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Subject: Comments on Regional Haze Revisions to State Implementation Plan

The Shell Puget Sound Refinery (PSR) appreciates the opportunity to provide comments on the Washington Department of Ecology's (Ecology's) revisions to the State Implementation Plan (SIP) for Regional Haze. This letter provides Shell's comments.

As requested by Ecology in its November 27, 2019 request, Shell submitted a January 30, 2020 letter to Ecology identifying specific emission units at the PSR that met Ecology's criteria for a four-factor analysis. Shell also submitted the requested four-factor analysis for each subject emission unit in an April 30, 2020 report. Throughout this process, Shell has expressed an interest in responding to Ecology's questions or comments regarding its four-factor analysis and providing supplementary information that may help Ecology develop an accurate and informed review.

Since those submittals, Shell has received no communication from Ecology about its analysis until receiving Ecology's January 2021 draft SIP revision report. Ecology's conclusions in the report, including its assessment of Shell's four-factor analysis, contain many errors and inaccuracies, and bring additional emission units (namely, the fluidized catalytic cracking unit, or FCCU) into the four-factor review without Shell having the opportunity to provide its own analysis for that equipment. Many of these errors could have been avoided if Ecology had provided Shell with the opportunity to answer questions or supply supplementary information throughout Ecology's review.

Of particular note, Ecology's control equipment cost calculations in the report are substantially lower than the calculations provided by each of the five refineries in the state. The cost calculations play a critical role in developing the conclusions

of the analysis, but Ecology's report does not detail the assumptions used in its analysis, and has not yet made that information available. Beyond the comments provided in this letter, Shell expects to have additional comments after reviewing Ecology's calculations.

Washington's Current Progress on Regional Haze

Washington has already made significant progress in reducing regional haze impacts. The emission reductions already required under existing rules and agreements are projected by Ecology to meet the uniform rate of progress or "glidepath" value for the second ten-year planning period (2018-2028) with room to spare. As noted on page 5 of Ecology's draft report, the four-factor analysis process is used to identify controls "necessary to meet the reasonable progress goals for each mandatory Class I area." Based on the projected rate of progress, these goals will be met, and further emission reductions during this planning period are unnecessary. Moreover, there is no requirement for Ecology to pursue additional reductions beyond the glidepath; many other states have already concluded that no additional controls are needed in this planning period.

Characterization of Shell PSR NO_x Emissions

In the introduction to the refinery section of the draft report (pages 40 and 41), Ecology presents misleading information about the relative NO_x emissions of the Shell Puget Sound Refinery compared to other refineries, implying that Shell's NO_x sources are poorly controlled. However, there are important differences about the Shell refinery operations that make this type of comparison inappropriate. The differences in NO_x emissions are not an indicator of poorly controlled emission units, but are instead indicative of the different types of equipment and products in use at the refinery. The report calculates a NO_x intensity metric based on 2014 emissions per barrel of refinery production capacity. Emissions from the Shell refinery include emissions from a co-located cogen plant, a non-refining process that other refineries in the state do not have. Moreover, refineries vary in complexity based on the types of products and operations conducted at the site. Less complex refineries that do not operate certain types of process equipment (e.g., FCCUs) will necessarily have lower total NO_x emissions per barrel of throughput.

In contrast to the implication in Ecology's report, the Puget Sound Refinery has well-controlled NO_x emissions compared to most refineries, with controls installed on all but two process heaters, and SCR installed on its cogens. Additionally, the subject of Ecology's draft report is whether controls are needed at particular sources, and the overall NO_x emissions from the site are not relevant to that discussion. This section is misleading and irrelevant and should be removed from the report.

Selective Catalytic Reduction Cost Calculations

Ecology's draft report indicates that Ecology performed its own cost analysis and concluded that Shell's report had "discrepancies that inflated the cost for the retrofit." As noted above, Ecology's draft report does not provide enough information for Shell to be able to identify the specific differences in methods between Shell's and Ecology's approaches, and to understand why Ecology may have estimated a different cost.

However, it is clear from the information available that there are errors in Ecology's methodology. Costs to implement an SCR will vary substantially between different heaters based on many heater-specific factors including the firing rate of the heater, its exhaust flow, the ease of retrofitting the SCR to the heater, and other site-specific characteristics. Additionally, local operating costs such as the cost of maintenance labor and reagent differ from default levels in EPA's Control Cost Manual, which was cited by Ecology as the resource for its analysis. Ecology's report lists the same cost for an SCR system at Shell's Boiler #1 (\$5,084,927) as for Shell's CRU2 heaters (also \$5,084,927), even though the maximum firing rate of Boiler #1 is 1.4 times that of the CRU2 heaters. Moreover, this same exact cost (\$5,084,927) is also cited in Ecology's report as the cost to implement SCR on heaters at the Phillips 66, Marathon, and US Oil refineries. Applying the same cost to each heater or boiler without regard to differences in heater size and other characteristics is not an appropriate method of determining the cost-effectiveness of SCR.

Interest Rate

Ecology indicates in its report that it is using 3.25 percent interest rate for evaluating the cost of capital recovery. This rate is equivalent to the current historically low prime rate. Shell believes that the current prime rate provides an unrealistic assessment of the actual costs of borrowing during the timeframe that any investments in new controls would be required. Over the past 20 years, the prime rate has varied from 3.25 percent to 9.23 percent, and actual borrowing costs will be higher than the prime rate. A more appropriate interest rate of 7 percent (as used in Shell's four-factor analysis) should be used. The 7 percent rate is consistent with the Office of Management and Budget (OMB) guidance as the base-case for regulatory analysis. Please refer to the note on interest rates in our four-factor analysis report for additional background.

Technical Feasibility of SCR

Ecology's report appears to assume that SCR is technically feasible for implementation on any emission units subject to the four-factor review. However, this is not necessarily the case and will require additional study by the refinery on a case-by-case basis. The cost or technical feasibility to implement SCR will vary based on emission unit-specific conditions. For example, there may not be enough footprint area or vertical room to install the necessary ductwork for the

SCR system. Also, potential back-pressure caused by an SCR unit may also make SCR infeasible.

Cost Effectiveness Threshold

Ecology's report includes extensive discussion of the cost-effectiveness of SCR on process heaters in terms of \$/ton of pollutant removed, but the report does not answer the critical question of what cost threshold Ecology is considering as the cutoff for requiring additional controls from the refineries under a Reasonably Available Control Technology (RACT) review. Except in areas of the most extreme nonattainment, historical RACT reviews conducted in nonattainment areas have used a cost effectiveness threshold for NO_x of \$3,000/ton or less.

Boiler #1 (Erie City Boiler)

Boilers are general emission sources that are present at most industrial facilities, and are not an emission unit specific to refineries. We believe Ecology's review inappropriately singles out boilers that happen to be located at refineries for review under the regional haze program, while disregarding similar or even identical boilers from other industries in the state. If boilers are included in the regional haze SIP update, Ecology should review boilers of various sizes and fuel types as a category of sources independent from refinery processes, and assess the need for further control from boilers broadly across all industries.

For Boiler #1 (Erie City Boiler), Ecology's report determined that a regulatory order would be needed to shut the unit down by January 2028. Shell's analysis included the assumption that the boiler had a remaining useful life of eight years. The remaining useful life is a consideration in a four-factor analysis for determining whether to require controls. The specific timeframe, however, is an estimate and while useful for estimating the cost-effectiveness of implementing additional emission controls, is not a commitment by the refinery to shut down the boiler in that timeframe. The regional haze program should not mandate a shutdown of the equipment, but instead provide Shell with the flexibility to evaluate its options for compliance (including the possibility of a retrofit) on Boiler #1, just as it would for any other source subject to regional haze requirements.

FCCU / CO Boiler

Ecology's draft report states that Shell was one of two refineries that "did not submit any information on FCCU controls, which are the largest emission source on their sites."¹ Elsewhere, the report states that "Shell has an FCCU for which they did not supply cost data,"² and that Shell's contractor that prepared the four-

¹ P. 42

² P. 52

factor analysis “did not supply cost data or this equipment.”³ These statements imply that Shell’s submittals were deficient by not providing information requested by Ecology.

However, Shell’s FCCU is outside the scope of review for the four-factor analysis. Ecology’s November 27, 2019 letter to Shell requested a four-factor analysis only for units that had not been retrofitted since 2005. The FCCU at the Shell refinery was retrofitted with a wet gas scrubber in 2006 to meet Refinery MACT SO₂ and PM regulations and EPA consent decree requirements. Additionally, a new lower NO_x limit was established for the unit, which took effect in 2014. The limit is in Shell’s Air Operating Permit and is federally enforceable.

Shell provided background information about these FCCU retrofits in its January 30, 2020 initial response to Ecology’s information request. Until Ecology’s draft report was issued in January 2021, at no point since Shell’s January 2020 response, or since Shell’s four-factor analysis was submitted in April 2020, has Ecology indicated a need for additional information about the FCCU, or questioned the FCCU’s exclusion from the four-factor analysis.

Please remove references to the FCCU from the report, as it does not meet the emission unit selection criteria identified by Ecology for this review.

Cogen Units

As discussed above regarding Boiler #1, simple cycle and combined cycle combustion turbines are general emission sources that are present at many industrial facilities, and are not emission units specific to refineries. We believe Ecology’s review inappropriately singles out Shell’s cogens for review under the regional haze program on the basis that they happen to be co-located with the refinery, while disregarding similar or even identical turbines from other industries in the state. If the cogen units are included in Ecology’s regional haze determination, Ecology should review simple and combined cycle combustion turbines as categories of sources independent from refinery processes, and assess the need for further control broadly across all industries.

The cogen units at the PSR fall outside the scope of review identified by Ecology for the four-factor analysis. Ecology’s November 27, 2019 letter to Shell requested a four-factor analysis for boilers and process heaters greater than 40 MMBtu/hr. The cogen units are combustion turbines and do not fall under these specific source types. However, Shell did include the cogen units in its report to show that even at other combustion units, it had implemented SCR

³ P. 54

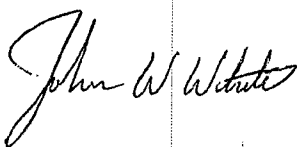
for NOx control. Because these units do not meet Ecology's criteria, please remove references to the cogens from the report.

In addition to continuing to operate the cogen units with SCR, over the last five years Shell has discontinued firing of liquid fuel in the units, which has resulted in NOx reductions. Liquid fuel firing was discontinued in Cogen #2 in June 2015, Cogen #3 in June 2016, and Cogen #1 in June 2017. Shell has obtained federally enforceable permit limitations to make these changes permanent.

Ecology's report identifies the three cogen units at the refinery as requiring further study. Ecology cites the fact that similar new units are permitted at levels below 2 ppm NOx. Those low emission limits for new turbines represent a much more stringent level of control (i.e., Lowest Achievable Emission Rate, or LAER) that may be appropriate for nonattainment areas, but does not represent a RACT level of control. Shell's cogens already operate with SCR, the best technology that Ecology is proposing in its report for implementation for other emission units. The SCR systems were installed initially as a BACT control option, and were designed to meet a particular outlet concentration. The refinery currently operates the cogens and SCR system to minimize emissions of NOx while also maintaining low levels of ammonia slip. Attempting to lower NOx emissions further would raise the possibility of emitting substantially more ammonia, a regulated toxic air pollutant in Washington, and risk violation of the ammonia emission limits on the cogens. Comparing the emission rates of Shell's turbines to those of new turbines is not a relevant comparison for assessing the performance of an SCR system, as new turbines will have a lower NOx inlet emission rate to the SCR than existing turbines can achieve. Further reducing the emission limit would have negligible benefit to air quality and visibility, represents a level of control far more stringent than RACT, and should be removed from Ecology's report.

Thank you for considering our comments. We appreciate the opportunity to review Ecology's draft report and are available to respond to any questions that Ecology may have about our four-factor analysis or these comments.

Sincerely,

A handwritten signature in black ink, appearing to read "John White". The signature is fluid and cursive, with the first name "John" being more prominent than the last name "White".

John White
General Manager