Chemical Engineering Plant Cost Index (CEPCI) to account for increased control equipment costs. If Ecology proposes escalating costs for one part of the cost to control calculation, then all stakeholders should be afforded the same opportunity to escalate costs to current dollars.

- **Include All Retrofit-Related Costs:** Ecology's draft FFA indicates that bp cannot include lost production costs in the cost of compliance calculation.

Installing SCR on the Crude Heater, #1 Reformer Heaters, and the #1 Hydrogen Plant Heaters would result in extended process unit downtime during a scheduled turnaround because all of the required construction activities cannot start until the equipment are shutdown so that existing equipment (air preheaters, ducting, stacks, etc.) can be removed and the new equipment can be installed in the same area.

bp Cherry Point is a single train refinery, meaning the refinery has one crude distillation unit where all crude must go through the Crude Heater to supply other refinery process units. The bp Crude Heater, one of the largest cylindrical process heaters in the world, is located in a very congested part of the refinery that severely limits the amount of pre-work that could be completed before the turnaround. Several pieces of the existing crude heater would need to first be removed to create enough room for the SCR reactor, larger fans, electrical substation, ammonia system, etc. Almost all of the crude heater retrofit project scope would need to be started after the heater is shutdown because of the space limitations. This would require bp to extend the turnaround length by several weeks, compared to a normal turnaround, and results in significant lost production throughout the refinery.

As described by EPA in the Control Cost Manual, the cost associated with lost production for an existing source due to the installation of an emissions control device is a component of the indirect installation costs for a control device installation project.[5] bp requests that Ecology include all actual costs related to retrofitting existing equipment in FFA cost of compliance calculations.

- **Annualizing Capital Costs**: A capital recovery factor performs the function of annualizing total capital investments over the equipment life. bp provided Ecology with a capital recovery factor based on an interest rate of 5 percent (average Federal Reserve Prime Rate), and bp's cost of capital was also higher than 5 percent. bp requests that Ecology revise the capital recovery factor used their cost calculations to reflect bp's actual cost of capital more accurately by using 5 percent instead of the 3.25 percent currently used in calculations documented in the draft FFA.

- **Ammonia Reagent Costs**: The cost of the ammonia reagent is a substantial portion of the cost to operate an SCR system. Ecology selected an ammonia reagent cost of $0.04/pound for bp heaters instead of using bp's actual ammonia reagent cost of $0.33/pound. bp purchases 29 percent aqueous ammonia reagent for existing SCR control equipment

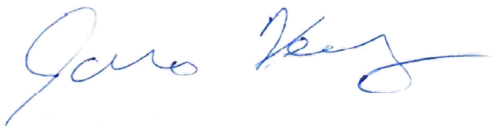
[5] EPA Control Cost Manual, Chapter 2 (Cost Estimation: Concepts and Methodology), November 2017 accessed at https://www.epa.gov/sites/production/files/2017-12/documents/epaccmcostestimationmethodchapter_7thedition_2017.pdf in January 2021.

at the refinery, and bp requests that Ecology revise the ammonia reagent costs to incorporate actual ammonia reagent costs.

- **General Comments**: The initial review of Ecology's draft FFA found several confusing and conflicting statements that should be addressed in the next draft FFA. bp will provide Ecology with a redline mark-up of the current draft FFA to assist with correcting other confusing and inaccurate statements.

bp appreciates the opportunity to provide these initial comments and looks forward to submitting additional comments regarding the Regional Haze SIP Revision for the 2nd 10-Year Plan. bp also plans to meet with Ecology staff to discuss our comments in more detail. Please feel free to contact me at james.verburg@bp.com or 360-526-3901 if you would like to discuss further.

Sincerely,



James Verburg
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