EARTHJUSTICE

November 16, 2021

Rachel Assink
Department of Ecology
Air Quality Program
P.O. Box 47600
Olympia, WA 98504-7600

RE: Rulemaking for Chapter 173-441 WAC: Reporting of Emissions of Greenhouse Gases

Dear Rachel Assink:

This letter is submitted on behalf of Earthjustice, a national nonprofit public interest environmental law organization. We wield the power of law and the strength of partnership to protect people's health, to preserve magnificent places and wildlife, to advance clean energy, and to combat climate change. Here in our Northwest Office based in Seattle, we focus on blocking industry's attempts to turn this special place into a hub for transporting dirty fossil fuels, while also working to advance clean energy policies and greater energy efficiency.

Earthjustice submits this letter urging the Department of Ecology ("Ecology") to update the global warming potentials for calculating carbon emissions to reflect best available science. Washington regulations require that facilities directly emitting greenhouse gas ("GHG") emissions quantify and report their emissions to the Department of Ecology. WAC 173-441-010.[1] This is referred to as the Reporting Requirement. Washington's existing Reporting Requirement specifies the methodology that facilities must use to quantify their emissions, and in particular specifies what global warming potentials should be used to calculate carbon dioxide equivalent emissions when evaluating the climate warming impact of GHG emissions. Table A-1, WAC 173-441-040 (specifying global warming potentials). Ecology is not currently proposing any changes to the global warming potentials to update them in accordance with best available science, and it should. Ecology should not rely on outdated science that underestimates the actual climate warming impacts of greenhouse gases when quantifying GHG emissions.

In the current climate crisis, an accurate assessment of a project's effect on global warming is particularly important. Although public discourse around anthropogenic climate change often centers on carbon dioxide, pound-for-pound methane is a much more powerful greenhouse gas. Although this has been no secret, the last 15 years have seen an increase in study of the greenhouse gas effects of methane. That understanding, unfortunately, does not reveal

[1] A facility must report its emissions if it emits more than 10,000 metric tons of GHGs per year. WAC 173-441-030.

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good news; rather, it has shown that methane is even more harmful to the climate than was known even two decades ago.

Moreover, methane emissions are often unintentional and invisible to the naked eye, resulting from venting, or small leaks in pipelines, valves, joints, transportation containers, and storage tanks. Leaks and accidental releases emitted directly from a facility should count toward direct facility emissions, even though they are not intentionally emitted.

This improved understanding of the climate warming impact of methane is reflected in the updated values for global warming potentials published in the 5th Assessment Report of the Intergovernmental Panel on Climate Change ("IPCC"). The global warming potential is a multiplier used for greenhouse gases to compare their effect accurately with each other, setting CO2 as the reference factor of one. The IPCC Report is updated from time to time and represents the international experts' consensus and the best available climate science.

Ecology should update the global warming potentials in Table A-1 of WAC 173-441-040 to align with best available science as described in the 5th IPCC Assessment report. In its Fifth Assessment Report, the IPCC updated global warming potentials to reflect the broad scientific consensus that the actual warming impact of greenhouse gases are much higher than initially determined in its earlier report. Certain greenhouse gases, like methane, exert a more aggressive climate-altering impact than previously understood. By way of comparison, under the 4th IPCC Assessment Report, one molecule of methane was determined to have the same impact as 25 molecules of CO2 over 100 years, and hence was determined to have a 100-year global warming potential of 25.[2] In its updated 5th Assessment Report, the IPCC increased the 100-year global warming potential value for methane to 36, because of methane's outsized warming impact on the global climate.[3] This change to the global warming potential for methane means that methane's warming impact is more than 40% higher than previously understood.[4]

Anyone wanting accurately to communicate the actual greenhouse gas effects of methane should refer to the most current global warming potentials described in the IPCC's 5th Assessment Report. This is not controversial; in fact, it is not in dispute at all. The U.S. EPA's webpage on Global Warming Potentials states that it "considers the [global warming potential] estimates presented in the most recent IPCC scientific assessment to reflect the state of the science. In science communications, the EPA will refer to the most recent GWPs."[5]

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[2] Ex. A., Direct Testimony of Peter Erickson, *Advocates for a Cleaner Tacoma et al. v. Puget Sound Clean Air Agency*, PCHB Case No. P19-087c, ¶¶ 58-59, (Mar. 19, 2021) ("Erickson Testimony").

[3] *Id*.

[4] *Id*.

[5] U.S. EPA, *Understanding Global Warming Potentials*, https://www.epa.gov/ghgemissions/understanding-global-warming-potentials.

Updating global warming potentials is especially urgent because nations around the world are relying on the 5th IPCC Assessment report to calculate GHG emissions. In December 2018, nations that are parties to the Paris Agreement agreed to use global warming potentials from the 5th Assessment Report because these values are more accurate.[6] For example, as of January 1, 2021, the European Union requires that polluters use global warming potentials from the Fifth Assessment Report to calculate GHG emissions.[7] The United States rejoined the Paris Agreement in February 2021, meaning that updating global warming potentials would align Washington's GHG emissions inventory with international law under the Paris Agreement.

Updating global warming potential values can have a significant impact on quantifying GHG emissions, particularly if a facility is emitting large quantities of methane. By way of example, GHG emissions for the Tacoma liquefied natural gas ("LNG") storage and production facility are significantly different depending on the global warming potentials used to evaluate emissions.[8] The Supplemental Environmental Impact Statement for the project calculated the GHG emissions from the facility using outdated global warming potentials from the 4th IPCC Assessment Report. However, using updated values from the IPCC's 5th Assessment Report

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[6] United Nations, Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on the third part of its first session (Mar. 14, 2019), https://unfccc.int/sites/default/files/resource/cma2018_3_add2_new_advance.pdf#page=25; *see also* **Ex. A**, Erickson Testimony ¶ 59.

[7] "[N]ational climate reporting and requirements for the EU inventory systems are repealed and replaced accordingly by: … Commission Delegated Regulation (EU) 2020/1044 – requirements for the EU inventory systems under Regulation on the Governance of the Energy Union and Climate Action including setting out the inventory guidelines and defining values for the global warming potentials based on the IPCC Fifth Assessment Report."

European Comm'n, *Emissions monitoring & reporting*, https://ec.europa.eu/clima/eu-action/climate-strategies-targets/progress-made-cutting-emissions/emissions-monitoring-reporting_en (referencing Commission Delegated Regulation (EU) 2020/1044).

[8] In support of this comment letter, we provide two pleadings from the case *Advocates for a Cleaner Tacoma et al. v. Puget Sound Clean Air Agency*, PCHB Case No. P19-087c, which challenged the Supplemental Environmental Impact Statement on greenhouse gas impacts for the Tacoma LNG Facility. First, we've included the pre-filed direct testimony from our expert Pete Erickson who provides a detailed analysis regarding the importance of using the best available science of the 5th Assessment Report to quantify greenhouse gas emissions. Ex. A, Erickson Testimony. We have also included an amicus brief filed by the Washington Attorney General's office in support of our case, which provides legal reasons supporting the adoption and use of global warming potentials from the 5th Assessment Report for calculating GHG emissions. Ex. B, Attorney General Office's Amicus Curiae Brief in Opposition to Respondents' Second Dispositive Motion, *Cleaner Tacoma et al. v. Puget Sound Clean Air Agency*, PCHB Case No. P19-087c, January 8, 2021.

dramatically increases lifecycle greenhouse gas emissions from the Tacoma LNG facility by around 200,000 tons/year.[9]

Getting an accurate inventory of GHG emissions is critical to successfully implementing the Climate Commitment Act. The purpose of the Climate Commitment Act is to help the state achieve greenhouse gas emission reduction targets set out in RCW 70A.45.050. *See* RCW 70A.65.060(1). The legislature set the state's emission reduction targets using current climate science regarding the steep reductions needed to avoid catastrophic climate change.[10] The Reporting Requirement is directly relevant to the Act, because Ecology must use information obtained from the GHG inventory to set the emissions baseline from which polluters must ratchet down their emissions. *See* RCW 70A.65.070(1)(A).

While the legislature did not define the term "current science," this term should be understood as synonymous with best available science. The Intergovernmental Panel on Climate Change is an open and transparent review by experts and governments that summarizes current science about the drivers of climate change, its impacts and future risks, and how adaptation and mitigation can reduce those risks.[11] There are 195 countries that are members of the IPCC, including the United States.[12] Thousands of scientists from around the world contribute to the work of the IPCC, and "t]hrough its assessments, the IPCC identifies the strength of scientific agreement in different areas and indicates where further research is needed."[13] For this reason, the findings of the IPCC are seen as the global scientific consensus regarding the current state of climate change science. The 5th Assessment Report is the most current scientific assessment prepared by the IPCC, and the IPCC is scheduled to complete its 6th Assessment Report next year.[14]

Relying on outdated science to calculate statewide GHG emissions would undermine the Climate Commitment Act because it would create an artificially low baseline for existing GHG emissions, and thereby underestimate the climate warming impact of existing statewide GHG emissions. An artificially low baseline, in turn, will mean that the Ecology cannot set its GHG reduction targets as steeply as needed to avoid climate catastrophe—meaning the law would fail to achieve its primary objective. Conversely, accurately accounting for GHG emissions would

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[9] **Ex. A**, Erickson Testimony, ¶ 61.

[10] "In 2020, the legislature updated the state's greenhouse gas emissions limits that are to be achieved by 2030, 2040, and 2050, based on *current science and emissions trends*, to support local and global efforts to avoid the most significant impacts from climate change." RCW 70A.65.005(2) (emphasis added).

[11] IPCC, *About the IPCC*, https://www.ipcc.ch/about/.

[12] IPCC, *List of IPCC Member Countries*, https://www.ipcc.ch/site/assets/uploads/2019/02/ipcc_members.pdf.

[13] IPCC, *supra* n.10.

[14] IPCC, *AR6 Synthesis Report*, https://www.ipcc.ch/report/sixth-assessment-report-cycle/.

ensure that the GHG baseline reflects actual emissions. Ecology should set emission reduction targets that rely upon best available science to ensure that Washington actually achieves its GHG reduction targets. Given that the United States recently rejoined the Paris Agreement, it is under an obligation to update federal regulations regarding GHGs reporting with current science as reflected in the 5th Assessment Report. By proactively updating global warming potentials now, Ecology will ensure that both the GHG baseline, and future emissions credits align with best available science and international policy agreements.

In addition to advancing the purpose of the Act, updating global warming potentials in accordance with best available science would not conflict with any provision of the Act.[15] The Climate Commitment Act requires Ecology to amend its regulations for the Reporting Requirement if the U.S. Environmental Protection Agency amends 40 C.F.R. 98, to ensure consistency with *any changes* to the federal reporting requirements. RCW 70A.15.2200(5)(c)(i). This section does not prohibit when Ecology can amend its rule, but instead requires Ecology to review its regulations if EPA makes changes to its reporting requirement. Here, however, EPA has not proposed any changes or amendments to 40 C.F.R. 98, meaning this statutory provision is not triggered.

Further, updating global warming potentials now would also avoid the need to do so in the future when EPA updates its GHG inventory regulations—in accordance with its responsibility to do so under the Paris Agreement. Updating Ecology's regulations now to reflect best available science would avoid the need for another rulemaking, which is burdensome and time intensive for both Ecology and the public. Further, industry has repeatedly called on governments to create regulatory certainty,[16] and updating the global warming potentials at the outset, while Ecology is still develop its cap-and-trade program, would enable industry to plan and budget in advance. If Ecology delays the decision to update global warming potentials, it would mean changing the GHG baseline and the allocation of credits to polluters while the program is in the first year of two of its implementation.

The Climate Commitment Act also requires Ecology to amend the Reporting Requirement regulations to "ensure consistency with emissions reporting requirements for jurisdictions with which Washington has entered a linkage agreement." RCW

[15] The Climate Commitment Act also provides that when amending its regulations for the Reporting Requirement, Ecology cannot enact regulations that conflict with RCW 70A.15.2200. RCW 70A.15.2200(5)(c)(ii). This statutory language does not impose any additional limits to Ecology's authority because as a general legal principle regulations that conflict with the authorizing statute are treated as void. *Winans v. W.A.S., Inc.*, 112 Wn. 2d 529, 540-41 (1989) ("[R]egulations, in order to be valid, must be consistent with the statute under which they are promulgated."); *Government of Guam v. Koster*, 362 F.2d 248, 252 (9th Cir. 1966) (striking down regulation that was in "obvious conflict with that statute").

[16] U.S. Chamber of Commerce, *The Business Community Needs Regulatory Certainty Now More Than Ever*, Feb. 10, 2021, https://www.uschamber.com/regulations/the-business-community-needs-regulatory-certainty-now-more-ever.

70A.15.2200(5)(c)(i)(B). However, Washington does not have any linkage agreement in place, so this provision is also not triggered. Further, other jurisdictions will likely soon update their regulations to achieve compliance with the 5th Assessment Report—just as the European Union has.

In conclusion, we urge Ecology to update its Reporting Requirement to reflect best available science by updating the global warming potentials listed in Table A-1 of WAC 173-441-040 to make them consistent with the IPCC's 5th Assessment Report. Doing so will ensure an accurate accounting of greenhouse gas emissions, which in turn will help ensure that Washington actually achieves its goal to avoid climate catastrophe by reducing GHG emissions by 95% below 2005 levels by 2050.

Sincerely,

Jaimini Parekh

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Exhibit A

POLLUTION CONTROL HEARINGS BOARD

FOR THE STATE OF WASHINGTON

ADVOCATES FOR A CLEANER TACOMA; SIERRA CLUB; WASHINGTON ENVIRONMENTAL COUNCIL; WASHINGTON PHYSICIANS FOR SOCIAL RESPONSIBILITY; STAND.EARTH, and THE PUYALLUP TRIBE OF INDIANS, Appellants, v. PUGET SOUND CLEAN AIR AGENCY, PUGET SOUND ENERGY Respondents.	PCHB No. P19-087c DIRECT TESTIMONY OF PETER ERICKSON

I. INTRODUCTION

1. My name is Peter Erickson. I am a Senior Scientist with the Stockholm Environment Institute ("SEI"). I have worked in environmental research and consulting for 20 years. I have been employed by the Stockholm Environment Institute ("SEI") since 2008. SEI is an international research institute with offices in five continents. According to the University of Pennsylvania Global Go-to Think Tank Index, SEI has been ranked as the world's top one or two environmental policy think tanks for the last several years.

2. I am a researcher with SEI's U.S. Center, which is registered in the U.S. as a 501(c)(3) non-profit corporation. SEI's U.S. Center has extensive experience analyzing how policies, actions, or infrastructure projects increase or decrease greenhouse gas emissions. In particular, in my work at SEI, I have authored or co-authored numerous studies on the GHG emissions effects of projects that use or displace fossil fuels. These include a study of industrial GHG emissions intensity for the State of Washington's Department of Ecology, published in

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2010.[1] This and other studies on the GHG emissions effects of projects and facilities that use or displace fossil fuels are listed in my C.V. During the last thirteen years, my professional focus has been on greenhouse gas emissions accounting and the role of policy mechanisms in reducing greenhouse gas emissions. Specifically, I have conducted and led research projects on these topics on behalf of numerous partners and funders, including international institutions (e.g., the United Nations Framework Convention on Climate Change, the World Bank), the U.S. government (U.S. Environmental Protection Agency), state governments (e.g., State of Washington, State of Oregon), and local governments (e.g., City of Seattle, King County, Pierce County).

3. I have also served on national and international committees devoted to greenhouse gas emissions accounting: one convened by the International Council of Local Environmental Initiatives (ICLEI) to create a U.S. Community-scale Greenhouse Gas Emissions Accounting and Reporting Standard, and one convened by the Greenhouse Gas Protocol to create the Greenhouse Gas Mitigation Goals Standard. I am currently an invited reviewer for several chapters of the Intergovernmental Panel on Climate Change's upcoming *Sixth Assessment Report* focused on mitigating global climate change. I have published widely in the peer-reviewed literature on these topics, including in the journals *Carbon Management, Climate Policy, Energy Policy, Environmental Research Letters, Environmental Science and Technology, Greenhouse Gas Measurement and Management, Nature, Nature Climate Change,* and *Nature Energy*. I have also written on the very issues presented in this case, for example, in a paper cited by the Washington Department of Ecology when it rejected a SEPA lifecycle

[1] Peter Erickson, et al., *Issues and Options for Benchmarking Industrial GHG Emissions*, October 8, 2010, STOCKHOLM ENVIRONMENT INSTITUTE, https://www.sei.org/publications/issues-options-benchmarking-industrial-ghg-emissions/.

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GHG analysis for the Kalama methanol project.[2] These and other efforts are documented in my curriculum vitae, which is attached as ACT-18.

4. I have carefully reviewed the draft and final supplemental environmental impact statements ("SEIS") concerning greenhouse gas ("GHG") emissions from the Tacoma LNG project that is the subject of this litigation, as well as its supporting documents, including the PSE Tacoma LNG Project GHG Analysis Final Report ("GHG Report") appended to the SEIS as Appendix B. I also am familiar with the draft version of these documents and submitted comments on the draft. I have also reviewed oral and written testimony from others who have offered opinions in this case, including Stephan Unnasch and Patrick Couch. This testimony explains my expert opinion that the methodologies and conclusions contained in the SEIS and GHG Report are fundamentally flawed and misleading. In my opinion, contrary to what is stated in the SEIS, GHG emissions associated with this project are significant, and are inconsistent with global, national, and state commitments to dramatically reduce GHG emissions. There are multiple reasons for this.

II. THE CLIMATE CRISIS AND NEED FOR EMISSIONS CUTS

5. First, it is helpful to review the state of the science with respect to the climate crisis and consensus agreements around the need for rapid and steep cuts in emissions of GHGs over the coming decades. Around the world, with just ~1 degree C of warming experienced to date, we are already seeing serious harms that include increasing flooding, wildfires, droughts, heat waves, expanded impacts of pests and pathogens, and other effects. All of these are

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[2] ACT-19, Peter Erickson, et al., *Towards a climate test for industry: Assessing a gas-based methanol plant*, STOCKHOLM ENVIRONMENT INSTITUTE, (February 26, 2018).

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plausibly linked to climate change.[3] For example, three "five-hundred year" floods occurred in Houston, Texas in just three years, with one storm – Hurricane Harvey – producing rainfall that "likely exceeded that of any known historical storm in the continental United States."[4] In many areas of the world and the country, increasing summer temperatures are already making working outdoors dangerous.[5] In the Pacific Northwest, warming has contributed to "vast mountain areas [having] already been transformed by mountain pine beetle infestations, wildfires, or both" and reduced snowpack.[6]

6. The impacts of climate change globally and in the Northwest are expected to get worse, especially if GHG emissions continue at recent levels. A scientific review of the effects of climate change on health has concluded, "The life of every child born today will be profoundly affected by climate change. Without accelerated intervention, this new era will come to define the health of people at every stage of their lives."[7] In the Pacific Northwest, climate change

[3] For a summary of these effects, see: Holdren, J. P. (2018, September). *The Science & Policy of Climate Change: An Update on the Challenge and the Opportunity*. Presented at the Low-emissions Solutions Conference, San Francisco, CA. (https://lowemissions.solutions/uploads/files/decks/2018_gcas_lesc/John%20Holdren_2018-09-11_Perspective_USF_JPH.pdf).

[4] Hayhoe, K., Wuebbles, D. J., Easterling, D. R., Fahey, D. W., Doherty, S., Kossin, J. P., … Wehner, M. F. (2018). *Chapter 2: Our Changing Climate. Impacts, Risks, and Adaptation in the United States: The Fourth National Climate Assessment, Volume II*. https://doi.org/10.7930/NCA4.2018.CH2.

[5] Field, C. B., Barros, V. R., Dokken, D. J., Mach, K. J., & Mastrandrea, M. D. (Eds.). (2014). Human Health: Impacts, Adaptation, and Co-Benefits. *In Climate Change 2014 Impacts, Adaptation, and Vulnerability* (pp. 709–754). https://doi.org/10.1017/CBO9781107415379.016.

[6] May, C., Luce, C. H., Casola, J. H., Chang, M., Cuhaciyan, J., Dalton, M., Lowe, S. E., Morishima, G. S., Mote, P. W., Petersen, A. S., Roesch-McNally, G., & York, E. A. (2018). *Chapter 24: Northwest. Impacts, Risks, and Adaptation in the United States: The Fourth National Climate Assessment, Volume II*. U.S. Global Change Research Program. https://doi.org/10.7930/NCA4.2018.CH24.

[7] Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S., Belesova, K., Boykoff, M., Montgomery, H. (2019). The 2019 report of The Lancet Countdown on health and climate change: Ensuring

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impacts associated with emissions at recent levels will lead to increased damages to people, property, and economic activity from fire, water shortages, risks to fisheries and aquatic ecosystems, and food security. For example, as reported in the US Government's *Fourth National Climate Assessment*, "Airborne particulate levels from wildfires are projected to increase 160% by mid-century… …creating a greater risk of smoke exposure through increasing frequency, length, and intensity of smoke events", and resulting increased respiratory illness.

7. Consistent with the findings of the international scientific community, the US Government's *Fourth National Climate Assessment* describes that climate risks can only be adequately addressed with "substantial and sustained reductions in global greenhouse gas emissions."[8] As the report notes, "Future risks from climate change depend primarily on decisions made today."[9]

8. To address the risks of climate change throughout the world, nations have been working collectively under the United Nations Framework Convention on Climate Change (UNFCCC). The landmark agreement of countries that are party to the UNFCCC, including the United States, is the Paris Agreement of 2015. The Paris Agreement commits countries to "holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels." In adopting the Paris Agreement, countries also asked the Intergovernmental Panel on

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that the health of a child born today is not defined by a changing climate. *The Lancet*. https://doi.org/10.1016/S0140-6736(19)32596-6.

[8] Reidmiller, D. R., Avery, C. W., Easterling, D. R., Kunkel, K. E., Lewis, K. L. M., Maycock, T. K., & Stewart, B. C. (2018). *Impacts, Risks, and Adaptation in the United States: The Fourth National Climate Assessment*, *Volume II.* U.S. Global Change Research Program. https://doi.org/10.7930/NCA4.2018 page 25.

[9] *Ibid*, page 26.

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Climate Change (IPCC) to produce a report on what emissions levels would be needed to achieve the 1.5 °C limit.[10]

9. The IPCC, in its special report, *Global Warming of 1.5 °C*, describes that net global carbon dioxide (CO_2) emissions must reach zero by about the year 2050 in order to meet the 1.5 °C with no or "limited" overshoot (exceedance) of the temperature limit.[11]

10. Use and production of all three major fossil fuels – coal, gas, and oil – must decline dramatically to meet the 1.5 °C limit. Over the next three decades (through 2050), the IPCC finds that, to attain the 1.5 °C limit with no or limited overshoot, coal use must decline by an average of 6% annually (for a total of 82% between 2020 and 2050), gas use by an average of 2% annually (for a total of 43%), and oil use by an average of 3% annually (for a total of 65%).[12] Further, one of the longstanding principles of the international negotiations, termed "common but differentiated responsibilities", is that reductions in the U.S. and other highly developed countries must proceed faster than these global averages, on account of our historic responsibility for climate change and our relatively high capacity to financially support solutions.

11. The role of "natural" gas in a global energy transition consistent with the goals of the Paris Agreement is a topic of considerable research and debate. As a fossil fuel, natural gas emits dramatically more greenhouse gas emissions than non-fossil sources of energy, such as solar or wind power. But in some limited circumstances and depending on what timescale is

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[10] UNFCCC. (2015). Decision 1/CP.21: Adoption of the Paris Agreement. Retrieved from United Nations Framework Convention on Climate Change website: http://unfccc.int/resource/docs/2015/cop21/eng/10a01.pdf.

[11] Rogelj, J., Shindell, D., Jiang, K., Fifita, S., Forster, P., Ginzburg, V., … Vilariño, M. V. (2018). Mitigation pathways compatible with 1.5°C in the context of sustainable development. In Special Report on the impacts of global warming of 1.5 °C. Retrieved from http://www.ipcc.ch/report/sr15/ Figure 2.5, page 113 and Table 2.4, page 119.

[12] *Ibid*, Table 2.6, page 132.

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considered, natural gas can emit fewer greenhouse gas emissions than would other fossil fuels, such as coal or oil. When researchers have weighed both possibilities against each other, they consistently find that expanding gas supply, especially from North America, offers little help in reducing greenhouse gas emissions or avoiding climate change. As summarized in the most complete study to look at this question, "increases in global supplies of unconventional natural gas do not discernibly reduce the trajectory of greenhouse gas emissions or climate forcing."[13] In other words, efforts to expand the supply of gas do little, if anything, to reduce greenhouse gas emissions. The reason is that expanding gas supply delays decarbonization of the energy system; a greater supply of low-cost gas both increases overall energy consumption as well as postpones the adoption of low-carbon energy.

III. THE SEIS ERRONEOUSLY ASSUMES MARINE AND TRUCK TRANSPORTATION WILL BE HIGH-CARBON FOR DECADES IF NOT FOR THIS PROJECT.

12. The SEIS provides a "life-cycle" analysis of GHG emissions, looking not just at direct GHG emissions but also at indirect emissions associated with the production, transportation, and end use of the LNG that would be processed and stored at the Tacoma project. Lifecycle analysis is an important tool to assess the GHG implications of government decisions. As documented here, however, there are a number of serious problems with the analysis in the final SEIS.

13. The SEIS documents significant life-cycle emissions from the project, the bulk of which are associated with the production and end-use of LNG. Specifically, the SEIS finds that the project would generate 683,514 metric tons (hereafter, "tonnes") of CO_2e/year at production

[13] McJeon, H., Edmonds, J., Bauer, N., Clarke, L., Fisher, B., et al. (2014). Limited impact on decadal-scale climate change from increased use of natural gas. *Nature*, 514(7523). 482–85. DOI: 10.1038/nature13837.

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level of 250,000 gallons/day ("Scenario A") and 1.37 million tonnes/year at a production level of 500,000 gallons/day ("Scenario B"). These are very significant volumes of GHG emissions associated with a single project, particularly one with an anticipated lifespan of decades.

14. The SEIS then compares emissions from the project with a hypothetical "no action" alternative, i.e., the emissions that would occur if the project is not approved and built. In the SEIS, the substantial bulk of these "no action" emissions arise from the combustion of conventional marine fuels, namely marine gas oil, which is similar to diesel. (SEIS, at 4-10). The second largest source of these "no action" emissions, after marine gas oil, is diesel for on-road trucking. Because, in total, these "no-action" GHG emissions are slightly higher than the anticipated GHG emissions if the project is operating, the SEIS concludes that the project's net GHG emissions are slightly negative and hence not a matter of concern.

15. But the SEIS makes a substantial error in assuming that, without the Tacoma LNG project, that tomorrow's marine and truck fuel markets would be just like today's. Specifically, the SEIS defines a no-action scenario that locks in fossil fuels as the only marine and truck fuels for the next 40 years.[14] This incorrect assumption results in the SEIS over-estimating the GHG emission reductions it attributes to the Tacoma LNG project. Below I address how the error affects the findings for each of the three largest markets for the facility's LNG: the Totem Ocean Trailer Express (TOTE) Marine vessel fueling system, "other marine" LNG, and on-road trucking.

16. The first end market for LNG mentioned in the SEIS is for TOTE vessels, which are "roll-on / roll-off" style container ships. For these vessels, the SEIS assumes that, if not for

[14] Per Table 2-1 of the SEIS, about 97% of the LNG produced is assumed to be used in the marine fuel market under Scenario A, and none for trucking. Under Scenario B, about 2% would go to on-road trucking.

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the project, that TOTE vessels would be using marine gas oil for the 40-year lifespan of the facility, e.g. to 2060 or beyond. But TOTE will likely have other options for engine systems on equivalent vessels well before 2060. For example, the International Energy Agency (IEA) reports that both hydrogen fuel cell and pure electric battery vessels for medium-distance marine shipping have, as of mid-2020, already been proven and are undergoing commercial demonstration. The IEA further envisions that these types of ships, plus other low-carbon propulsion or fuel systems (including synthetic fuels, such as ammonia), have a much greater role long-term than LNG in aligning marine shipping with a low-carbon energy system.[15] The Tacoma LNG project would work against these trends, however, since it is encouraging a retrofit to LNG for existing TOTE vessels now. Retrofitting long-lived vessels to LNG may well be pushing off, by many years (e.g., for however long the retrofits extend the life of the ships), the eventual conversion of TOTE's fleet to much lower-GHG emissions marine vessels that are under development. In other words, committing to LNG now could actually *increase* GHG emissions for TOTE vessels relative to the no-action scenario in the long-term, counteracting any slight reduction in GHG emissions in the short term.

17. The risk that the Tacoma LNG project gets in the way of even lower-carbon marine shipping could be greater for the "other marine" uses (estimated in the SEIS as 55% of the project's LNG under Scenario A) than for the TOTE vessels (estimated at 42.7% of the project's LNG). This is because these unnamed other marine vessels may not be built yet. The SEIS assumes, without justification, that these other ships use the exact same engines, powered by marine fossil fuels, as the TOTE vessels, but does not otherwise describe the vessels, even

[15] ACT-20, IEA (2020). *Energy Technology Perspectives 2020.* International Energy Agency, Paris, at Table 5.4 and Figure 5.11.

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though they comprise the majority of the project's LNG use. It is therefore inappropriate to assume that they would all be powered by marine fossil fuel for forty years.

18. On the contrary, options for marine propulsion technologies and fuels are expanding rapidly, and include not only LNG engines, but also engines, such as battery-electric or hydrogen fuel cell-based, that can be much lower-carbon than LNG. For example, the Washington State Department of Commerce reports that "efforts are already underway to electrify marine vessels."[16]

19. In addition, marine technologies may also be subject to regulation, including by the International Maritime Organization (IMO), the United Nations organization that coordinates regulation for shipping, and which has a target of reducing emissions to levels consistent with the Paris Agreement temperature goals, which the IMO interprets as meaning at least a 50% reduction in CO_2 emissions from international shipping by 2050 as compared to 2008 levels.[17] If the existence of the Tacoma LNG project spurs other marine shipping companies or boat builders to build (or speed up the construction of) LNG ships to take advantage of this new fuel supply, those companies might as a result be forestalling the option to choose even lower-carbon ships now or in the future. In that circumstance, the Tacoma LNG project would *increase* emissions relative to the no-action scenario and make it more difficult to meet the IMO's goals. In other words, and in contrast to statements made by the Respondent's witness Stephan Unnasch, LNG from the Tacoma LNG project will be competing (and displacing) not only with marine fossil

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[16] Washington State Department of Commerce (2020). *Washington 2021 State Energy Strategy: Transitioning to an Equitable Clean Energy Future*. https://www.commerce.wa.gov/growing-the-economy/energy/2021-state-energy-strategy/.

[17] ACT-20*, supra,* at Table 5-3.

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fuels, but also other fuel options. The SEIS does not mention, let alone examine, these possibilities.

20. The third-largest end use of the project's LNG is for on-road, heavy-duty trucking (an estimated 2% of the project's LNG under Scenario B, though the project's capacity for loading LNG for trucks in considerably higher). Again, the SEIS assumes that the project's LNG will be displacing diesel, here in tractor trucks carrying freight in semi-trailers. However, the SEIS provides no evidence that, absent the Tacoma LNG project, that diesel-based tractor trucks would be the default fuel choice for the next 40 years. To the contrary, Washington State's recently released 2021 State Energy Strategy calls for Washington to "to match California's ZEV sales targets for medium- and heavy-duty trucks,"[18] which requires 30% of tractor trucks sold by 2030 to be zero emissions. This is also consistent with Washington State signing the *Multi-State Medium- and Heavy-Duty Zero Emission Vehicle: Memorandum of Understanding*, and which further aims to have 100% of sales of medium- and heavy-duty trucks zero emissions by 2050. These goals are attainable. Both hydrogen fuel cell and battery electric heavy-duty trucks are already in use (especially in China), the Tesla semi-truck will soon introduced, and Seattle-based Amazon has committed that 50% of its logistics will be zero-carbon by 2030.[19] A recent analysis by the Lawrence Berkeley National Lab found that long-haul, heavy-duty trucks are already lower cost than their diesel counterparts over the lifetime of the vehicles[20]. These policy commitments and examples all refute the SEIS's implausible

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[18] ACT-21, Washington State Department of Commerce (2020). *Washington 2021 State Energy Strategy: Transitioning to an Equitable Clean Energy Future*, at 60.

[19] ACT-20, *supra*, at Table 5-1 and Table 5-2.

[20] Phadke, A., Khandekar, A., Abhyankar, N., Wooley, D., & Rajagopal, D. (2021). *Why Regional and Long-Haul Trucks are Primed for Electrification Now*. https://eta-publications.lbl.gov/publications/why-regional-and-long-haul-trucks-are.

assumption that, in the absence of the Tacoma LNG project, heavy-duty trucking will be diesel-based tractor trailers for the next 40 years. As with marine shipping, the SEIS does not mention, or analyze, the possibility that LNG competes with a wide variety of fuels and may therefore, instead of displacing fossil fuels, actually postpone the necessary conversion of truck fleets to battery electric or fuel cell vehicles that are lower-carbon than LNG.

21. In all three end uses described above – TOTE marine, other marine, and on-road trucking – the SEIS makes the same error: it assumes that the default, or "baseline" technology forty years from now will be static, or the same as in the recent past. But there is broad consensus in the GHG emissions mitigation accounting community that static baselines such as employed in the SEIS are less appropriate (and generally less accurate) than "dynamic" baselines that take into account foreseen changes in technology and behavior conditions over time. As the GHG Protocol effort (an exhaustive, stakeholder-driven process) has indicated, dynamic, not static, baselines "should be used where relevant and feasible" in assessing the GHG emissions impact of a policy or action.[21] In the case of the Tacoma LNG facility, dynamic baselines would assess plausible future changes in marine and on-road shipping technologies and the market share of battery electric, hydrogen fuel cell, and other low-carbon technologies, rather than assuming that the current fossil fuels would be the default fuels for the next 40 years.

22. Dynamic baselines like this have been used in other regulatory contexts. For example, the US EPA, in evaluating new greenhouse gas emission and efficiency standards for medium and heavy trucks, found that greenhouse emissions under a dynamic baseline that got more efficient due to ongoing market trends alone would be less than under a static, current-

[21] GHG Protocol. (2014). Policy and Action Standard: An accounting and reporting standard for estimating the greenhouse gas effects of policies and actions. Retrieved from http://ghgprotocol.org/policy-and-action-standard.

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technology baseline and, therefore, that the emission reductions attributable to the new proposed truck efficiency standards would also be less under a dynamic baseline.[22] Similarly, a dynamic baseline was similarly used in an analysis by DNV-GL seeking to forecast trends in marine shipping.[23] That analysis compares various options to a "current policies pathway" under which carbon intensity of marine shipping significantly drops even without any additional, new policies. This comparison reveals that such techniques are commonplace and readily available, but were not used in this SEIS.

23. More support can be found in the recently released "conceptual framework" for the Washington Department of Ecology's proposed Greenhouse Gas Assessment rule.[24] While the rule is not yet complete, it is grappling with many of the issues raised above. Ecology's proposed framework makes clear that the "no action alternative" to be used in assessing a project's lifecycle GHG emissions is not a static snapshot where the future is just like today. Instead, the proposal calls for defining the no action scenario as assessing future conditions under "state and federal GHG reduction limits and international goals approved by the U.S. Government." *Id*. at 18. This analysis is designed to show the "impact of the project relative to potential future conditions without the project." *Id*. If such a rule applied here, the no action

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[22] U.S. EPA (2016). Greenhouse Gas Emissions and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles – Phase 2. EPA-420-R-16-900. Assessment and Standards Division, Office of Transportation and Air Quality, U.S. Environmental Protection Agency, and Office of International Policy, Fuel Economy, and Consumer Programs, National Highway Traffic Safety Administration, U.S. Department of Transportation, Washington, DC. https://nepis.epa.gov/Exe/ZyPDF.cgi/P100P7NS.PDF?Dockey=P100P7NS.PDF. Table 5-1, 5-2, and 5-3.

[23]ACT-2, Remi Eriksen, et al. *Maritime Forecast to 2050, Energy Transition Outlook 2019,* DNV GL, 11 (2019), at 90-91.

[24] ACT-22, WSDOE *Draft GAP Rule Conceptual Framework for Informal Review*, Wash. State Dep't of Ecology (March 2021).

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alternative would likely show dramatic reductions in marine GHG emissions over the lifetime of the project, consistent with international goals (e.g., the Paris Agreement) and state emissions targets. If the Tacoma LNG project was compared to *this* no action alternative, net GHG emissions would be significant.

24. Some of the best thinking about how to guard against the risks of using an incorrect baseline has been done under the Kyoto Protocol, in a system called the Clean Development Mechanism (CDM). I was hired by the United Nations to evaluate the GHG emission reductions achieved by the CDM, and so I have considerable experience with it. [25] The designers of the CDM were concerned that developers of energy projects might try to claim more emission reductions than actually occurred, and so put in place measures to guard against this outcome. I will describe two such practices below.

25. In one such practice, in the CDM, emission reductions are only quantified for a fixed duration, called a "crediting period", that is either seven years (and generally twice-renewable, for a total of 21 years), or ten years (and not renewable). The designers of the CDM believe that these time limits are needed because of the great uncertainty in defining a correct no-action scenario more than a decade into the future. While the LNG project here would not be in the CDM system, and so need not necessarily meet that standard, it is still instructive to understand how the most careful thinking about GHG emissions baselines puts firm time limits on how far out emission reductions can be quantified with some certainty. Of course, the point is not to ignore the potential impacts of decisions past seven years or some other horizon, as

[25] I was commissioned by the United Nations Framework Convention on Climate Change to conduct an assessment of this issue, which was published in peer-reviewed form as follows. Erickson, P., Lazarus, M., & Spalding-Fecher, R. (2014). Net climate change mitigation of the Clean Development Mechanism. *Energy Policy*, 72, 146–154 https://doi.org/10.1016/j.enpol.2014.04.038.

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respondents have argued. Rather, the point is that when comparing an action to a counterfactual "no action" scenario, great care must be exercised in making assumptions about what will happen in the future, and an effort made to define a baseline that is consistent with what is known about the future. This example from the CDM underscores how careful quantification of GHG emission reductions demands an assessment of about how a baseline may change decades into the future; by contrast, it is not acceptable to assume that a single technology or practice is the baseline alternative for such a long time period.

26. Furthermore, the CDM designers also developed dynamic baselines that take into account ongoing changes in energy technology. These baselines seek to represent, as accurately as possible, the "no action" scenario in which the proposed project is not developed, and which could therefore be a useful analog for how to construct a no-action scenario for the Tacoma LNG project. For example, for new renewable energy projects, the standard CDM baseline calculation takes into account the new, *prospective* power plants that would be affected by the proposed project, not just the current, already-operating power plants. This means that the baseline emissions intensity would decline over time, at least for regions that are building out low-carbon renewable electricity at faster than historic rates, as most are. This in contrast to Patrick Couch's January 19th, 2021 declaration, in which he misleadingly claims that "renewable electricity generation projects are assumed to displace the existing grid resources or existing generator emissions". In the CDM, evaluating emission reductions relative to the *existing* power plants is only an option for a specific type of small scale power project that are afforded special rules and which represent a very small share of all emission reductions from renewable power in the program. Mr. Couch's example is misleading and not representative of the bulk of the CDM program.

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27. In his January 19th, 2021 declaration, Patrick Couch further brings up the example of how the Low Carbon Fuel Standard ("LCFS") (as applied in California) calculates GHG emissions reductions relative to fossil fuels. However, he fails to mention that the Low Carbon Fuel Standard awards its credits for GHG emission reductions relative not to the current emissions intensity of only fossil fuels, but actually to a dynamic baseline emissions intensity that declines each year.[26] In the LCFS system, fossil LNG offers little if any GHG emission benefit relative to fossil fuels, and was not awarded any GHG emission reduction credits in the California program in 2019 or 2020.[27] Given the declining, dynamic baseline of the LCFS program, fossil LNG may never again be eligible for emission-reduction credits, for the very sensible reason that it does not reduce GHG emissions relative to the policy goals of the State of California.

28. Regardless of what technology or technology mix comprises the baseline for marine fuels and on-road trucking, it is important to recognize the uncertainty in evaluating the counterfactual, no-action scenario. But the SEIS provides no hints that its baseline scenario for completely fossil-fuel based marine shipping and trucking is highly likely to be inaccurate, nor does it mention the possibility that, since the market is already evolving towards more low-carbon transportation, that the Tacoma LNG project could actually increase emissions over time relative to the no-action scenario. The possibility is neither discussed nor quantified in the very limited sensitivity analysis (e.g., Figure 5.5 in App. B to the SEIS), which instead focuses mainly on how different assumptions related to the project itself (not the no-action scenario) would change net emissions. As a result, the SEIS presents an extraordinarily misleading view of how

[26] ACT-23, California Air Resources Board. (2020). Low Carbon Fuel Standard Basics. https://ww2.arb.ca.gov/sites/default/files/2020-09/basics-notes.pdf.

[27] https://ww3.arb.ca.gov/fuels/lcfs/dashboard/dashboard.htm.

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the project may contribute to greenhouse gas emissions. At the very least, the SEIS should have considered a more plausible baseline that includes already-foreseen changes in marine and on-road fuels and technologies, using credible analysis by international institutions, such as the International Energy Agency, or from local institutions, such as the Washington State Department of Commerce, which sees, in its new 2021 State Energy Strategy, 100% of new long-haul freight trucks being either electric or hydrogen-based by 2045.[28] Even better would be for the SEIS to consider as its no-action scenario a deeply low-carbon baseline, such as one consistent with Washington State's own goal of reducing its emissions in line with the 1.5 degrees C target of the Paris Agreement, as proposed in the draft GHG analysis conceptual framework noted above. A baseline consistent with 1.5 degrees C of warming would probably mean zero new investment in fossil fuel infrastructure, since that fossil fuel infrastructure already in existence globally has committed enough CO_2 emissions to exhaust or nearly exhaust the 1.5 C carbon budget.[29]

29. Respondents have consistently argued that it would be "speculative" to forecast the future of marine (or truck) transport. But the argument ignores that the SEIS *already* speculates on the future, by defining a no action alternative that locks today's technology in place for 40 years, which is entirely implausible. The SEIS could have used existing, commonly used approaches to define a no action alternative that was more plausible and reasonable than the one they chose. And it could have acknowledged that the many uncertainties associated with assumptions about the no action alternative. It did neither of these things, instead reaching what

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[28] ACT-24, Washington State Energy Strategy Decarbonization Modeling Final Report, at 22.

[29] Tong, D., Zhang, Q., Zheng, Y., Caldeira, K., Shearer, C., Hong, C., Qin, Y. and Davis, S. J. (2019). Committed emissions from existing energy infrastructure jeopardize 1.5 °C climate target. *Nature*. 1. DOI: 10.1038/s41586-019-1364-3.

appears to be a firm (if erroneous) conclusion that GHG emissions would be less than they otherwise would be in the absence of the project. Such conclusion is unsupported, unreasonable, and misleading.

30. In my opinion, it is simply not reasonable for the SEIS' life cycle analysis to assume that, in the absence of this project, marine vessels and trucks will continue to emit GHG emissions at current levels, that is, burning fossil-based diesel fuel for the 40-year lifetime of this project. The result of this error is that the SEIS almost certainly over-estimates the GHG emission reductions attributable to the project, and, even more critically, misses the possibility that the project may *increase* emissions substantially, since it would be locking in a fossil fuel source that is not consistent with the energy and climate policy aspirations and commitments of Washington State.

IV. THE SEIS FAILS TO ESTIMATE THE INCREASE IN ENERGY USE FROM EXPANDING NATURAL GAS SUPPLY

31. One of the main findings of prior research on expanding natural gas supply is that, in addition to substituting for both higher-carbon and lower-carbon sources of energy, greater supply of gas also increases overall energy consumption and, in turn, greenhouse gas emissions. This has been called the "scale effect,"[30] and is an extension of the basic economic principle that expanding the supply of a fuel pushes down its price and increases its consumption. The implication here is that construction of the project would, regardless of how much marine or truck fuel is being displaced, also expand overall energy use, via lower energy prices. Lower prices could, for example, reduce the incentive to implement energy efficiency measures on

[30] ACT-25, McJeon, H., Edmonds, J., Bauer, N., Clarke, L., Fisher, B., et al. (2014). Limited impact on decadal-scale climate change from increased use of natural gas. *Nature*, 514(7523). 482–85. DOI: 10.1038/nature13837.

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ships or trucks (regardless of whether LNG-fueled or diesel-fueled, since, for those ships or trucks that do switch from diesel to LNG, they will be freeing up more diesel for other uses as well), therefore increasing emissions relative to if the project had not been built. It is therefore my opinion that, regardless of whether a fully fossil fuel baseline or some other baseline is used, it is unlikely that LNG from the project would substitute, one for one, for these other fuels; by contrast, total LNG consumption, and overall energy consumption, would also increase.

V. THE SEIS ERRONEOUSLY ASSUMES A LOW RATE OF METHANE LOSS "UPSTREAM" FROM NATURAL GAS PRODUCTION

32. The sections that follow address specific errors in the GHG estimates for the project itself, rather than the no action alternative. In multiple respects, the SEIS uses incorrect or misleading data to underestimate the project's GHG emissions. Collectively, these errors present an unreasonably optimistic and fundamentally misleading picture of the project's GHG emissions.

33. Besides CO_2, other gases also contribute to global warming. Many of these gases lead to more warming in the short term than CO_2, even as they decay in the atmosphere more quickly than CO_2. One of these gases is methane, CH_4, which absorbs much more energy (heat) than CO_2, but instead of remaining in the atmosphere for hundreds of years like CO_2, it remains for about a decade. Methane is released in large quantities from agricultural operations (e.g. cattle digesting their food, rice production), during decomposition of waste at landfills and wastewater treatment plants, and during the extraction of fossil fuels. CH_4 is also the principal component of natural gas.

34. Comparing the global warming potential of different gases with different lifetimes and potencies in a standard metric is important for policymaking. To this end, the IPCC uses the concept of "global warming potential" (GWP) to estimate how much *more* warming each gas

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will cause relative to the same mass of CO_2. In its most recent assessment report, the IPCC estimated that, over one hundred years, methane from fossil fuel sources has a GWP of 36.[31] In other words, every gram of methane has the same climate-altering impact of 36 grams of carbon dioxide. This figure represents a change from the IPCC's previous assessment, in which the GWP of methane was estimated at 25. In all cases, because methane contributes even more to warming in the short term than in the long term, the IPCC also provides a GWP value for CH_4 over a 20-year timescale that is substantially higher than the 100-year value: over 20 years, the GWP of methane from fossil sources is 87.[32]

35. The greenhouse gas emissions of any project involving natural gas are substantially influenced by the fact that natural gas is itself mostly methane. As described in the SEIS, the natural gas that would be supplied to the Project is expected to be over 90% methane, by volume. As a result, any of that methane that escapes along the way (e.g. due to leaks) is, itself, a highly potent greenhouse gas, one that is (per the IPCC as described above) about 36 times *more* potent (or 87 times as potent on a 20 year time horizon) than if the methane had not leaked and had instead been combusted to yield CO_2. (When CH_4 is combusted, the carbon and hydrogen each join with oxygen to yield CO_2 and water vapor, H_2O, respectively.) Due to this

[31] This is the value including climate-carbon feedbacks, such as the reduced ability of oceans to absorb CO_2 at higher levels of warming. Not counting climate-carbon feedbacks or oxidization to CO_2, the value is 28. Climate-carbon feedbacks for non-CO_2 gases are important to include to give the most accurate picture of the warming potential of a gas. Climate-carbon feedbacks for non-CO_2 gases was an emerging issue, for which the Fifth Assessment Report made a first estimate, they will be considered as standard practice in the Sixth Assessment Report due later this year. Myhre, G., Shindell, D., Bréon, F.-M., Collins, W., Fuglestvedt, J., Huang, J., … Mendoza, B. (2013); *see also* Anthropogenic and natural radiative forcing. In Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (pp. 658–740). Cambridge; New York: Cambridge University Press.

[32] As for the 100-year value, this includes climate-carbon feedbacks and CO_2 oxidization. The value without either factor is 84.

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known likelihood of methane loss, the total GHG emissions for a project involving natural gas can be dramatically higher than if only CO_2 is considered, and which makes the consideration of methane especially important for projects, like the Tacoma LNG project, that involve natural gas. Methane loss from natural gas production, processing, transportation, distribution, storage, and use is common and a substantial contributor to global greenhouse gas emissions.

36. How much methane leaks or is otherwise lost during extraction, processing, and transportation is therefore critically important in determining the overall GHG emissions associated with natural gas. These "upstream" sources of methane loss are addressed in the SEIS.

37. The upstream analysis in the SEIS is severely problematic, however. In particular, the central assumption in the SEIS, used to support its central case and conclusions, is that 0.32% of the methane is lost in the course of extracting, processing, transmitting, and distributing the gas to the Project. SEIS Appendix B, Table B.4. This value was taken from the GHGenius 4.03 spreadsheet, and the GHGenius documentation reports that the primary source of these methane loss assumptions is a greenhouse gas inventory from the Canadian Association of Petroleum Producers (CAPP) from the year 2000.[33] This value is inconsistent with current scientific understanding of methane loss associated with natural gas production.

38. The CAPP source – as well as other sources relied on in the SEIS – uses an incomplete method that does not count all methane losses – especially not those from irregular operations or accidental releases, which have since been found to be a substantial source of emissions from natural gas production. The CAPP inventory was an engineering-based,

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[33] The GHGenius documentation was shared with me by the consultants who made it, (S&T)2 Consultants Inc. (2012). GHGenius Natural Gas Pathway Update. Delta, BC: (S&T)2 Consultants Inc. for Natural Resources Canada.

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"bottom-up" method that measured methane leakage from individual pieces of equipment and processes under controlled conditions. Essentially, the researcher doing such a study holds up a nozzle (similar to a vacuum cleaner attachment) capable of measuring methane over specific pieces of equipment during regular operations and reports the amount of methane leaking from it. But the biggest breakthrough in methane research in the last two decades has been the discovery that most methane losses occur during *irregular* operations or accidental releases, *not* during the controlled operating conditions that characterize "bottom-up" studies like the CAPP study.[34]

39. Better, more-complete values for methane loss are available and widely reported in the scientific literature, even as they too will likely be improved over time. It is now widely understood that methane loss from oil and gas production is higher than what is typically measured in the types of bottom-up, engineering-based measurements of specific pieces of equipment that are used in the SEIS.

40. For example, the most comprehensive estimate of methane loss from North America is 2.3% of gross gas production, a value published in the most highly cited general scientific journal in the United States, *Science*, in 2018. This analysis is a compilation and

[34] ACT-26, Brandt, A. R., Heath, G. A., Kort, E. A., O'Sullivan, F., Pétron, G., Jordaan, S. M., … Harriss, R. (2014). Methane Leaks from North American Natural Gas Systems. *Science*, 343(6172), 733–735, at 2 (734). https://doi.org/10.1126/science.1247045. While the scientific literature is not as complete or longstanding in Canada as in the U.S., airborne studies in Canada have found similar trends: See, for example: ACT-27, Johnson, M. R., Tyner, D. R., Conley, S., Schwietzke, S., & Zavala-Araiza, D. (2017). Comparisons of Airborne Measurements and Inventory Estimates of Methane Emissions in the Alberta Upstream Oil and Gas Sector. *Environmental Science & Technology*, 51(21), 13008–13017. https://doi.org/10.1021/acs.est.7b03525.

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synthesis of both bottom-up and top-down studies.[35] The Alvarez study is a synthesis of at least 10 different data sets published since 2012, across six different oil and gas production areas in the United States, drawn from 433 different sites, all validated against a separate, top-down method. This is no ordinary study; instead, it looks at a decade worth of data collected all across the country to reach the best possible estimate from the overall body of research that has been done to date. Because of the scientific understanding of how and when methane loss occurs — extensively documented in Alvarez and its supporting references and confirmed in several subsequent studies — it is not acceptable to rely only on studies that only estimate methane leakage from specific pieces of equipment during controlled operating conditions, as this SEIS does.

41. In particular, two recent studies in Canada confirm that methane loss from oil and gas production in Canada also occurs mostly during irregular events that are not typically reported by bottom-up industry studies, even as further work will help refine these findings. One, conducted in the province of Alberta, by Zavala *et al.*, estimated a methane loss rate from gas fields in the Red Deer region of about 3%.[36] While this Zavala *et al*. study notes the need to be cautious in comparing to other regions, it emphasizes that the finding "is indicative of the GHG-intensity of natural gas production in the Red Deer region." This finding is important because, according to PSE's expert Patrick Couch, "the Red Deer region is more closely analogous to the regions from which PSE will source gas for the Tacoma LNG facility as it represents similar

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[35] ACT-28, Alvarez, R. A., Zavala-Araiza, D., Lyon, D. R., Allen, D. T., Barkley, Z. R., Brandt, A. R., … Hamburg, S. P. (2018). Assessment of methane emissions from the U.S. oil and gas supply chain. *Science*, 361(6398), 186–188. https://doi.org/10.1126/science.aar7204.

[36] ACT-29, Zavala-Araiza, D., Herndon, S. C., Roscioli, J. R., Yacovitch, T. I., Johnson, M. R., Tyner, D. R., Omara, M., & Knighton, B. (2018). Methane emissions from oil and gas production sites in Alberta, Canada. Elem Sci Anth, 6(1), 27. https://doi.org/10.1525/elementa.284.

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tight gas formations as those in the Montney region." (Couch Declaration January 19, 2021). In contrast to Couch's assertion that Red Deer is "associated with lower methane emission rates," it appears that Red Deer may actually have *higher* emissions than the Alvarez et al. study. Further, as detailed in the related Johnson *et al*. study, methane emissions from Red Deer are 17.7 times higher than the bottom-up values reported by industry.[37] Importantly, this means that the Johnson *et al*. study does *not* find, and in stark contrast to Patrick Couch's erroneous assertion in his January 19, 2021 declaration, that gas production in Western Canada has "lower methane emissions rates". The Johnson *et al.* study found only that the Canadian National Inventory *method*, when correctly applied, agrees with top-down studies "once reported and *unreported* sources were combined" [emphasis added]. This exactly illustrates the grave error at stake here: the SEIS does not count the "unreported" sources that do not show up in its main source: the CAPP inventory, or others like it considered.

42. Furthermore, a new study completed by scientists from the Canadian government begins to paint a similar, but geographically more comprehensive. picture for methane loss from Canada. This study, called "Eight-Year Estimates of Methane Emissions from Oil and Gas Operations in Western Canada Are Nearly Twice Those Reported in Inventories,"[38] uses a top-down method to estimate what methane emissions are missed by bottom-up, inventory methods across Alberta and Saskatchewan. It finds that the methane emissions released from oil and gas

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[37] ACT-27, *supra* at Figure 5.

[38] ACT-31, Chan, E., Worthy, D. E. J., Chan, D., Ishizawa, M., Moran, M. D., Delcloo, A. and Vogel, F. (2020). Eight-Year Estimates of Methane Emissions from Oil and Gas Operations in Western Canada Are Nearly Twice Those Reported in Inventories, H. *Environmental Science & Technology*. DOI: 10.1021/acs.est.0c04117.

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operations in the study area are "nearly twice those reported in inventories" and which amount to about 4.4% of gross gas production.[39]

43. Lastly, a new analysis of methane loss associated with gas delivered to each of the 50 US States, including Washington State, adds further evidence that methane loss associated with gas for the Tacoma LNG facility is likely much higher than estimated in the SEIS. This new analysis compiles basin-level methane loss data to estimate that the upstream (production-stage) methane lost (mainly in Canada) to deliver gas in Washington to be 2.2%.[40] This finding further underscores how the SEIS estimate of methane loss of 0.32% is implausibly low.

44. New methane policy in British Colombia and Canada is encouraging, but it mainly addresses known events or leaks from specific pieces of equipment that can be detected with frequent surveys, potentially still missing many of the accidental methane releases (e.g. methane venting from storage tanks) that characterize the majority of actual methane emissions.[41] These policies are not yet enough to suggest that Canadian methane loss could be substantially below the value published in *Science*.

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[39] I calculate the 4.4% estimate as follows. Chan *et al*. report the mean annual methane emissions value from Alberta and Saskatchewan from 2010 to 2017 of 3.0 million tonnes CH_4. The Government of Canada estimates natural gas production from oil and gas fields in 2010 to 2017 in these two provinces to average 3,550 billion cubic feet per year. Assuming natural gas is 90% methane and that methane weighs 0.714 g per liter at standard temperature and pressure implies that annual methane production is 65 million tonnes per year. Assuming that the 3.0 million tonnes methane lost from Chan *et al*. were not counted in official production statistics brings the total to 68 million tonnes per year. 3 million is 4.4% of 68 million. Note that the study, like Alvarez *et al.* in the United States, does not differentiate methane loss from oil versus gas wells.

[40] ACT-32. Burns, D., & Grubert, E. (2021). Attribution of production-stage methane emissions to assess spatial variability in the climate intensity of US natural gas consumption. *Environmental Research Letters*. https://doi.org/10.1088/1748-9326/abef33.

[41] See for example https://www.pembina.org/reports/2020-09-02-media-primer-on-canadian-methane-regulations.pdf.

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45. The recent Washington State Department of Ecology Final Second Supplemental EIS (FSSEIS) for the Kalama facility can also be used as a reference point, since it also develops analysis on upstream methane loss rates from gas.[42] It offers two different "low" emissions scenarios, a "medium" scenario, and a "high" scenario. The lowest scenario they examine is a loss rate of 0.71%--over twice the estimate used in the Tacoma LNG SEIS. (see p. 42 Table 3.4-1). Their "medium" scenario (1.46%) is derived from the national results of Alvarez *et al.*, and their "high" estimate is 3%. In my view, this is a more credible approach to estimating upstream emissions than the one used in the Tacoma SEIS.

46. In summary, the SEIS's central estimate of upstream CH_4 emissions associated with the project, 0.32%, is substantially at odds with recent studies, including those conducted in Canada, that take into account how most methane is actually lost – through irregular operations or accidental releases.. For example, using a 2.3% methane loss rate from the most comprehensive study to date on this topic, instead of 0.32% as claimed in the SEIS, would increase the estimate of emissions attributable to the project by about 120,000 tons CO_2e annually relative to their central, primary estimate.[43] Even this may be a conservative number, in light of the analyses above showing the potential for an even higher methane loss rate in western Canada.

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[42] ACT-33, Kalama FSSEIS, p. 42 Table 3.4-1.

[43] For this calculation, I use the value of 2.7% methane loss reported on page 15 of the Supplementary Materials of Alvarez et al 2018, and confirmed with co-author David Lyon on November 6, 2019. This value represents methane loss as a fraction of gas *delivered* to US destinations, which is more appropriate here since the analysis is conducted from the perspective of the LNG Project receiving the gas, not from the perspective of the gas extraction site *producing* the gas. The entire calculation is (326,239 tonnes of gas received at the facility per year) x (83% of which is methane) x (2.7% of which is lost) x (GWP of 25 as in the SEIS) = 183,000 tons CO2e, compared to 58,000 tons CO_2e from upstream methane in the SEIS.

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47. Appendix B to the SEIS provides a "sensitivity analysis" that claims to show how the analysis would look different under different assumptions, including higher methane loss rates. With respect to the upstream methane loss rate, Appendix B provides a graph that is difficult to read but appears to conclude that GHG emissions would be roughly 55,000 tons/year higher than disclosed in the main SEIS, central estimate, if using the same *Science* analysis I cite above. That number appears too low.

VI. THE SEIS ERRONEOUSLY ASSUMES A LOW RATE OF METHANE LOSS "DOWNSTREAM," DURING USE

48. Not only does the SEIS underestimate methane loss "upstream" during natural gas production, but it also underestimates methane loss "downstream," during use of the natural gas on ships.

49. Methane loss from LNG systems on marine vessels is often called methane "slip." This is methane that enters the combustion chamber on the ship, but escapes without being burned.[44] Methane that escapes without being burned is much worse for the climate than methane that is burned to make CO_2, because, as described above, the global warming potential (GWP) value of CH_4 is 36 times that of CO_2 over a 100-year timeframe, and 87 times over a 20-year timeframe.

50. The SEIS appears to use an erroneously low value for its methane slip assumption. Appendix B (Table 2.4) shows the central ("baseline") assumption of 5.3 g CH_4 per kWh of marine engine output, and an "upper" value of 6.9 g CH_4 per kWh. The SEIS does not

[44] ACT-34, Corbett, J. J., Thomson, H., & Winebrake, J. J. (2015). Methane Emissions from Natural Gas Bunkering Operations in the Marine Sector: A Total Fuel Cycle Approach. Prepared for U.S. Department of Transportation, Marine Division; ACT-35, Shafarian, A., et al (2019): Natural Gas as Ship Fuel: Assessment of Greenhouse Gas and Air pollutant Reduction Potential (https://ideas.repec.org/a/eee/enepol/v131y2019icp332-346.html).

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cite its source for these values (instead, it just refers to "the most recent literature"), but the values it uses exactly match those published in the "SINTEF report" mentioned in the SEIS's December Response to Comments.[45] That report, however, clearly proposes the value of 6.9 g CH_4 per kWh as its "recommended emission factor" for dual-fuel engines, like that analyzed in the SEIS. Further, a related article, Ushakov et al. 2019, in the *Journal of Marine Science and Technology*[46] *also* proposes the value of 6.9 g CH_4 per kWh, as the *central* value that is "advised to be used for performing various estimations and simulations of emissions from LNG-fueled" marine diesel engines, not as a high end, "upper" value as done in Appendix B to the SEIS.[47] The SEIS therefore appears to mischaracterize the "recent literature."

51. The 5.3 g CH_4 per kWh of engine output is also the value for methane slip reported by LNG engine manufacturer MAN in its October 26, 2018 letter to TOTE Maritime. This value is derived from a test, conducted in July 2018, at a ship load of 75%.[48] Ship load is a measure of the actual power output of an engine as a percent of its maximum power output.

52. Methane slip from marine engines is highly sensitive to the ship load. At 75% load, methane slip is just over 5 g CH_4 per kWh. But at lower loads, as the Ushakov *et al*. study

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[45] ACT-36, Stenersen, D., & Valland, A. (2017). GHG and NOx emissions from gas fuelled engines. SINTEF.

[46] ACT-37, Ushakov, S., Stenersen, D., & Einang, P. M. (2019). Methane slip from gas fuelled ships: A comprehensive summary based on measurement data. *Journal of Marine Science and Technology*. https://doi.org/10.1007/s00773-018-00622-z.

[47] *Id*. at 15. The concept of methane slip can also be characterized as a percentage of methane lost, just like was done for "upstream" methane at natural gas production sites. For example, a methane slip of 6.9 g CH_4 per kWh is equivalent to a methane loss rate of about 4.6%; similarly, a methane slip of 10 g CH_4 per kWh is equivalent to a methane loss rate of about 6.7%. Source: Table 5 of Ushakov et al 2019 (ibid), which shows methane slip of 6.9 g CH4 per kWh is equivalent to 40.9 g CH_4 per kg fuel. Assuming the LNG is 89% methane by weight (as in SEIS Appendix B, Table A.11) would yield a methane loss rate of 4.6%.

[48] ACT-38, Comments submitted on November 21, 2018 to the Draft Supplemental Environmental Impact Statement prepared by Puget Sound Energy (Excerpts 1-75).

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shows, methane slip can be much higher. Methane slip at 50% load is about 7 g CH4 per kWh, at 25% load can be greater than 15 g CH_4 per kWh, and at 10% load can be nearly 30 g CH_4 per kWh. Therefore, how a ship operates and, by extension, what load assumptions the SEIS uses to characterize methane slip, have a large bearing on the resulting estimate of methane emissions. For example, a vessel that is operating in tidally influenced coastal waters, with variable speeds and navigation challenges, is likely operating a different load profile than a vessel in open water.

53. As described in the SEIS calculations, the TOTE vessels are estimated to operate at a load of 33.3 MW during transit from Tacoma to Anchorage and back, compared to the engine capacity of 52.2 MW.[49] This is a load of 64%, and therefore different than the ~75% load assumed by either the MAN test or the Ushakov and SINTEF studies (which used load assumptions consistent with the E2/E3 test cycle). When maneuvering at each port, the SEIS calculations show the TOTE vessels' load at 2%. But the methane slip for a ship operating at these loads would, as described above, be substantially higher than the 5.3 g CH_4 per kWh value assumed.

54. Even a 64% load for the TOTE vessels may be too high and optimistic, however. A recent study of actual container ship loads for vessels similar in size to the TOTE vessels found average load much lower: about 40%.[50] This load would, per the Ushakov *et al.* study, translate to a methane slip of nearly 10 g CH_4 per kWh, nearly double that assumed in the SEIS. Therefore, the SEIS does not appear to make accurate assumptions about load and, by extension, methane slip.

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[49] ACT-38, *supra*, at 61 (labeled 30 of 45).

[50] ACT-30, Rutherford, D., Mao, X. and Comer, B. (2020). *Potential CO_2 Reductions under the Energy Efficiency Existing Ship Index*. Working Paper 2020-27. https://theicct.org/sites/default/files/publications/Marine-EEXI-nov2020.pdf.

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55. Even less is known about the "other marine" vessels who would be using the majority of the project's fuel. What kind of engines they use, and what load profiles they operate under, are as-yet unknown. The SEIS nonetheless uses the optimistic methane slip data and load data from TOTE for such unknown vessels. This again is unsupported.

56. Finally, in addition and separate to the above, the SEIS appears to rely on data that is simply incorrect. Mr. Unnasch, in his oral testimony, stated that he did not rely on SINTEF or other published literature but rather relied on data provided by TOTE for the slip values in the SEIS. The TOTE values are appended to a letter it provided to the agency in 2018.[51] However, TOTE's data contains two significant and obvious errors. First, it assumes zero slip at 100% load, a number entirely inconsistent with the published data. Second, it makes a mathematical error in the way that it averages the variable slip amounts that arise under different loads which leads to a consequential understatement of the average. Even leaving aside the implausible assumption that TOTE's vessels would operate under zero slip for a significant portion of each journey, TOTE should have revealed a 6.8 g/kWh estimate, which is similarly in line with SINTEF and other recommendations.

57. Regardless of the precise actual value, using a more defensible methane slip rate would translate to additional GHG emissions not counted in the SEIS. For example, if the SEIS had used the 6.9 g CH_4 per kWh as recommended by the studies discussed above, the emissions associated with the project would increase by about 90,000 tons CO_2e annually.

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[51] ACT-39, Technical comments submitted on November 21, 2018, to the Draft Supplemental Environmental Impact Statement prepared by TOTE Maritime Alaska, Appendix 1 at 3.

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VII. THE SEIS USES AN OUTDATED METHANE GLOBAL WARMING POTENTIAL

58. The SEIS uses the global warming potential ("GWP") estimates from the IPCC's 2007 *Fourth Assessment Report* ("AR4") to calculate methane GHG emissions. In its 2013 *Fifth Assessment Report* ("AR5"), however, the IPCC updated the methane global warming potential estimates to reflect a new scientific consensus, based on considerable new research. As noted above, these updated estimates increase the GWP for methane by more than 40%, from 25 to 36.

59. The SEIS should use AR5 values for GWP, because AR5 represents the accurate, up-to-date scientific understanding of methane's contribution to global warming. The reasons for using AR4 rather than AR5, according to the SEIS, are that both Washington State and US EPA's national GHG inventories use AR4 values. AR4 is still used for state and national level GHG inventories, but should not be for much longer. In December 2018, nations that are Parties to the Paris Agreement agreed to use GWP values from AR5.[52] The reason that nations and states may still use AR4 is that it takes time for everyone to shift their GHG inventory systems to the updated GWP estimates, including back-calculating prior GHG inventories to the updated GWP values. The SEIS document need not be constrained in this way, however, and there is no need to harmonize the estimates among multiple government or industry actors, since the intent of an EIS is to present as accurate a picture as possible of the GHG impacts of the project.

60. The sensitivity analysis claims to include disclosure of emissions under AR5 values, but it does so incompletely. The sensitivity analysis uses an incomplete AR5 value of 30 to conclude that the project would increase the emissions attributable to the project by some 50,000 tons CO_2e annually. (FEIS, Appendix B, Figure 5.5). But this value does not fully

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[52] See https://unfccc.int/sites/default/files/resource/cma2018_3_add2_new_advance.pdf#page=25.

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represent the conclusions of AR5 since it does not include the important "climate-carbon feedbacks." In brief, since warming from CH_4 also leads to other mechanisms (such as more water vapor in the atmosphere, or limited ability of oceans to absorb carbon) that themselves *also* lead to warming, it is more accurate to use the higher of the two GWP values in AR5: 36, not 30.[53] Further, even if the correct figure was used, an estimate of emissions based on an updated GWP from AR5 should not be considered part of the sensitivity analysis, where it is portrayed as an outlier value, but instead be represented as the central, best, "baseline" estimate. These are the central conclusions of the scientific community, and should be used as the central cases of the SEIS; by contrast, it is inappropriate for the SEIS to characterize them as sensitivities.

61. In total, updating the GWP value from the AR4 value of 25 to the AR5 value of 36 increases the overall emissions attributable to the project by about 200,000 tons CO_2e annually.

VIII. THE SEIS SHOULD DISCLOSE GHG IMPACTS ON A 20 YEAR TIME HORIZON AS WELL AS A 100 YEAR TIME HORIZON

62. The SEIS uses a 100-year time horizon to assess the impacts of methane leaks upstream and elsewhere. While there is a broad consensus that the 100-year horizon is a useful standard metric for comparison of GHG estimates, it does not always present a complete picture when dealing with projects involving methane. That is because methane, as explained above, has much greater warming effect in the short term than in the long-term. Accordingly, use of *solely* a 100-year horizon partially masks the GHG impacts. As a supplement to the 100-year horizon, use of a 20-year time horizon presents a more accurate picture of the shorter-term

[53] This is the value from Myhre et al 2013, see footnote 14. For further discussion of climate-carbon feedbacks, see Dean, J. F., Middelburg, J. J., Röckmann, T., Aerts, R., Blauw, L. G., Egger, M., … Dolman, A. J. (2018). Methane Feedbacks to the Global Climate System in a Warmer World. *Reviews of Geophysics*, 56(1), 207–250. https://doi.org/10.1002/2017RG000559.

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warming effects of the methane-related impacts associated with this project, and is a widely recognized and important complementary metric that was also used by the same consultants in the August 2019 FSEIS for the Kalama Methanol project. [54] A 20-year time horizon is also important in light of the expected near-term impacts of climate change. It is notable that the Kalama FSSEIS discloses both 100 year and 20 year values in its life-cycle analysis. (See Table 3.6-2 and 3.6-3).

63. Increasing the GWP from a 100-year value of 36 to a 20-year value of 87 would increase the emissions attributable to the project by 920,000 tons CO_2e annually. The SEIS does not conduct any sensitivity analysis or present any value for emissions reflecting GWP over a 20-year timespan.

IX. THE SEIS SENSITIVITY ANALYSIS HIDES WHAT SHOULD BE THE CENTRAL FINDING: THE TACOMA LNG PROJECT WILL INCREASE EMISSIONS IN THE LONG TERM

64. The SEIS includes some treatment of how alternate assumptions could affect its results, in a sensitivity analysis presented in its Appendix B. But the SEIS misuses the concept of sensitivity analysis. A sensitivity analysis is intended to explore the possibility (or sensitivity) that input values could be higher or lower than a *best* estimate or expected value, not to portray that best estimate as an outlier, as done in Appendix B. Put another way, a sensitivity analysis is only as good as the assumptions that goes into it. If a sensitivity analysis looks, one by one, at the accurate values as *individual* sensitivities, as in Appendix B, it can dramatically miss what the actual, *combined*, best estimate of emissions would be. My assessment is that, as documented

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[54] ACT-40, Ocko, I. B., Hamburg, S. P., Jacob, D. J., Keith, D. W., Keohane, N. O., Oppenheimer, M., Roy-Mayhew, J. D., Schrag, D. P. and Pacala, S. W. (2017). Unmask temporal trade-offs in climate policy debates. *Science*, 356(6337). 492–93. DOI: 10.1126/science.aaj2350.

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in the prior sections, the SEIS is incorrect in many of its assumptions; this is important because, if more accurate assumptions had been made, the SEIS would have concluded that the Tacoma LNG project will increase emissions in the long term, not just as one of many possibilities in the sensitivity analysis, but as a robust, core conclusion.

65. Moreover, as noted above, the sensitivity analysis is incomplete. It offers nothing to address the uncertainties around the inaccurate no- action alternative documented above, nor the possibility that expanding natural gas supply may increase overall energy use and, therefore, GHG emissions. It does not include any sensitivity for using a 20-year GWP. It uses inaccurate values to understate the change in emissions when using different upstream methane loss and GWP assumptions. Even if it was appropriate to use a sensitivity analysis in this way, which it is not, this one fails to present an accurate picture of the project's potential emissions under different assumptions.

X. SUMMARY: THE SEIS IS CRITICALLY FLAWED

66. My assessment, as documented above, is that the SEIS, make two types of critical errors that fundamentally undermine its conclusions. The first, discussed in Section II through Section IV, is that the SEIS critically *over-estimates* GHG emissions associated with the "no action" case by assuming that marine and on-road truck emissions will be solely powered by fossil fuels for the life of the project, and by neglecting to analyze how expanding LNG supply could increase overall energy consumption. The result is that the SEIS's estimates of net emissions relative to this no-action scenario is almost certainly wrong.

67. Second, as noted above, the SEIS estimates the GHG emissions of the project at 683,514 metric tonnes of CO_2e/year at 250,000 gallons/day (Scenario A) and 1.37 million tonnes/year at 500,000 gallons/day (Scenario B). These are, indisputably, significant GHG emissions. Still, by using inaccurate and incomplete information on methane, it critically *under-*

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estimates even these significant gross GHG emissions associated with the project. These are discussed in Sections V-VIII. The result is a distorted and incorrect picture of the gross GHG emissions associated with the project. The result is that, regardless if one is looking at gross emissions, or instead net emissions relative to the no-action scenario, that the SEIS presents a skewed and inaccurate picture of the GHG emissions associated with the Tacoma LNG project, and one that is not a fitting basis for important policy decisions facing the future energy supplies of Washington . It is my opinion that, if the SEIS had used up-to-date, accurate science and analytical practice, it would have found that the facility would be a substantial source of gross GHG emissions, would *increase* (not decrease) GHG emissions relative to a no-action scenario in the long term, and would therefore be inconsistent with Washington State's goal to align its emissions and energy system with the 1.5 C goals of the Paris Agreement.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge.

Executed this 19th day of March, 2021, at Seattle, Washington.

PETER ERICKSON

Exhibit B

POLLUTION CONTROL HEARINGS BOARD
FOR THE STATE OF WASHINGTON

ADVOCATES FOR A CLEANER TACOMA; SIERRA CLUB; WASHINGTON ENVIRONMENTAL COUNCIL; WASHINGTON PHYSICIANS FOR SOCIAL RESPONSIBILITY; STAND.EARTH, Appellants, v. PUGET SOUND CLEAN AIR AGENCY, PUGET SOUND ENERGY, Respondents.	NO. P19-087c ATTORNEY GENERAL OFFICE'S AMICUS CURIAE BRIEF IN OPPOSITION TO RESPONDENTS' SECOND DISPOSITIVE MOTION

I. INTRODUCTION

The Puget Sound Clean Air Agency (PSCAA) had a statutory duty to conduct a thorough greenhouse gas emissions analysis preceding its Order of Approval to Construct the Tacoma Liquefied Natural Gas (LNG) Project, using accurate calculations of its emissions' global warming potential and disclosing any unreliability in its assumptions. Its Final Supplemental Environmental Impact Statement (FSEIS)[1] fell short of this duty. Specifically, the FSEIS calculated the global warming potential for methane solely for project inventory

[1] The FSEIS is in the docket for Puget Sound Energy's Second Dispositive Motion as Kisielius Declaration Exhibit B. This Brief will refer to it as "FSEIS," and to the "PSE Tacoma LNG Project GHG Analysis Final Report," which begins on page 54 of that document, as "FSEIS Appendix B."

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purposes, without sufficiently disclosing its actual, greater impact. Significantly, this misrepresentation contributed to a conclusion that the Project had a slightly beneficial net effect on greenhouse gas emissions, around 2.2 percent lower than the No Action Alternative;[2] disclosure of actual impacts may have informed the Agency that, in fact, the Project had a harmful net effect on greenhouse gas emissions. Second, the FSEIS fails to disclose the grave uncertainty surrounding its assumption of a very low leak rate for methane between extraction at the wellhead and delivery at the Project. And finally, it assumes that the Project's marine fuel customers would all convert from marine gas oil or diesel fuel (collectively, marine gas oil), and that the newly available fuel source would not attract new LNG users who would not be converting, nor would new marine gas oil users be enticed by the now-unpurchased quantity of marine gas oil. The FSEIS makes this assumption without disclosure of the degree of speculation or likelihood undergirding it. In so doing, the FSEIS erroneously implies that the Agency can rely on its conclusion that LNG will perfectly displace marine gas oil.

In other words, by obscuring the Project's actual climate impact and omitting the speculative nature of its assumptions, the FSEIS failed in its primary purpose under the State Environmental Policy Act (SEPA): to ensure that PSCAA had necessary information at hand when making a decision on the Order of Approval. Consequently, the Attorney General's

[2] FSEIS at x, xi, xii (comparing 1,366,115 to 1,396,480 tonne CO_2 equivalent per year); FSEIS at 4-11 ("The net effect for the comparison of the Proposed Action with the No Action Alternative was still an overall decrease of GHG emissions in the Final SEIS, as identified in the DSEIS"); FSEIS at 4-14 ("the proposed action would not cause a significant adverse impact from GHG emissions."). Or, as PSE puts it, the FSEIS "found that in the near term, this Project will result in GHG emission reductions by replacing TOTE's marine gasoil ('MGO') use with LNG." PSE's 2d Dispositive Mot. at 21.

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Office respectfully asks the Pollution Control Hearings Board to deny the Respondents' Second Dispositive Motion as it applies to those issues.

II. IDENTITY AND INTEREST OF AMICUS CURIAE

The Attorney General submits this brief as amicus curiae to ensure the integrity of the State Environmental Policy Act when applied to greenhouse gas emissions analysis, a critical step in agency understanding of the effects of decision-making on climate change. The Attorney General has a strong interest in ensuring that state law, including SEPA, is interpreted and applied correctly and consistently. Where state law intersects with vital and urgent matters of public interest, such as SEPA analyses of climate impacts, the Attorney General has a clear interest in representing the State.

III. ARGUMENT

The FSEIS for the Tacoma LNG Project failed to present an accurate analysis of the Project's greenhouse gas emissions because (1) it presented a limited-purpose calculation of the global warming potential of the methane emitted from the Project without context, (2) it failed to disclose the reliability (or lack thereof) of its assumption that the Project's methane leak rate would be very low, and (3) it failed to disclose the speculative nature of its assumption that LNG would perfectly displace marine gas oil currently in use. These three failures rendered the FSEIS insufficient, meaning that PSCAA did not have available the analysis necessary to make an informed decision. A thorough FSEIS may have informed the Agency that the Project may have a net harmful effect on greenhouse gas emissions. SEPA requires the Agency to have a complete and accurate analysis before it issues an Order of Approval.

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A. SEPA Requires a Thorough and Accurate Greenhouse Gas Emission Analysis

SEPA "may be the most powerful legal tool for protecting the environment of the state."[3] The legislature made its objectives clear by stating four purposes of the law: "(1) To declare a state policy which will encourage productive and enjoyable harmony between humankind and the environment; (2) to promote efforts which will prevent or eliminate damage to the environment and biosphere; (3) and [to] stimulate the health and welfare of human beings; and (4) to enrich the understanding of the ecological systems and natural resources important to the state and nation." RCW 43.21C.010. SEPA, modeled after the National Environmental Policy Act (NEPA), "gives agencies the tools to allow them to both consider and mitigate for environmental impacts of proposals."[4]

In short, SEPA "sets forth a state policy of protection, restoration and enhancement of the environment." *Polygon Corp v. City of Seattle*, 90 Wn.2d 59, 63, 578 P.2d 1309 (1978) (citing RCW 43.21C.020). One of the primary methods of implementing this policy is SEPA's requirement that covered agencies examine the environmental effects of decisions before they are made. This deceptively simple mandate—to look at environmental impacts before an agency leaps—produces better agency decisions and ensures public awareness and participation in those decisions. *See, e.g., Victoria Tower P'ship v. City of Seattle*, 59 Wn. App. 592, 601, 800 P.2d 380 (1990) ("The primary function of an EIS is to identify adverse impacts to enable the decision-maker to ascertain whether they require either mitigation or denial of the proposal.").

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[3] Washington Dep't of Ecology, *State Environmental Policy Act Handbook* at 5 (2018 Updates).
[4] *Id.* at 6.

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In the current climate crisis, an accurate assessment of a project's effect on global warming is particularly important. Accordingly, SEPA requires that agencies take a hard look at greenhouse gas emissions, so that they know the full implications of the decisions they face, and have the information necessary to mitigate environmental harms. Thus, for projects involving transportation, storage, or use of fossil fuels, the SEPA review must consider the lifecycle impacts of producing, transporting, and using such fuels. WAC 197-11-444(1)(b)(iii) (listing "climate" among elements of environment to be considered in SEPA); WAC 197-11-60(4)(c) (requiring consideration of lifecycle impacts). *See also, e.g., Columbia Riverkeeper v. Cowlitz Cty.*, No. 17-010c, 2017 WL 10573749 (Shoreline Hearings Bd. Sept. 15, 2017) (holding that the EIS for methanol project was invalid for failing to consider lifecycle GHG emissions).

Recognizing that it can be difficult to determine future environmental impacts precisely, SEPA regulations require that agencies fully disclose "scientific uncertainty concerning significant impacts." WAC 197-11-080(2), -330(3)(d). Where an agency cannot learn what it needs to, the costs to do so are exorbitant, or the means to obtain information are speculative or unknown, the agency "shall weigh the need for the action with the severity of possible adverse impacts which would occur if the agency were to decide to proceed in the face of uncertainly. If the agency proceeds, it shall generally indicate . . . its worst case analysis and the likelihood of occurrence, to the extent this information can reasonably be developed." WAC 197-11-080(3)(b). In other words, SEPA allows an agency to proceed in the face of uncertainty—so long as it discloses the uncertainty, assesses what would happen if its assumption is wrong, and attempts to ascertain the likelihood that it is right or wrong.

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The determination of whether an EIS is adequate is a question of law subject to de novo review. *OPAL v. Adams Cty.*, 128 Wn.2d 869, 875, 913 P.2d 793 (1996). EIS adequacy refers to the legal sufficiency of the environmental data contained in the impact statement. *Klickitat Cty. Citizens Against Imp'd Waste v. Klickitat Cty.*, 122 Wn.2d 619, 633, 860 P.2d 390 (1993), *amended*, 866 P.2d 1256 (1994) (citing R. Settle, *The Washington State Environmental Policy Act: A Legal and Policy Analysis* § 14(a)(i) (4th ed. 1993)). The adequacy of an EIS is tested under the "rule of reason." *SEAPC v. Cammack II Orchards*, 49 Wn. App. 609, 614–15, 744 P.2d 1101 (1987); *Cheney v. Mountlake Terrace*, 87 Wn.2d 338, 344–45, 552 P.2d 184 (1976).

B. The Final Supplemental Environmental Impact Statement Had No Reasonable Basis to Present a 2007 Global Warming Potential Factor for Methane as if It Accurately Represented Both an Inventory Report and Actual Impacts

SEPA allows an agency to choose among experts, methods of analysis, or calculations so long as it has a sufficient reason for its choice.[5] But PSCAA's decision to use only an out-of-date Global Warming Potential figure for methane, without explaining that updated science indicates that the actual environmental impact would be greater, had no good reason behind it. SEPA does not permit such a choice.

At issue is the FSEIS's analysis of the impact of the Project's methane gas emissions on global warming. Although public discourse of anthropogenic climate change often centers on carbon dioxide, pound-for-pound methane is a much more powerful greenhouse gas. Moreover, methane emissions are often unintentional and invisible to the naked eye, resulting from venting at the wellhead, or small leaks in pipelines, valves, joints, transportation

[5] *See, e.g., City of Des Moines v. PSRC*, 98 Wn. App. 23, 36–37, 108 Wn. App. 836, 988 P.2d 27 (1999).

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containers, and storage tanks. Although this has been no secret, the last 15 years have seen a dramatically closer study of the greenhouse gas effects of methane. That understanding, unfortunately, does not reveal good news: rather, it has shown that methane is even more harmful to the climate than was known even two decades ago.[6]

This improved understanding of the greenhouse gas effects of methane is reflected in the updated Global Warming Potential (GWP) factor published in the newest Assessment Report of the Intergovernmental Panel on Climate Change (often referred to as "AR5" or the 2013 IPCC Report). The GWP is a multiplier used with greenhouse gasses to compare their effect accurately with each other, setting CO_2 as the reference factor of one. The IPCC Report is updated from time to time, and represents the international experts' consensus. In 2007, the IPCC AR4 set methane's 20-year GWP factor at 72, and the 100-year factor at 25; this is because methane has a much more severe warming effect in the near term, after which it breaks down. In 2013, just six years after the AR4 factors were published, the AR5 updated the 20-year Global Warming Potential of methane to a range of 84 to 86, and the 100-year GWP to a range of 28 to 36.[7] In other words, the most accurate internationally accepted global warming potential figure is significantly higher than that published in the AR4 back in 2007.

Anyone wanting accurately to communicate the actual greenhouse gas effects of methane should alert a reader that the most current Global Warming Potential factor is in the 2013 AR5. This is not controversial; in fact, it is not in dispute at all. The U.S. EPA's web

[6] *See generally* IPCC, *Climate Change 2013: the Science Basis. Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, 731 Cambridge U. Press (2013), http://climatechange2013.org/; *see also* U.S. EPA, *Greenhouse Gas Emissions*, https://www.epa.gov/ghgemissions/overview-greenhouse-gases#CH4-reference

[7] IPCC, *supra*, at 731

page on Global Warming Potentials says, when explaining the different purposes of the AR4 and AR5 factors, "[t]he EPA considers the GWP estimates presented in the most recent IPCC scientific assessment to reflect the state of the science. In science communications, the EPA will refer to the most recent GWPs."[8] This does not mean that an EIS cannot also use the AR4 figures; for example, in its Second Supplemental Environmental Impact Statement on the Kalama Manufacturing and Marine Export Facility, the Department of Ecology presented calculations using both AR4 and AR5, explaining that "GWP values are periodically updated to reflect current science regarding the energy properties of GHGs and their lifetimes in the atmosphere."[9]

Older GWP factors do not have qualities that make them accurate for any calculation whose purpose is to correctly state the greenhouse effect of a gas, although they may have other uses. The FSEIS for the Tacoma LNG Project, however, applies only the GWP factor from the 2007 AR4, rather than the higher, updated factor from the 2013 AR5. In other words, it chooses a calculation method that is certain to produce a lower assessment of the effect of the methane emitted from the Project.

SEPA has something to say about this: it is only permitted if presented alongside information that gives the decision-maker accurate, updated information about impacts, as Ecology did in its Kalama facility Final SSEIS. To be sure, SEPA gives an agency discretion when choosing methods of scientific analysis, so long as they are accurate, it discloses them sufficiently and has a good reason for the method chosen.[10] Here, though, the reason PSCAA

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[8] U.S. EPA, *Understanding Global Warming Potentials*, https://www.epa.gov/ghgemissions/understanding-global-warming-potentials

[9] Dep't of Ecology, *Kalama Manufacturing and Marine Export Facility, Final 2d Suppl. Envtl. Impact Statement (FSSEIS)* 86 (Dec. 2020); *see also id*. at 86–88.

[10] *See City of Des Moines*, 98 Wn.App. at 35–37.

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gives for its choice is patently insufficient. The Agency does not claim that its choice is accurate, or scientifically sound. Rather, the FSEIS says only that emissions "are quantified and reported on a CO2 equivalent basis by applying global warming potential (GWP) factors from IPCC AR4, which is the currently accepted international reporting standard and the method for State of Washington GHG reporting."[11]

This statement is misleading. The FSEIS does not explain the narrow circumstances in which AR4 numbers are appropriate for "reporting," which notably do not include scientifically accurate assessments of environmental impacts. Rather, states and nations report GHG inventories using the AR4 factors for inventory reports (*not* environmental impact analyses) because the United Nations Framework Convention on Climate Change has not yet agreed to use the updated, 2013 AR5 factors. There is no scientific disagreement with the newer, higher GWP factors; switching to them for inventory reports is just an international political process that takes time. The FSEIS is not a report to any of the inventories cited by PSE,[12] and neither PSE nor the Agency attempt to argue that it is. PSCAA offers no defense of the inaccurate GWP factor on the basis of science, accuracy, or applicability to this project in particular. In other words, according to the Agency itself, it chose the older GWP factor for a reason unrelated to accurate environmental analysis.

To be sure, an EIS may use the 2007 AR4 GWP factor in order to offer an apples-to-apples comparison with other projects using the same calculations.[13] But if it does, it must

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[11] *See, e.g.*, FSEIS App. B at 4 (stating that Emissions "are quantified and reported on a CO2 equivalent basis by applying global warming potential (GWP) factors from IPCC AR4, which is the currently accepted international reporting standard and the method for State of Washington GHG reporting"). Other filings from Respondents misleadingly suggest that PSCAA is required to use the AR4 GWP for SEPA purposes (*e.g.*, PSE's Response to Mot. for Stay at 68 (referring to "directives from the IPCC, EPA, Washington legislature and Ecology")).

[12] *See* PSE's 2d Dispositive Mot. at 27.

[13] *See generally* Dep't of Ecology, *FSSEIS, supra* n.9.

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also offer the 2013 AR5 GWP calculations and note that they represent the up-to-date assessment of the actual climate impacts of the methane emissions. The result of PSCAA's choice, however, is a FSEIS that misinformed decision-makers. Agency staff (or members of the public) reviewing the Project's merits who hoped to learn what the actual global warming impact of the methane emitted would not learn it from the FSEIS, not because the information was not available, but because the FSEIS chose to obscure it. The FSEIS buries the AR5 data in an indecipherable chart in the last section of an appendix; a "sensitivity analysis" that still does not state what the Tacoma LNG Project's GHG emissions actually will be using current science. Here is the chart from the sixty-sixth page of the second Appendix that the Respondents contend accurately informs the Agency and the public of the global warming potential of the Project's methane emissions:

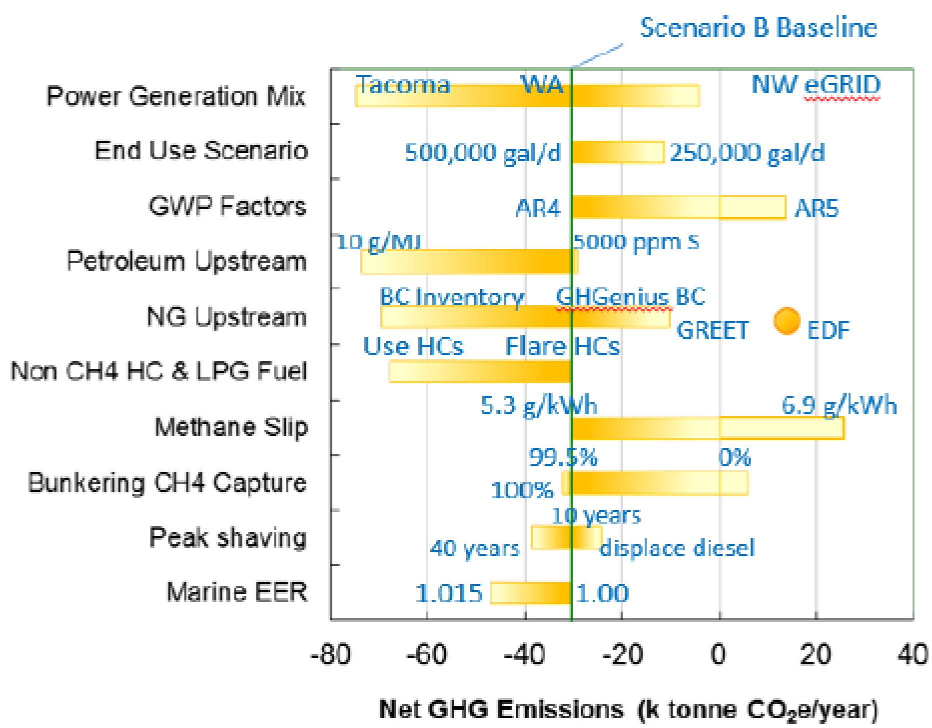

Figure 5.5. Sensitivity of Net GHG Emissions to Key Assumptions

The accompanying text's entire explanation of the only data presented using current Global Warming Potential factors was: "The GWP values also effect the overall emissions due to the higher GWP in the AR5 compared to the AR4."[14] The FSEIS even misstates the percentage increase in methane's Global Warming Potential from AR4 to AR5.[15] This is the sort of hide-the-ball behavior that SEPA forbids.[16]

Similarly, the Tacoma LNG FSEIS presented only the lowest possible application of the AR4 Global Warming Potential factor: the 100-year projection, rather than present it alongside the higher, 20-year projection. Because of how it breaks down in the atmosphere, methane's danger is greatest in the relative near term. The FSEIS, however, presents only the 100-year GWP. Although under certain circumstances, long-term effects might be a more comprehensive way of considering impacts, our society will have to endure both the near-term and the long-term climate change effects of these methane emissions. To present only the long-term projection without the context of the nearer-term projection is to hide a real, severe impact that must be considered under SEPA.

NEPA case law confirms this conclusion: an EIS fails if it relies on outdated environmental assumptions and fails to disclose the existence of current information.[17] The

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[14] FSEIS App. B at 66–67.

[15] FSEIS App. B at 6 (stating that the AR4 GWP was 25, and the AR5 GWP is 30, calculating it as a 17 percent increase). It is actually a 20 percent increase: 5 divided by 25 is 1/5, or 20 percent. Moreover, because the AR5 100-year GWP is not 30, but is a range from 28 to 36, the FSEIS further understates the potential effect.

[16] *Ctr. for Biological Diversity v. U.S. Forest Service*, 349 F.3d 1157, 1169 (9th Cir. 2003) ("agency must disclose responsible opposing scientific opinion and indicate its response in the text of the final statement itself."); *Pac. Coast Fed'n. of Fishermen's Ass'n v. Nat'l Marine Fisheries Serv.*, 482 F. Supp. 2d 1248, 1255 (W.D. Wash. 2007) ("relegation" of dissenting views to "the appendix was improper under NEPA").

[17] Washington courts often look to NEPA and interpretive case law to help apply SEPA. "The National Environmental Policy Act of 1969 (NEPA), 42 U.S.C. §§ 4321-4370f is substantially similar to SEPA, Washington Courts may look to federal case law for SEPA interpretation." *Pub. Util. Dist. No. 1 of Clark Cty. v. Pollution Control Hearings Bd.*, 137 Wn. App. 150, 158, 151 P.3d 1067 (2007) (citing *Des Moines v. Puget Sound Council,* 98 Wn. App. 23, 37 n.28, 988 P.2d 27 (1999)); *see also Int'l Longshore & Warehouse Union, Local 19 v. City of Seattle*, 176 Wn. App. 512, 525, 309 P.3d 654 (2013) ("Because NEPA is substantially similar

U.S. District Court for the District of Montana recently held that an agency violated NEPA by arbitrarily using the older GWP figure for only the 100-year timeline: "BLM's failure to acknowledge th[e] changing science [on the GWP of methane] . . . constituted an additional arbitrary decision that undermined the accuracy and integrity of the GWP analysis." [18] There, the agency relied upon a GWP for methane of 21 assessed over a 100-year timeline, using the 2007 figure published in the AR4. *Id.* at *15. The court held that the BLM failed to explain why it ignored the updated GWP for methane, using the older figure, and also using the lower 100-year factor instead of the higher 20-year factor. *Id*.

The FSEIS does not offer a defense of its figure based in science or factual accuracy, because there is no such defense. The only basis given is the international and state inventory reporting standards.[19] This is not a reasoned analysis of environmental effect under SEPA. Where a federal agency attempted the same thing in *Western Org.,* the District Court held that the agency may not base its choice of Global Warming Potential factors "on a political agreement between nations rather than on science."[20] Such a decision "when other more appropriate time horizons remained available, qualifies as arbitrary and capricious under these circumstances, and "fails to satisfy NEPA's purpose of fostering informed decision-making." *Id.* The same goes for SEPA.

The principle of informed decision-making underlying SEPA makes PSCAA's decision particularly egregious. By using the 2007 GWP factor without presenting the 2013

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to SEPA, we may look to federal case law for SEPA interpretation."); *Kucer v. State Dep't of Transp.*, 140 Wn.2d 200, 215–16 (2000).

[18] *Western Org. of Res. Councils v. U.S. Bureau of Land Mgmt.*, No. CV 16-21-GF-BMM, 2018 WL 1475470, at *16 (D. Mont. Mar. 26, 2018), *reconsideration denied*, No. CV 16-21-GF-BMM, 2018 WL 9986684 (D. Mont. July 31, 2018), and *appeal dismissed*, No. 18-35836, 2019 WL 141346 (9th Cir. Jan. 2, 2019).

[19] FSEIS App. B at 7; PSE's 2d Dispositive Mot. at 27.

[20] *Western Org. of Resource Councils*, 2018 WL 1475470, at *15.

update, and by relying on the 100-year projection without the context of the 20-year projection, the FSEIS minimized the environmental impacts of the Project, rendering the FSEIS arbitrary as a matter of law. *See, e.g., Mont. Envtl. Info. Ctr. v. U.S. Office of Surface Mining*, 274 F. Supp. 3d 1074, 1098 (D. Mont. 2017) (holding that minimizing environmental impacts renders an EIS insufficient), *amended in part, adhered to in part*, No. CV 15-106-M-DWM, 2017 WL 5047901 (D. Mont. Nov. 3, 2017);[21] *see also Columbia Riverkeeper*, 2017 WL 10573749, at *8 (holding that EIS violated SEPA by failing to adequately analyze greenhouse gas effects, where analysis relied on obsolete agency guidance that was withdrawn to incorporate new scientific information). By way of example, Ecology's Kalama EIS (discussed above) presented a table identifying AR4 and AR5 values at 20 and 100 years.[22]

As noted above, an agency is entitled to a degree of deference in its choice of methodology in environmental review. *See, e.g., City of Des Moines v. PSRC*, 98 Wn. App. 23, 36–37, 108 Wn. App. 836, 988 P.2d 27 (1999). And, were the FSEIS's deficiencies a matter of conflicting experts' equally valid opinions, the Agency could cite a long list of cases to support the contention that it must be allowed latitude to make reasonable choices among them.[23] But there is <u>no</u> good reason— and surely not one within the Agency's realm of expertise— to use the 2007 global warming figure without the informing the reader that updated climate impacts can be assessed with the 2013 update, or the 100-year GWP without the context of the 20-year GWP.

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[21] The court amended the remedy awarded, but not the holding. 2017 WL 5047901, at *6.

[22] Dep't of Ecology, *FSSEIS*, at 88; *see also id.* at 87, 98, and 53–54 (describing its sensitivity model, in which "[i]n addition to the 100-year AR4 values, the user can choose the 20-year AR4, 20-year AR5, or the 100-year AR5 values.").

[23] *See, e.g.*, cases cited in Agency Response to Motions for Stay at 37–40.

C. The Final SEIS Failed to Disclose the Great Uncertainty of its Methane Leak Rate Assumption

The FSEIS's bottom-line assessment of greenhouse gas impacts relies on its assumption that the natural gas the Project uses will be extracted and transported from British Columbia to Tacoma, using an impressively low "leak rate" – specifically, it assumes that less than one-third of one percent of the methane will leak between the well and the Project. This extraordinarily optimistic assessment of efficiency is significant because leaked methane has a very severe greenhouse gas impact.

The Respondent's Second Dispositive Motion goes into detail about conflicts between the parties' experts, presenting the merits of various studies showing methane leak rates from the 0.32 percent relied upon by PSCAA to much higher rates from more recent and comprehensive studies.[24] The parties' battle of experts is significant, but a SEPA violation hides in plain sight: The FSEIS fails to disclose the grave uncertainty underlying its 0.32 percent assumption, or even to present its reader with a range of likely leak rates demonstrating their effect on the bottom-line calculation of climate impact.

It would not have been difficult to do so. The Department of Ecology, in a final SSEIS for the Kalama Manufacturing and Marine Export Facility[25] reviewed a number of potentially applicable leak rates, from 0.32 to 2.3 percent. That project is expected to use 99.4 percent British Columbia natural gas and 0.6 percent U.S. Rocky Mountain natural gas – substantially similar to the 100 percent British Columbia gas supply planned for the Tacoma LNG Project. Although Ecology concluded that a medium leak rate would be 1.46 percent (or more than four times PSCAA's stated rate for the Project), it plainly disclosed a low, medium, and high

[24] PSE's 2d Dispositive Mot., at 30–33.
[25] Dep't of Ecology, *FSSEIS*, at 38–42.

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estimated methane emissions rate. It presented that information in the main body of the Second SEIS, alongside its analysis from a prior SEIS:[26]

Table 3.4-1. Upstream Methane Emission Rates from First and Second SEIS

First SEIS

Emissions	Units	Low	Baseline	High
Upstream Methane Emission Rate	Percent of Natural Gas Used	0.71	0.71	0.97

Second SEIS

Emissions	Units	Low Emissions Scenario 1	Low Emissions Scenario 2	Medium	High
Upstream Methane Emission Rate	Percent of Natural Gas Used	0.71	0.97	1.46	3

The Tacoma LNG FSEIS did no such thing. Although an appendix does list various gas leakage rates – incidentally, demonstrating that PSCAA chose the lowest possible leak rate on the list[27] – it does not discuss the uncertainty and consequences of error in its choice. Its only disclosure of the effect of these various possible leak rates was in the "sensitivity analysis" bar chart presented above, with only this explanation: "The higher methane leak rate rates from different GHG estimates also result in a considerable range in GHG emissions."[28]

SEPA regulations require more: that an agency fully disclose "scientific uncertainty concerning significant impacts."[29] Where an agency cannot learn what it needs to, the costs to do so are exorbitant, or the means to obtain information are speculative or unknown, the agency "shall weigh the need for the action with the severity of possible adverse impacts

[26] *Id*. at 42.
[27] FSEIS App. B at 99, tbl. B.4.
[28] FSEIS App. B at 67.
[29] WAC 197-11-080(2).

which would occur if the agency were to decide to proceed in the face of uncertainty. If the agency proceeds, it shall generally indicate . . . its worst case analysis and the likelihood of occurrence, to the extent this information can reasonably be developed."[30] In other words, SEPA requires agencies to disclose uncertainty in their analyses, assess what would happen if an assumption is wrong, and attempt to ascertain the likelihood that it is right or wrong. The FSEIS's use of the lowest available methane leak rate, without presenting information about its vulnerability or the consequences of inaccuracy, failed to do so.

D. The Final Supplemental Environmental Impact Statement Failed to Disclose the Uncertainty of its Assumption that LNG Will Perfectly Displace Marine Gas Oil

Relatedly, SEPA also allows an agency to make reasoned assumptions behind its calculations when facing uncertainty. But the law requires agencies to disclose those assumptions, and to be frank when the assumptions may not be accurate. The FSEIS failed that test when it assumed, in the face of substantial doubt, that all LNG used by marine shipping will displace marine gas oil currently used.[31] In other words, the FSEIS relies on the notion that every gallon of LNG from the Project in the marine market will result in an offsetting reduction in the use of marine gas oil. This is important because, if greenhouse gasses from the Project fail to displace <u>any</u> portion of existing emissions from marine gas oil, then the Project's bottom-line greenhouse gas analysis is wrong, and understates the Project's greenhouse gas emissions.

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[30] WAC 197-11-080(3)(b).

[31] FSEIS App. B at 4 ("[t]he analysis is based on a 1:1 displacement of the end use for the no action alternative. No market induced displacement effects are calculated because these effects are small."); *id*. at 28 ("The assumption on fuel displacement is that every gallon of LNG displaces an activity associated with its end use."); *id*. at 27 ("Displacing diesel and MDO will have an effect on petroleum fuel markets. In principal [sic], providing additional supply will reduce the price and induce a small increase in demand. This effect is very small since the amount of petroleum fuel displaced is a small fraction of the global supply.").

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The FSEIS's error arises from a difficult spot in its analysis: How do you calculate the effect of a new fuel source on a market? This analysis requires PSCAA to face a number of questions, such as: How many customers will convert to the new fuel source from marine gas oil? Will there be any LNG customers who are brought into the market by the newly available fuel? Will there be any new marine gas oil customers who will buy and burn the fuel that former-gas oil, now-LNG customers have forgone?

These are very difficult questions, because they require foresight into future supply, demand, fuel technology, and other market forces. However, the FSEIS attempts to give an easy answer to the hard questions: it assumes that shipping fuel technology will not change, that marine LNG customers will have switched from marine gas oil, and that no new marine gas oil customers will arise to buy the unpurchased and newly available fuel. Where PSCAA makes such assumptions, they must be supportable, and it must disclose their uncertainty. This it did not do.

Under SEPA, an agency has the obligation to examine impacts of "reasonably foreseeable future actions." *Quinault Indian Nation v. City of Hoquiam*, No. 13-012c, 2013 WL 6637401, at *10 (Wash. Pol. Control Bd., Dec. 9, 2013); *see also* RCW 43.21C.031 (mandating preparation of an EIS for major actions having a probable significant environmental impact) and WAC 197-11-782 (defining "probable" to mean "reasonably likely to occur" as opposed to being "remote or speculative"). As noted above, SEPA regulations require that agencies fully disclose "scientific uncertainty concerning significant impacts," WAC 197-11-080(2), and shall indicate "its worst case analysis and the likelihood of occurrence, to the extent this information can reasonably be developed." WAC 197-11-080(3)(b).

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The FSEIS assumes that all of the LNG produced by the facility will displace another fossil-based marine fuel, but it does so without any admission of uncertainty in its assumption. FSEIS App. B at 24 ("The analysis assumes a 1:1 displacement of the end use activity associated with the fuels produced by the" Project). The Agency's omission of this uncertainty violates SEPA. As a general matter, the impacts considered under SEPA must be reasonably foreseeable, and not speculative, as the "perfect displacement" assumption is in the FSEIS. But more specifically, the law does not permit an agency to avoid an assessment of the effect of increased availability of a fuel source merely because the effect may be speculative.[32] *Mid States Coal. for Progress v. Surface Transp. Bd.*, 345 F.3d 520, 549–550 (8th Cir. 2003) (analyzing requirements under NEPA). Even if the precise *extent* of the effect is difficult to determine, the agency must consider the *nature* of the effect. *Id*. In *Mid States*, the agency failed to take into account that the increased availability of a fuel source may have an effect on the demand for that source. *Id.* at 549 (noting that "the proposition that the demand for coal will be unaffected by an increase in availability and a decrease in price . . . is illogical at best"). Similarly, an agency may not assume, without disclosing the degree of uncertainty, that newly available fuel will substitute for previously available fuel on a 1:1 basis: "Even if we could conclude that the agency had enough data before it . . . we would still conclude this perfect substitution assumption arbitrary and capricious because the assumption itself is irrational (i.e., contrary to basic supply and demand principles)." *WildEarth Guardians v. U.S. Bureau of Land Mgmt*., 870 F.3d 1222, 1234, 1236 (10th Cir. 2017).

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[32] Energy markets are understandably difficult to predict. As the United States Court of Appeals for the D.C. Circuit recently noted, "projections of energy markets over a 25-year period are highly uncertain and subject to many events that cannot be foreseen, such as supply disruptions, policy changes, and technological breakthroughs." *Sierra Club v. Dep't of Energy*, 867 F.3d 189, 194 (D.C. Cir. 2017).

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In briefing opposing the Appellants' Motion for Stay, Respondents relied heavily on the argument that SEPA does not permit an agency to base its analysis on guesses about the future.[33] But although SEPA does not permit rank speculation about future changes, it also does not permit one to assume without basis that current technology and economic conditions will remain static. In other words, one may not, on the one hand, claim that any assumptions about the future are speculative and therefore not permitted, and on the other hand assume with complete certainty that the future will be exactly what it is today. The FSEIS must disclose any uncertainty in its assumption of status quo. Here, PSCAA should have disclosed that the availability of LNG as a fuel is likely to generate some demand for it from sources other than previous marine gas oil users, and that similarly some new customers for marine gas oil are likely to arise to use the newly unpurchased and available supply, even if it cannot determine the extent of those effects.

Moreover, insofar as the FSEIS claims the benefits of newly available LNG fuel but avoids an analysis of the potential harms from continued consumption of marine gas oil, it fails the rule of reason. *See, e.g., High Country Conservation Advocates v. U.S. Forest Serv.*, 52 F. Supp. 3d 1174, 1191 (D. Colo. 2014) ("[I]t was nonetheless arbitrary and capricious to quantify the benefits of the lease modifications and then explain that a similar analysis of the costs was impossible when such an analysis was in fact possible and was included in an earlier draft EIS."); *see also Montana Envtl. Info. Center v. U.S. Office of Surface Mining*, 274 F. Supp. 3d 1074, 1097 (D. Mont. 2017).

[33] *See, e.g.*, PSE brief in opposition to Motion for Stay at 57–58 (contending that any attempt to forecast changes in marine technologies, policies, future fuel mixes or market forces is entirely speculative and not permitted).

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This conclusion is reinforced by the Ninth Circuit's recent holding in *Center for Biological Diversity v. Bernhardt*,[34] also in the context of the error of an agency's decision to ignore market effects of a new source of fuel. That court favorably discussed the Department of the Interior's process for discussing and disclosing uncertainty in assumptions: it "requires the agency to include a statement explaining that the information is lacking, its relevance, a summary of any existing credible evidence evaluating the foreseeable adverse impacts, and the agency's evaluation of the impacts based upon 'theoretical approaches or research methods generally accepted in the scientific community.'"[35]

In sum, the FSEIS was required to either back up its "perfect displacement" assumption with facts or analysis, or "indicate . . . its worst case analysis and the likelihood of occurrence, to the extent this information can reasonably be developed." WAC 197-11-080(3)(b). Because it did not do so, the FSEIS was insufficient under SEPA.

IV. CONCLUSION

The errors in the FSEIS, like those at issue in *High Country Conservation Advocates*, are "more than mere 'flyspeck.'"[36] Because of these errors, the bottom-line greenhouse gas calculation erroneously informed decision-makers that the Project would result in a slight improvement in greenhouse gas emissions, where an accurate analysis would have revealed something different. SEPA demands more. The Attorney General's Office respectfully asks the Board to deny the Respondents' Second Dispositive Motion.

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[34] *Center for Biological Diversity v. Bernhardt*, No. 18-73400, 2020 WL 7135484 (9th Cir. Dec. 7, 2020).

[35] *Id.* at *9 (citing 40 C.F.R. § 1502.22(b)(1)).

[36] *High Country Conservation Advocates*, 52 F. Supp. 3d at 1191.

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