Exhibit A-35

Expert Report of

Julie M. Carey
National Economic Research Associates, Inc.

and

Peter Rawlings, Mary Hess, and Dustin Pittman
Environmental Resources Management, Inc.

Prepared for

K&L Gates, LLP
925 4th Ave, Suite 2900
Seattle, WA 98101

IN SUPPORT OF APPLICATION OF MILLENNIUM BULK TERMINALS-LONGVIEW, LLC

FOR SHORELINE SUBSTANTIAL DEVELOPMENT PERMIT AND CONDITIONAL USE PERMIT

FILE NUMBER 12-04-0375, SHORELINE PERMIT NUMBER 17-0992

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I. INTRODUCTION

The purpose of this expert report is to provide commentary on the energy, economic, and environmental aspects of the Millennium Bulk Terminals—Longview (MBT-Longview) State Environmental Policy Act (SEPA), Final Environmental Impact Statement (FEIS).[1] Specifically, a review was undertaken of the FEIS to provide an assessment of the underlying analysis and conclusions with respect to the coal market analysis and the estimated net greenhouse gas (GHG) emissions, as well as the approach adopted for evaluating the significance of potential impacts from these emissions.

This expert report, developed for MBT-Longview, is co-authored by Julie Carey of National Economic Research Associates, Inc. (NERA) and Peter Rawlings, Mary Hess, and Dustin Pittman of Environmental Resources Management, Inc. (ERM). Julie Carey authored the energy, economic/statistic and GHG quantum portions of the response. Peter Rawlings, Mary Hess, and Dustin Pittman authored the environmental and climate change comments.

Julie Carey is an energy economist and a Director with NERA who regularly provides expert evidence in energy-related regulatory proceedings and commercial disputes. She has more than 20 years of experience addressing economic issues in power, oil and gas, coal, renewables, pipelines, and railroad sectors. Ms. Carey helps clients with issues related to energy market dynamics, competition, regulatory economics, environmental assessments, and other economic issues. Ms. Carey has authored expert reports and provided expert testimony on energy industry matters before the Federal Energy Regulatory Commission (FERC) and many other U.S. and Canadian regulatory agencies as well as before U.S. Courts and arbitration panels. In addition to her economic consultancy practice, Ms. Carey is an Adjunct Professor at Georgetown University, where she teaches energy economics in the graduate economics program. Her CV is provided as Exhibit A-45.

Peter Rawlings is a sustainability and climate change practitioner and a Partner with ERM. Mr. Rawlings' expertise focuses on providing GHG and climate change advice in the oil and gas, power, financial, and infrastructure sectors, and he has over 20 years of experience covering lifecycle GHG assessments, GHG and energy mitigation planning and climate risk analyses. Mary Hess and Dustin Pittman are air quality and climate change senior consultants with ERM in Seattle, Washington. They have prepared recent SEPA and NEPA Air Quality and Climate Change Assessments for client projects and performed limited Lifecycle Analyses for client planning purposes. Ms. Hess has assisted clients identifying GHG mitigation options for SEPA Mitigated Determinations of Non-Significance during the permitting process. Ms. Hess and Mr. Pittman have been closely monitoring the development of Washington State's Clean Air Rule and how this rule impacts lead agencies' SEPA and NEPA determinations. Their CVs are provided as Exhibit A-46 (Hess), Exhibit A-49 (Rawlings), and Exhibit A-50 (Pittman).

[1] Millennium Bulk Terminals—Longview, LLC (MBT-Longview). SEPA Final Environmental Impact Statement (FEIS) released by Cowlitz County and the Washington State Department of Ecology on April 28, 2017.

II. SUMMARY OF EXPERT OPINIONS

The FEIS includes a comprehensive lifecycle assessment of the estimated net GHG emissions[2] from the proposed MBT-Longview project (the "Project"), which includes coal mining, rail transport from coal mines, international shipping and end-use combustion in Asia, and offsetting end-use combustion in the U.S. The FEIS GHG analysis is one of the most (if not the singular most) expansive in scope and detailed environmental impact statements (EISs) completed to date in the U.S. An assessment of EISs from comparable projects shows that there is no common or consistent methodology for defining the scope of GHG analyses (e.g. direct or lifecycle) or for determining the potential significance and causal linkage between project-level GHGs and climate change impact. As a result, there are different and varying levels of analyses and expectations across projects subject to SEPA and/or the National Environmental Policy Act (NEPA).

The FEIS includes a substantial and sufficiently-detailed energy market and economic analysis (across a wide geography (U.S. and Asia), the entire lifecycle and for a 20 year time horizon) to discern that the Project is not likely to result in an increase in estimated net lifecycle GHG emissions. However, it is also a highly uncertain analysis. Any current forecast is based on information that is likely to change due to uncertainty in the complexity of the analysis arising from a range of factors addressed in the FEIS, including the broad geographic scope across many countries/jurisdictions, numerous volatile commodity markets, and downstream energy market dynamics. All of these factors require the development of many input assumptions that are forecast over 20 years. Consequently, the FEIS is substantially more uncertain and less reliable from a statistical perspective than traditional EISs, which typically limit their analyses to a narrower local geographic region in proximity to the proposed projects.[3]

The analyses undertaken and presented in the FEIS provide substantial evidence to support the conclusion that the Project will result in *de minimis* or negative estimated net GHG lifecycle emissions. [4] An independent analysis from the National Energy Technology Laboratory (NETL), an agency of the U.S. Department of Energy (DOE), titled "Life Cycle Analysis of Coal Exports from the Powder River Basin," (the "NETL Report") reaffirms the reasonableness of this conclusion.[5]

The FEIS reports estimated net lifecycle GHG emissions from the Project with and without the coal mining offset. However, the FEIS chooses a scenario on which to base its recommend

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2 GHGs comprise a number of different gases such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and chlorofluorocarbons (CFCs), as well as water vapor and ozone. Many of these can result from both natural and human activities, and when assessed for a proposed action, the emissions attributable to human activities are typically calculated.

3 See Section V.A., below, and Appendix B.

4 Negative estimated net GHG lifecycle emissions for a FEIS scenario indicate that the changes from the Project caused the total net lifecycle emissions to be reduced as compared to the no action case. Therefore, the estimated net GHG lifecycle emissions are less than 1.

5 As discussed below NETL concludes that there is too much uncertainty to ensure that a definitive difference exists between the life cycle GHG profiles between the PRB and alternative coal sources. Life Cycle Analysis of Coal Exports from the Powder River Basin, National Energy Technology Lab of the U.S. DOE, August 2016.

mitigation requirement (equal to 1.99 million metric tons CO_2e[6] per year) that does not address any offsets related to coal-mining.[7]

The coal mining offset is the difference in coal mining-related GHG emissions associated with Powder River Basin (PRB) coal versus alternative international coals (e.g. China, Russia, Australia and Indonesia) that the FEIS assumes are displaced by the Project. The FEIS's preferred GHG emissions scenario, the 2015 U.S. and International Energy Policy (the "2015 Energy Policy"), reports that the Project will result in a reduction in estimated net GHG emissions with the coal mining offset (-63.5 $MMtCO_2e$) and the Project will result in an increase in estimated net GHG emissions without the coal mining offset (22.3 $MMtCO_2e$).[8] If a lifecycle analysis is deemed to be the appropriate boundary to use in regulatory decision-making, then the FEIS should consider any coal mining offset to represent a complete lifecycle analysis and avoid overstating net emissions.[9]

The FEIS's claim that the coal mining-related GHG offset is too uncertain is unsubstantiated as it is no more uncertain than the coal market and GHG entire analysis.[10] The FEIS reports a lower PRB coal mining methane emissions factor than emissions factors for virtually all other types of coal that the FEIS assumes will be displaced by the Project.[11] Even with a 50% reduction in the estimated GHG emission from the coal mining offset to account for uncertainty, the total estimated net lifecycle GHG emissions from the Project are negative (-21.01 $MMtCO_2e$).[12]

Furthermore, in all scenarios, the FEIS net estimated GHG emissions can be viewed as conservative and likely overstated. Minor adjustments to the conservative assumptions show that all the FEIS GHG emission scenarios are further reduced and are likely to be *de minimis* or result in a negative level of estimated net GHG emissions (i.e. negative). Consequently, the FEIS scenarios do not support a conclusion of a probable increase in the estimated net GHG emissions from the Project. The adjustments addressed here show that the FEIS tends to overstate the level of net GHG emissions that could be attributed to the Project. But even when these adjustments are taken into account, the estimates would still fall within the range of results reported by the FEIS. The adjustments to the FEIS energy market and economic modeling analysis that address the overstated GHG emissions aspects of the FEIS include: (1) eliminating excess vessel- and

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6 Million metric tons CO_2e (MMTCO2e) or million metric tons of carbon dioxide equivalent.CO_2e is a measure used to compare the emissions from various GHGs based upon their global warming potential; CO_2e is commonly used as a metric to sum GHG emissions.

7 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, Section. 5.8, pp. 5.8-20 and 5.8-24. FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-22 to 3-23 and Table 66 and Table 67.

8 FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-22 to 3-23 and Table 66 and Table 67.

9 SEPA Greenhouse Gas Emissions Technical Report, Figure 4. p 2-6 .

10 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, p. 5.8-19. FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 2-21 to 2-28.

11 FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-6 and Table 45. The FEIS assumes methane is the largest and most uncertain component of coal mining-related GHG emissions.

12 See Section V.C.1. below.

railroad-related estimated net GHG emissions from the Project in all scenarios;[13] (2) eliminating overstatements in the estimated net GHG emissions in the No Clean Power Plan (No CPP) scenario associated with too little U.S. substitution of lower GHG emitting natural gas for coal-fired power;[14] and (3) eliminating the implausible Upper Bound scenario.[15]

The FEIS uses several regulatory thresholds as a basis for determining the significance of the estimated net GHG emissions. The approach of using thresholds from regulations as guidelines for a standard to evaluate the "significance" of estimated net GHG emissions is not a comparable standard (i.e., it is not on an apples-to-apples basis). The selected regulatory GHG thresholds evaluate direct facility-level emissions and not the estimated net lifecycle GHG emissions that are evaluated in the FEIS. Further these regulatory GHG thresholds were not developed to assess significance under SEPA. The FEIS's comparison of estimated net GHG emissions against regulatory thresholds as a proxy for determining a significant climate change impact is an over simplification. The causal relationship between GHG emissions and climate change effects is complex, particularly when considering the wide geographical scope of the FEIS analysis.

The preponderance of evidence in the FEIS supports the conclusion that the Project will result in *de minimi*s or negative estimated net GHG lifecycle emissions; therefore, any GHG mitigation by MBT-Longview associated with the Project should be voluntary in nature and above and beyond any applicable regulatory requirement. For any such proposed mitigation, appropriate boundary considerations should be used. In particular, mitigation should focus on direct[16] or Scope 1 emissions,[17] both to avoid potential double-counting (due to mitigation efforts being implemented by others across the different lifecycle stages) and to prevent mitigation of emissions that are speculative.

III. BACKGROUND OF THE FEIS LIFECYCLE ANALYSIS

The FEIS presents an analysis of the estimated net GHG emissions resulting from the construction and operations of the Proposed Action (i.e., the Project), an assessment of the significance of these emissions, and a summary of potential impacts from those emissions attributed to the Project on climate change. The FEIS assesses and presents GHG emissions from

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13 See Section V.C.1 and V.C.2.below. The estimated vessel-related GHG emissions overstatement results because the FEIS assumes that most of the PRB coal will be destined for more distant destinations rather than nearer locations (such as Japan and South Korea). The estimated railroad-related GHG emissions overstatement results because the FEIS failed to include reductions in estimated GHG emissions associated with inland rail and other transportation that will occur from the U.S. displacement of coal originating in China, Russia and other countries.

14 See Section V.C.4. below. The No CPP scenario appears to overstate the estimated GHG emissions from the Project because it forecast no increase in U.S. coal prices that are expected from the Project's increase in U.S. coal production.

15 See Section V.B. below.

16 Direct GHG emissions are those emissions from sources that are under the ownership or control of the entity responsible for the proposed action.

17 Scope 1 emissions are direct GHG emissions that occur from sources that are owned or controlled by an entity, for example, emissions from combustion in owned or controlled boilers, furnaces, vehicles, etc.; or emissions from chemical production in owned or controlled process equipment. Scope 2 emissions account for GHG emissions from the generation of purchased electricity consumed by an entity. Scope 3 emissions are a consequence of the entity's activities, but occur from sources not owned or controlled by the entity. Source: The Greenhouse Gas Protocol – A Corporate Accounting and Reporting Standard – Revised Edition 2004; WBCSD and WRI.

two boundary scopes to reflect the requirements of two co-lead agencies. For Cowlitz County, the geographical extent of the county itself was used as the GHG emissions boundary area. For the Washington State Department of Ecology, the boundary area for GHG emissions was based on the expected transportation routes and emissions from the combustion of coal. While the FEIS reports estimated net lifecycle GHG emissions from the Project with and without the coal mining offset, it recommends reliance on the scenarios without the coal mining offset. The FEIS analysis estimates net GHG emissions from the Project resulting from four scenarios, in which each one represents a range of estimated net GHG emissions based on forecasts of different economic, energy market, and policy outcomes for 2018 through 2038. For each scenario, the FEIS estimates net GHG emissions associated with potential increases in coal combustion in Asia and potential decreases in coal combustion in the U.S. (as a result of substitution of U.S. natural gas combustion). The estimated net GHG emissions are influenced by many factors such as coal prices, transportation costs, and competing energy sources, as discussed in Section V of this expert report. The FEIS also generally describes potential future climate change impacts on precipitation, snowpack, temperature, and sea level in southwest Washington, without identifying any specific incremental new climate change impacts that would occur only if the Project is approved.

This report is structured to present expert opinions on a series of topics covered in the FEIS as follows:

- Section IV provides opinion on the level of analysis provided with respect to GHG emissions and climate change, and how this compares with comparable projects;

- Section V provides an evaluation of the FEIS energy market and economic modeling and its probable impact;

- Section VI provides opinion on the methodology and approach taken to determining the causal relationship and significance of the estimated net GHG emissions; and

- Section VII provides opinion on the consistency in GHG accountability with respect to proposing mitigation responsibilities.

IV. LEVEL OF ANALYSIS WITH RESPECT TO OTHER EIS FILINGS

A. The FEIS provides a more detailed and harder look at net estimated GHG emissions and climate change compared to almost any other EIS completed under NEPA or SEPA

The FEIS provides a detailed and comprehensive assessment of potential future estimated net GHG emissions that could result from the Project's construction and operation, and climate change implications related generally to rising GHG levels in the atmosphere. To assess the degree of detail provided in the FEIS, we reviewed over 40 comparable projects across the U.S. that have, or are, undergoing SEPA or NEPA analyses (see Appendix A), to compare their scope of EISs to the FEIS.

The level of assessment in the FEIS involves a more detailed and harder look at GHG emissions and climate change as compared to the scope and level of analysis performed in the other projects. The FEIS scope[18] is far more expansive than other EISs in terms of the range of temporal, geographical, and market elements considered. In addition, unlike other EISs, the FEIS includes an expansive lifecycle analysis[19] that ranges from the coal mining areas in Wyoming/Montana to power stations in Asia; it attempts to evaluate commodity markets and the impact of a transloading facility on the Columbia River to the Asian and U.S. coal markets over a 20-year period; and it provides an assessment of significance determination. Very few of the projects we evaluated attempted to assess lifecycle considerations from a geographical and market perspective, or comment on potential significance of GHG emissions. Rather, the majority of EISs we evaluated only considered GHG emissions from within their respective physical project boundaries (i.e., direct, Scope 1 GHG emissions from the proposed project).

The FEIS GHG emissions and climate change analysis is one of the most (if not the singular most) expansive and detailed environmental reviews that have been completed to date in the U.S.

B. There is an absence of a common or consistent methodology among EISs

Our review of comparable projects (see Appendix A) confirms that there is no standard or common methodological approach for assessing the scope of GHG emissions (e.g. lifecycle versus direct emissions) or for determining the potential significance and causal linkage between GHGs and climate change impact in SEPA and NEPA project reviews. The absence of a consistent methodology or approach results in wide variability in the way in which GHG emissions and climate change are considered and assessed, making comparisons between projects difficult. For example, the majority of reviewed projects evaluate direct GHG emissions only, i.e., no lifecycle considerations. For those few projects where lifecycle emissions were assessed, the boundary conditions applied for lifecycle emissions varied and were inconsistent, e.g., some projects only reviewed the upstream or downstream emissions and not a complete -- cradle-to-grave -- lifecycle analysis.

Furthermore, the majority of reviewed projects quantify GHG emissions using different geographical and temporal areas and boundaries; they do not assess or comment on whether the estimated GHG emissions are considered a "significant" impact. There is no consistent methodology or approach across the projects aimed at determining whether GHG emissions represent a potential effect or impact.

Because there is no common or consistent methodology for GHG and climate change analyses, different levels of analysis are being used across EISs, and no consensus has been developed concerning the level of SEPA and NEPA review that constitutes a valid assessment of potential impacts versus the level that constitutes mere speculation.

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[18] See FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, Section 5.8.1.4, pp. 5.8-6 and 5.8-7 of the FEIS for the scope of the analysis.

[19] The lifecycle analysis of GHG emissions included in the FEIS covers upstream emissions from rail transportation of coal from the Powder River Basin and Uinta Basin mining regions, emissions from operation of the terminal, and downstream emissions attributable to transportation of the coal to Asian markets and its subsequent end-use combustion.

V. EVALUATION OF THE FEIS ENERGY MARKET AND ECONOMIC MODELING AND THE PROJECT'S PROBABLE IMPACT

A. The FEIS energy market and economic modeling analysis is generally acceptable but also uncertain

The FEIS includes an energy market and economic modeling analysis and estimated net lifecycle GHG emissions from the Project over a long time horizon extending from 2018 through 2038. As discussed in Appendix B, the FEIS energy and economic analysis underlying the estimated net GHG emissions from the Project is a substantial and sufficiently-detailed energy market and economic analysis (across a wide geography (U.S. and Asia), the entire lifecycle and for a 20 year time horizon); however, it is also a highly uncertain analysis. The process that the FEIS utilizes is well-defined and generally follows reasonable practices for analyzing such impacts (with a few possible adjustments that make it a conservative estimate). Despite following generally-reasonable practices, the FEIS results are still highly uncertain for many reasons. These include the broad geographic scope across many countries and jurisdictions, long time horizon for the analysis, and uncertainty in global commodity markets and downstream energy market dynamics.

As also discussed in Appendix B, an extensive energy market and economic modeling analysis such as the FEIS's long-term forecast with a broad geographic scope is substantially more uncertain and less reliable than a traditional EIS that limits the analysis to a narrower local geographic region and with fewer input assumptions that are likely to change (see Appendix B). To demonstrate the relatively greater uncertainty, and therefore lower reliability, we conducted a statistical analysis on the estimated net lifecycle GHG emissions associated with the FEIS scenarios as compared to a narrower local geographic region in a traditional EIS analysis (e.g. Cowlitz County). This statistical analysis provides evidence that a substantial and much higher degree of variation is inherent in the FEIS scenarios when compared to a traditional EIS analysis that focuses on a smaller geographic footprint with fewer input assumptions that are likely to change.[20]

B. The FEIS's Upper Bound scenario is implausible

The FEIS presents an implausible Upper Bound scenario that is driven predominantly by unsupported and unrealistic assumptions regarding induced coal demand and growth in coal demand. See Appendix C for a detailed discussion.

Specifically, as discussed in Appendix C, and illustrated in Figure 1 below, the Upper Bound scenario reports a significantly higher estimated net GHG emissions from the Project than the other FEIS scenarios. The increases are approximately 801 MMtCO_2e and 779.8 MMtCO_2e in the FEIS scenarios with and without the coal mining offset, respectively.[21] Further, the Upper

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[20] Limiting the FEIS scenarios to a narrower geographic scope, such as Cowlitz County, has a very low standard deviation equal to 0 MMtC02e. However, the standard deviation for the Total FEIS (with the coal mining offset) scenarios and the Total FEIS (without the coal mining offset) scenarios is 435.1 and 386.7 MMtC02e, respectively. The entirety of the uncertainty inherent in the many input assumptions underlying the FEIS is not captured by this analysis.

[21] CO_2e is a measure used to compare the emissions from various GHGs based upon their global warming potential; CO2e is commonly used as a metric to sum GHG emissions.

Bound scenario reports estimated net GHG emissions that are 36 times higher than the 2015 Energy Policy scenario when coal mining emission estimates are excluded from the FEIS analysis.[22] By any statistical, mathematical, or other means of comparison, the Upper Bound scenario is highly divergent from the other scenarios directionally and by the order of magnitude of the estimated GHG emissions from the Project.[23] For these reasons, the FEIS's Upper Bound scenario is implausible and unsupported and should not be considered.

Figure 1: FEIS Net Estimated GHG Emissions ($MMtCO_2e$) [24]

Scenario	FEIS with Coal Mining offset	FEIS without Coal Mining offset
2015 Energy Policy	-63.5	21.8
Lower Bound	-122.0	-41.9
No CPP	-4.8	51.2
Upper Bound	801.5	779.8

The significantly higher estimated net GHG emissions reported for the FEIS Upper Bound scenario is largely driven by an unsupported and overstated assumed induced demand. Induced demand is the term the FEIS uses to define the additional quantity demanded as a result of the change in price resulting from the Project. The induced demand is based on the input assumption for the coal price elasticity of demand equal to -0.68 for China. The price elasticity of demand is an economic measure that represents the responsiveness of the quantity demanded of a good or service to a change in its price.[25]

Because of the assumed level of induced demand, the FEIS Upper Bound scenario produces estimated net GHG emissions from the Project that are almost 15 times higher than the estimated net GHG emissions if the Upper Bound scenario were to exclude the induced demand component.[26] To incorporate a more reasonable assumption in our adjustment to the FEIS Upper Bound scenario, the coal price elasticity of demand was reduced from -0.68 to -0.1.[27] The

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22 35.77 = 779.8 / 21.8

23 As discussed later there is inadequate support to exclude the coal mining offset from the FEIS net estimated life cycle GHG analysis.

24 FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-22 and 3-23 and Table 66 and 67.

25 The negative sign in the price of elasticity of demand metric represents the inverse relationship that exists, which causes a decrease in price to result in an increase in demand.

26 14.73 = 801.49 / 54.42. This calculation is based on the FEIS scenarios that include coal mining offset. See Appendix B.

27 This reduction in coal price elasticity of demand is consistent with recommendations made in response to the Draft EIS. Millennium Bulk Terminals - Longview Coal Export Terminal. Comments on Draft Environmental Impact Statement (Draft EIS), June 13, 2016, Attachment 4- Greenhouse Gas Technical Reports and Memoranda.

estimated net GHG emissions for the adjusted Upper Bound scenario are still higher than all other scenarios, but are more in line with the other scenarios.

The FEIS's assumed coal price elasticity for China of -0.68, which is primarily based on the literature review from five studies,[28] is unsupported and overstated because these studies are inapplicable:

- The EIA study is for the U.S. instead of China;[29]
- The Burke, Paul J., Liao, Hua study focuses on all types of coal and does not separately analyze steam coal (e.g. bituminous and subbituminous coal) applicable to the FEIS;[30]
- The Parry, Veung and Heine study merely assumes a price elasticity instead of calculating it and the secondhand study it relies on uses outdated data (1953-1994);[31]
- The Jiao, Fan and Wei study uses outdated data (1980-2006), fails to include the statistical analysis to evaluate its reliability and appear to study all types of coal and not separately analyze steam coal (e.g. subbituminous and bituminous coal) applicable to the FEIS;[32] and
- The Ma and Stern study reports a range of price elasticity of coal demand between -0.03 and -0.199, which is substantially smaller than the FEIS assumption of -0.68 and which is not applicable to the Project because it excludes coal used to generate electricity and heat, such as subbituminous and bituminous coal applicable to the FEIS.[33]

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28 Burke, Paul J., Liao, Hua. Is the price elasticity of demand for coal in China increasing?, China Economic Review, Volume 36, December 2015, pp. 309-322.

29 U.S. Energy Information Administration, 2012. Fuel Competition in Power Generation and Elasticities of Substitution. April.

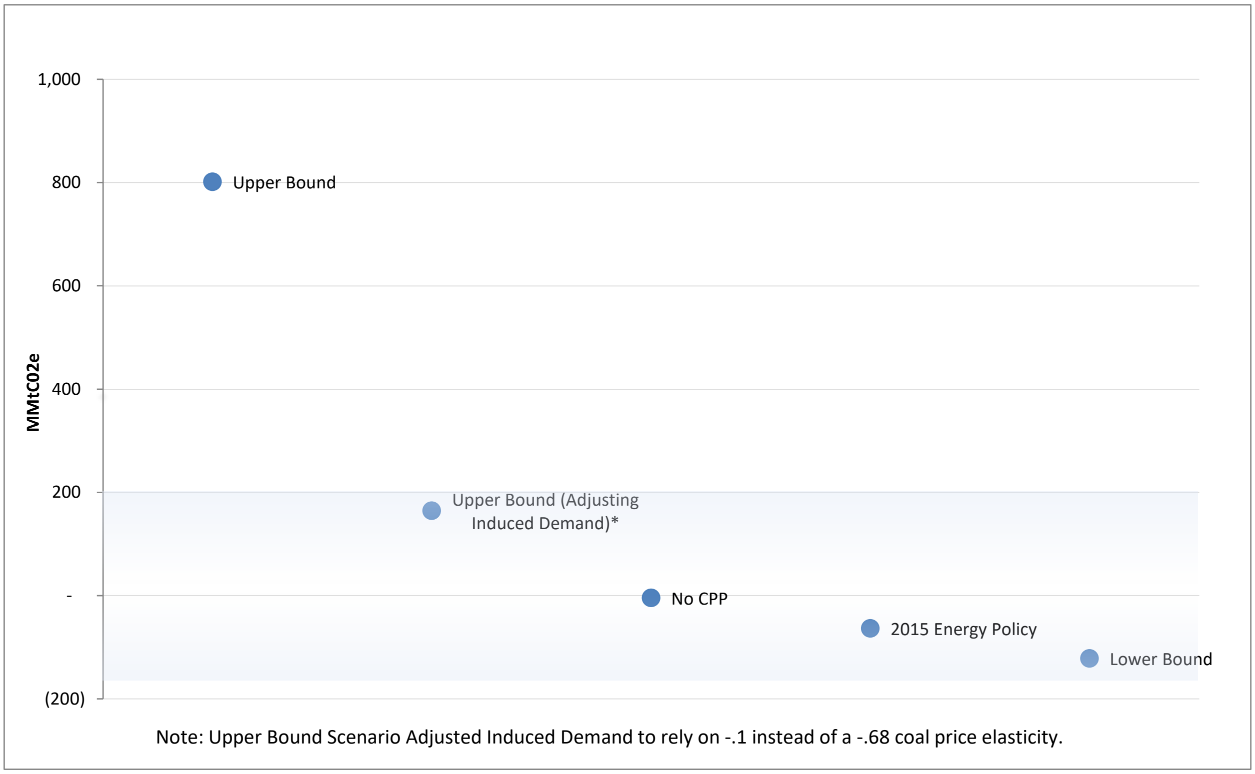
30 Burke, Paul J., Liao, Hua. Is the price elasticity of demand for coal in China increasing?, China Economic Review, Volume 36, December 2015, pp. 309-322.

31 Parry, Ian, Chandara Veung, and Dirk Heine, *How Much Carbon Pricing is in Countries' Own Interests? The Critical Role of Co-Benefits*. CESifo Working Paper No. 5015, October 2014.

32 Jiao, Jian-Ling, Ying Fan, Yi-Ming Wei, The Structural Break and Elasticity of Coal Demand in China: Empirical Findings from 1980 – 2006, *International Journal of Global Energy Issues* 31(3):331-344, January 2009.

33 Ma, C. and Stern, D.I. 2016. *Long-run estimates of interfuel and interfactor elasticities*, CCEP Working Paper 1602, Jan. Caryrawford School of Public Policy, The Australian National University. Available at: http://www-bcf.usc.edu/~gareth/ISL/ISLR%20First%20Printing.pdf

Figure 2: FEIS Summary of Scenarios: Net Estimated GHG Emissions (MMtCO_2e) (2018-2038) and the Adjusted FEIS Upper Bound Scenario Reducing Induced Demand[34]



In addition, as discussed in Appendix C, the FEIS Upper Bound scenario is unrealistic about the assumed substantial surge in future coal demand well above levels forecast by independent forecasting agencies (including the International Energy Agency, or IEA). While the FEIS relies upon IEA for its coal demand growth forecasts in other scenarios, for the Upper Bound scenario the FEIS does not rely on the IEA or any other publicly-developed coal demand forecast. Instead, the FEIS relied upon an ICF-developed coal demand growth forecast based on historical growth levels from 2000 through 2012, when coal demand was rapidly increasing.[35] The magnitude of coal growth assumed in the FEIS Upper Bound scenario is unlikely, as global energy markets have become increasingly diversified in fuel supply sources, suggesting such an ambitious coal demand growth target is unrealistic.[36]

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34 The reduction to the induced demand is accomplished by reducing the coal price elasticity of demand from -0.68 to -.1. Estimated net total GHG emissions from the primary components includes: Pacific Basin and U.S. markets plus shipping and rail transportation as well as coal mining and a category for other emissions (largely direct). *SEPA Greenhouse Gas Emissions Technical Report*, pp. 3-3, 3-7, 3-9, 3-10, 3-18, 3-19, 3-20, 3-21, 3-22 and 3-23.

35 FEIS, SEPA Coal Market Assessment Technical Report, p. 5-3 and Table 5-1.ICF refers to ICF International, which is the consulting firm that conducted the underlying energy market and economic and GHG analysis in the FEIS.

36 Moreover, the only potential factor that could lead to such high coal demand increases in the future is if breakthrough in a GHG mitigation technology solution (e.g., carbon capture and sequestration) occurs, which would greatly reduce the potential estimates of net GHG emissions impact from the Project in the Upper Bound scenario.

C. The remaining FEIS scenarios demonstrate that the estimated levels of net GHG emissions from the Project are likely to be *de minimis* or negative

When evaluating the remaining scenarios, the analyses undertaken and presented in the FEIS provide substantial evidence supporting the conclusion that the Project will result in *de minimis* or negative estimated net GHG lifecycle emissions. [37] The FEIS net estimated GHG emissions can be viewed as conservative. We identify a few adjustments to evaluate and appropriately rely on the FEIS scenarios. Adjustments include the following:

(1) Eliminate overstated coal mining related estimated net GHG emissions: While the FEIS reports estimated net lifecycle GHG emissions from the Project with and without the coal mining offset, [38] it chooses a scenario on which to base its recommend mitigation requirement that does not include the coal-mining offset.[39] The FEIS's claim that the coal mining-related GHG offset is too uncertain is unsubstantiated as it is no more uncertain than the entire analysis.[40] The overstatement from excluding the coal mining offset is discussed further below in Section C.1.

(2) Eliminate overstated vessel- and railroad-related estimated net GHG emissions:[41]

- **Vessel-Related** estimated GHG emissions are overstated in all scenarios because the FEIS ignores the likelihood that the coal will be transported a shorter distance than has been assumed in the FEIS. MBT-Longview expects Japan and South Korea to be important buyers of PRB coal (discussed further below in Section C.2); and

- **Railroad-Related** estimated GHG emissions are overstated in all scenarios because the FEIS fails to include reductions in estimated GHG emissions associated with inland rail and other transportation that will occur from the U.S. displacement of coal originating in China, Russia, and other countries. The FEIS does not account for the offsetting effect as discussed further below in Section C.3.

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37 Negative estimated net GHG lifecycle emissions for a FEIS scenario indicate that the changes from the Project caused the total net lifecycle emissions to be reduced as compared to the no action case. Therefore, the estimated net GHG lifecycle emissions are less than 1.

38 The FEIS's preferred 2015 Energy Policy scenario reports that the Project will result in a reduction in estimated net GHG emissions with the coal mining offset (-63.5 $MMtCO_2e$) and the Project will result in an increase in estimated net GHG emissions without the coal mining offset (22.3 $MMtCO_2e$). FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-22 to 3-23 and Table 66 and Table 67.

39 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, Section 5.8, pp. 5.8-20 and 5.8-24. FEIS, SEPA Greenhouse Gas Emissions Technical Report, pp. 3-22 to 3-23 and Table 66 and Table 67.

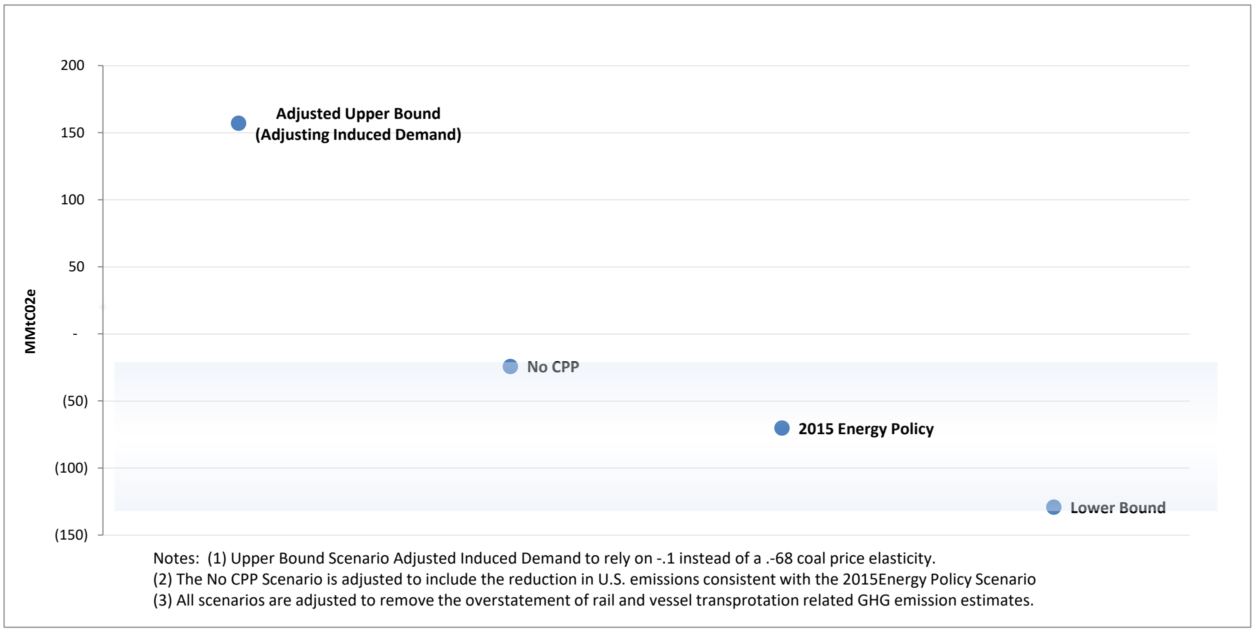
40 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, p. 5.8-19. FEIS, SEPA Greenhouse Gas Emissions Technical Report, pp. 2-21 to 2-28.

41 The estimated railroad-related GHG emissions overstatement results because the FEIS failed to include reductions in estimated GHG emissions associated with inland rail and other transportation that will occur from the U.S. displacement of coal originating in China, Russia and other countries. The estimated vessel-related GHG emissions overstatement results because the FEIS assumes that most of the PRB coal will be destined for more distant destinations rather than nearer locations (such as Japan and South Korea). The No CPP scenario appears to overstate the estimated GHG emissions from the Project because it does not project any reduction in U.S. coal prices that are expected from the Project's increase in coal demand and therefore projects no impact on U.S. coal demand. Lastly, the Upper Bound scenario should be corrected or eliminated due to unsupported induced demand and coal demand forecast.

(3) The No CPP scenario overstates the net estimated GHG emissions from the Project by reporting effectively no substitution of natural gas-fired power plants for coal-fired power plants from the Project. This substitution is expected to occur as the Project will increase U.S. demand for coal, coal prices will rise which reduces the estimated GHG emission as lower GHG emitting natural gas power plants are substituted for coal-fired power plants. The No CPP scenario should be adjusted to include a more realistic reduction in U.S. coal consumption resulting from higher U.S. coal prices expected from the Project (i.e., comparable to the quantity forecast by the 2015 Energy Policy scenario). The overstatement from the No CPP scenario is discussed further below in Section C.4.

As shown in Figure 3, with the additional adjustments, the FEIS scenarios demonstrate that the estimated net GHG emissions from the Project are further reduced and result in negative estimated net GHG emissions and support the conclusion of no probable net GHG emissions caused by the Project.[42]

Figure 3: Adjusted FEIS Scenarios - Net Estimated GHG Emissions (MMtCO_2e) (2018-2038)[43]



1. The FEIS overstates estimated net lifecycle GHG emissions from the Project by ignoring appropriate reductions related to the coal mining offset

While the FEIS reports the estimated net lifecycle GHG emissions from the Project with and without the coal mining offset, it chooses a scenario on which to base its recommend mitigation

[42] The Upper Bound scenario is implausible due to the unsupported induced demand and coal demand forecast. It should be disregarded as discussed in Section V.B., above;

[43] This analysis begins with the FEIS scenarios which include the coal mining component and incorporates the other offsetting adjustments discussed. FEIS, The SEPA Greenhouse Gas Emissions Technical Report, p 3-23 and Table 67.

requirement that does not include the coal-mining offset.[44] The coal mining offset is the difference in coal mining-related GHG emission associated with PRB coal versus alternative international coals (e.g. China, Russia, Australia and Indonesia) that the FEIS assumes are displaced by the Project. The FEIS's recommended mitigation, equal to 1.99 million metric tons CO_2e ($MMtCO_2e$) per year, is based on the FEIS 2015 Energy Policy scenario excluding the coal mining offset.[45] Specifically, the FEIS relies on 2015 Energy Policy scenario analysis that excludes the coal mining offset, resulting in 22.36 $MMtCO_2e$ estimated net GHG emissions. When the coal mining offset is included, this scenario would result in -63.54 $MMtCO_2e$ estimated net GHG emissions.[46]

If a lifecycle analysis is deemed to be the appropriate boundary to use in regulatory decision-making, the FEIS scenario with the coal mining offset should be included to represent a complete lifecycle analysis (i.e. with all of the necessary components).[47] The lifecycle analysis should evaluate the extent to which mining PRB coal results in changes to estimated GHG emissions compared to the mining of substitute international coal that the Project will displace. To avoid overstating the net emissions, FEIS should evaluate coal mining-related GHG emissions in the same manner that it evaluates the GHG emissions associated with different coal characteristics between PRB coal and the international coal that the Project will displace.

The FEIS's claim that the coal mining-related GHG offset is too uncertain is unsupported as it is no more uncertain than the entire analysis.[48] As we discuss further in Appendix B to this report, the entirety of the FEIS analyses (i.e. all scenarios) are highly uncertain and dependent on many inputs that are highly variable, not just the coal mining component. The uncertainty analysis (presented in Appendix B) shows that limiting the geographic scope studied substantially reduces the uncertainty and includes fewer input assumptions that are likely to change.[49]

The FEIS reports a lower PRB coal mining methane emissions factor than emissions factors for virtually all other types of coal that the FEIS assumes will be displaced by the Project.[50] The FEIS provides a range in coal mining emissions rates (middle/modeled, low, and high) to

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44 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, Section 5.8, page 5.8-20 and 5.8-24. FEIS, SEPA Greenhouse Gas Emissions Technical Report, pp. 3-22 to 3-23 and Table 66 and Table 67.

45 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, Section 5.8, page 5.8-20 and 5.8-24. FEIS, SEPA Greenhouse Gas Emissions Technical Report, pp. 3-22 to 3-23 and Table 66 and Table 67.

46 FEIS, SEPA Greenhouse Gas Emissions Technical Report, pp. 3-22 to 3-23 and Table 66 and Table 67.

47 SEPA Greenhouse Gas Emissions Technical Report, Figure 4. pp. 2-6.

48 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, p. 5.8-19. FEIS, SEPA Greenhouse Gas Emissions Technical Report, pp. 2-21 to 2-28.

49 Appendix B shows that the FEIS is substantially more uncertain and less reliable from a statistical perspective than a traditional environmental impact assessment that limits the analysis to a narrower local geographic region in proximity to a project. Limiting the FEIS scenarios to a narrower geographic scope, such as Cowlitz County, has a very low standard deviation equal to 0 MMtC02e. However, the standard deviation for the Total FEIS (with the coal mining offset) scenarios and the Total FEIS (without the coal mining offset) scenarios is 435.1 and 386.7 MMtC02e, respectively. The entirety of the uncertainty inherent in the many input assumptions underlying the FEIS is not captured by this analysis.

50 FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-6 and Table 45. The FEIS assumes methane is the largest and most uncertain component of coal mining-related GHG emissions.

demonstrate the uncertainty in coal mining emissions, which supports including the coal mining offset.[51] For the 2015 Energy Policy scenario, the weighted average coal mining emissions rate for the FEIS low estimate is equal to 0.09 MT $C0_2$e/MT coal versus the middle estimate of 0.18 MT $C0_2$e/MT coal. This suggests that at most a 50% reduction in the coal mining offset is appropriate.[52] In addition, the weighted average emissions rate for the FEIS high estimate is equal to 0.26, which suggests that coal mining emissions deduction could be much larger and equal to 142%.[53] Even with a 50% reduction in the estimated GHG emission from the coal mining offset to account for uncertainty, the total estimated net lifecycle GHG emissions from the Project are negative and equal to -21.01 $MMtCO_2$e.[54]

Further evidence supports the conclusion that PRB coal has lower mining-related emissions than other comparable coal that it is expected to substitute/displace as a result of the Project. The NETL Report expects PRB coal mining to have lower coal mining emissions rates than alternative coal origins it will displace.[55]

For all of these reasons, if a lifecycle analysis is relied upon to determine significance of the Project, the 2015 Energy Policy scenario analysis that includes the coal mining offset should be used to avoid overstating emission estimates. The FEIS 2015 Energy Policy scenario analysis with the coal mining offset supports the conclusion of *de minimis* or negative levels of estimated net GHG emissions from the Project. This conclusion holds even if the estimated coal mining related estimated GHG emission are reduced by 50%.

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51 SEPA Greenhouse Gas Emissions Technical Report, p. 3-6 and Table 45. While the FEIS appears to have relied solely on the middle estimate for all scenarios, its range estimates report coal basin specific variation. Sometimes the variation in the coal extraction emissions rates for individual mines is as high as a 300% difference from the low to the high estimate. (e.g. China .16 vs .44 and Russia .05 vs .15). Other times the variation in the coal extraction emissions rates is modest (Other US underground mines observe a 33% increase in the emissions rate from the low to the high scenario (.15 vs .20).

52 50% = .09/.18 MT C02e/MT coal. MT = metric ton of coal. For the FEIS 2015 Energy Policy scenario analysis, the PRB coal mining emissions rate of .02 will displace coal with a weighted average coal mining emissions rate equal to .18 (middle/modeled). Specifically in the middle (or "modeled") scenario PRB (.02) is lower than China (.30), Russia (.15), Indonesia (.02) and Australia (.04). The FEIS low range reports PRB (.02) is lower than China (.16), Russia (.05), and Australia (.04) but higher than Indonesia (.01). FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-6 and Table 45. This adjustment is based on the FEIS methane emissions rates, which it indicates is a major source of GHG emissions in coal mining and for which is subject to a high degree of uncertainty. This estimated adjustment is conservative because the non-methane component of the GHG emissions is less uncertain than the methane component uncertainty used.

53 142% = 0.26/0.18 MT C02e/MT coal. Specifically in the middle (or "modeled") scenario PRB (.02) is lower than China (.30), Russia (.15), Indonesia (.02) and Australia (.04). The FEIS high range reports PRB (.02) which is lower than China (.44), Russia (.16), and Australia (.13) and Indonesia (.04). SEPA Greenhouse Gas Emissions Technical Report, p. 3-6 and Table 45.

54 Specifically, in the 2015 Energy Policy scenario 50% of the 85.30 $MMtCO_2$e coal mining offset is equal to 42.53 $MMtCO_2$e (50% *85.90 $MMtCO_2$e). Therefore the FEIS net estimated GHG emissions without the coal mining offset equal to 21.76 $MMtCO_2$e should be reduced by the 42.23 $MMtCO_2$e coal mining offset, which yields -21.01 $MMtCO_2$e (-21.01 = 22.36-42.53).

55 Specifically, NETL expects PRB coal to have 25% lower GHG emissions than Australia coal and 31% to 39% lower than Indonesia coal For Australia 25% = 6.78/27 (kg CO_2e/MWh); For Indonesia Adaro, 39% = 6.78/17.38 (kg CO_2e/MWh) and Indonesia Muria 31% = 6.78/21.99 (kg CO_2e/MWh). Life Cycle Analysis of Coal Exports from the Powder River Basin, National Energy Technology Lab of the U.S. DOE, August 2016, p. B-3 (Table B-1).

2. *All FEIS scenarios appear to overstate vessel and railroad-related estimated net GHG emissions from the Project*

As discussed below, all of the FEIS scenarios appear to overstate vessel and railroad-related estimated net GHG emissions from the Project.

a. Overstated vessel-related estimated net GHG emissions

All of the FEIS scenarios overstate the vessel-related estimated GHG emissions from the Project because the FEIS assumes that the majority of PRB coal will be delivered to China, Hong Kong, and Taiwan. Instead, MBT-Longview expects Japan and South Korea to be the primary purchasers of PRB coal, which are destinations that are closer to the Project. The FEIS assumption overstates the estimated net GHG emissions from the Project because it overstates the vessel transportation distances (i.e., nautical miles) required to move PRB originating coal to Asia in the future.[56]

The assumption that the majority of PRB coal will be delivered to China, Hong Kong, and Taiwan is contrary to the commercial expectations from MBT-Longview, which is that substantial volumes of PRB coal will be delivered to Japan and South Korea. The Draft NEPA EIS discusses Japan and South Korea as the primary market (along with Taiwan).[57] The report identifies the strong demand for coal by these countries and recognizes that the heat value of subbituminous PRB coal produced is desired by these countries.[58] The Draft NEPA EIS also recognizes the closer proximity of the Project to Japan and South Korea.[59] In addition, the Westshore Terminal, which is to the north of the Project, is currently shipping coal to Japan and South Korea.[60]

Further, the NETL Report of the estimated lifecycle net GHG emissions from exports of PRB coal to Asia (discussed below) assumes Japan, South Korea, and Taiwan to be the potential customers of PRB exports because of their historical reliance on steam coal imports, expected future steam coal demand, and logistically-feasible location for West Coast U.S. terminals.[61]

The 2015 Energy Policy scenario assumes just 15.6% and 21.9% of the PRB originating coal from the Project will be delivered to Japan and South Korea, respectively.[62] However, these

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56 The vessel-related emissions may be overstated for additional reasons, however, insufficient workpapers provided for the FEIS and the vessel-related emissions calculations limited the ability to investigate.

57 Millennium Bulk Terminals—Longview, Draft NEPA Environmental Impact Statement, Chapter 2: Purpose and Need, Page 2-2.

58 *Id.*

59 Millennium Bulk Terminals—Longview, Draft NEPA Environmental Impact Statement, Chapter 2: Purpose and Need, pp. 2-1 to 2-5.

60 "Westshore's U.S. customers sell the majority of their thermal coal exports to utilities in Japan, Korea, and Chile, with minor exports to Taiwan and China. Japan and Korea, important Canadian trading partners, rely heavily on imports of thermal coal for electricity generation." http://www.westshore.com/#/facts

61 Life Cycle Analysis of Coal Exports from the Powder River Basin, National Energy Technology Lab of the U.S. DOE, August 2016, p. 4.

62 China (8.9%), Hong Kong (21.5%) and Taiwan (32.1%) Based on data from the MBT-Longview_GHG_Analysis_FinalEIS.xls at tab Interpolated Results_25.

countries are 20% closer (or 1,000 nautical miles) to the U.S. than China, Hong Kong, and Taiwan.[63] PRB coal will likely be more competitive in Japan and South Korea because reducing the vessel distances reduces the delivery costs.

Adjusting the distribution of coal deliveries from the Project to reflect a higher proportion of PRB coal destined to the closer countries (40% Japan, 40% South Korea, and 20% Taiwan or Hong Kong) reduces the vessel-related estimated GHG emissions by approximately 16.8% for the 2015 Energy Policy scenario and 29.8% for the No CPP scenario.[64]

b. Overstated railroad-related estimated net GHG emissions

All of the FEIS scenarios overstate the estimated railroad-related net GHG emissions from the Project because they do not appear to include the offset from avoided GHG emissions from inland railroad and other transportation of coal that is displaced by the Project's coal exports. Specifically, the FEIS includes increased GHG emission from the new railroad transportation needed to deliver PRB coal from the origin mines to the port, but does not appear to reduce the estimated GHG emission from reduced railroad and other transportation needs for the countries (China, Russia, Indonesia, and Australia) that will deliver less coal from their inland origin mines to ports. In other words, there is an offsetting effect that is not accounted for in the FEIS net estimated lifecycle emissions analysis.

China and Russia are the largest coal sources that the FEIS expects PRB coal from the project to displace. In both countries, the coal mining regions are inland and generally distant from the ports, thereby requiring rail transportation to deliver the coal from the mines to the port before being loaded onto ocean-going vessels for delivery to other Asia Pacific destinations, including Taiwan, Hong Kong, China, Japan, and South Korea. Consequently, lower estimated net GHG emissions from the Project will result because less rail transportation inland within China and Russia will occur when PRB coal displaces Chinese and Russian coal.

For example, in China, the major coal basin is Shanxi,[65] which is on average approximately 590 miles from the nearest major ports.[66] In addition, in Russia, the eastern coal basins most accessible to Asia Pacific demand via ports are an average of 790 miles from the nearest ports.[67]

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63 Japan and South Korea are 4,344 and 4,481 nautical miles from MBT-Longview, respectively. Hong Kong, Taiwan and China are 5,670, 5,455 and 5,290 nautical miles from MBT-Longview, respectively. MBTL_GHG_Analysis_FinalEIS.xlsx, Distances Summary worksheet, cells c45:c49, divided by 2 (to convert from round-trip to one-way), divided by 1.151 (to convert from miles to nautical miles)

64 Calculations based on MBTL_GHG_Analysis_FinalEIS.xls at tabs Interpolated Results_25, Distances Summary, Energy Policy and Scenario Data.

65 Jincheng, which is the top coal mining towns in Shanxi province in China, is assumed be the origin location of the coal basin.

66 The identified ports and distance from the Jincheng, Shanxi include: Qinhuangdao (642), Tianjin (490), Lianyungang (702), Yangtze River (674). Miles were estimated by Google maps. Assumptions were required as the FEIS did not provide sufficient information to understand what was assumed. IEA, (2009). Cleaner Coal in China. Available at: https://www.iea.org/publications/freepublications/publication/coal_china2009.pdf

67 Yuzhno Yakutsky is approximately 1233 and 1243 miles from Vanino and Vladivostok ports, respectively. Bureinsk is approximately 609 and 3383 miles from Vanino and Vladivostok ports, respectively. Zyryansky is approximately 424 miles and 1740 miles from from Ambarchik and Vladivostok ports, respectively. Miles were estimated by Google maps. IEA, (2014). Energy Policies Beyond IEA Countries: Russia 2014.

Consequently, the FEIS railroad-related estimated net GHG emissions from the Project should be reduced by 48% for Chinese coal (590/1223 miles) and by 64.6% for Russian coal (790/1223 miles) when displacing PRB coal.[68]

Further, the FEIS appears to overstate estimated GHG emission by not deducting estimated GHG emissions reductions that can be expected to occur in Indonesia and Australia associated with inland railroad and other transportation of coal that will no longer be needed as a result of displacement by PRB coal (i.e., offsetting adjustment). According to the NETL Report, which is discussed further below, approximately 140 miles (225 km x 0.62 miles per km) of railroad transportation is expected to be needed for inland transportation of Australian coal to deliver to the port. In Indonesia, approximately 49 miles (79 km x 0.62) of higher GHG emitting truck transportation and 150 miles (250 km x 0.62) of barging transportation is expected to transport Indonesian coal from the origin locations to a centralized location accessible for ocean-going vessels loading capabilities.[69] The FEIS does not appear to estimate the appropriate deductions of railroad-related estimated GHG emissions. Consequently, the FEIS railroad-related estimated net GHG emissions should be reduced by 8.9% for Australian coal and by 26.1% for Indonesian coal when displacing PRB coal.[70]

For the FEIS 2015 Energy Policy scenario, the railroad-related estimated net GHG emissions should be reduced by 43%. This calculation incorporates the adjustment factors discussed above along with the coal production displacement by each country resulting from the displacement by PRB coal due to the Project.

3. The No CPP scenario appears to overstate the estimated net GHG emissions from the Project

The FEIS's No CPP scenario overstates the estimated net GHG emissions from the Project by underestimating the reduction in estimated GHG emissions that can be expected to occur in the U.S. as the Project causes U.S. natural gas-fired power plants to substitute for coal-fired power plants. Specifically, the Project causes coal prices to rise from increased U.S. coal demand which makes lower GHG emitting natural gas-fired power plants more competitive compared to coal-fired power plants, leading to substitution of natural gas for coal power generation. Consequently, a reduction in estimated GHG emissions results from the Project.

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https://www.iea.org/publications/freepublications/publication/Russia_2014.pdf SUEK Annual Report (2015). Fueling Industry, Powering the World. page 51. http://www.suek.com/upload/files/pdf/en/SUEK_Annual_Report_2015_eng.pdf. World Mining Atlas. https://mining-atlas.com/operation/Zyryansky-Coal-Mine.php.

68 For this calculation Montana originating PRB was assumed. This calculation assumes that China and Russia railroad-related GHG emissions rates are the same as the U.S. It is possible that U.S. is cleaner.

69 Life Cycle Analysis of Coal Exports from the Powder River Basin, National Energy Technology Lab of the U.S. DOE, August 2016, Table 4-5, p. 26.

70 According to NETL, Australia can be expected to have 1.51 kg CO_2/mwh power generated from rail transportation of coal to the port, which is 8.9% of the PRB GHG emission level (of 16.9). Also, Indonesia can be expected to have 3.89 and 4.92 kg CO_2/mwh power generated from barging and trucking coal to the port, which is 23% and 29.1% of the PRB railroad GHG emissions (of 16.9) for Adero and Mulia (which is 26.1% as an average). Life Cycle Analysis of Coal Exports from the Powder River Basin, National Energy Technology Lab of the U.S. DOE, August 2016, p. B-3 (Table B-1).

As Figure 4 below shows, the No CPP scenario forecasts effectively no substitution of natural gas-fired power generation for coal-fired generation from the Project. The FEIS result appears to be driven by an error in the U.S. coal price forecast which assumes U.S. coal prices are unchanged from the Project's increased demand for coal (44 million tons per year).[71] The unchanged U.S. coal prices in the FEIS No CPP scenario is inconsistent with the Draft EIS analysis which reported decreases in U.S. coal prices from the Project.[72] Further, this result is implausible because favorable economic conditions exist in the U.S. downstream power markets where substantial coal and natural gas fired competition exists due to economical local natural gas and coal resources. This fuel competition in the U.S. is documented by the U.S. Energy Information Administration (EIA).[73]

Figure 4: FEIS Estimated Net GHG Emissions from Coal and Natural Gas Combustion in the U.S. ($MMtCO_2e$)[74]

	2015 Energy Policy	No CPP
U.S. Market		
Decrease Coal	(14.02)	(0.04)
Increase Gas	0.89	0.00
Net Emission Change	(13.13)	(0.04)

The FEIS No CPP scenario should be adjusted to reflect at least the same level of offsetting reduction in estimated GHG emissions in the U.S. reported in the 2015 Energy Policy scenario.[75]

71 FEIS, SEPA Coal Market Assessment Technical Report, April 2017, p 4-9. It seems further suspect that the No CPP scenario assumes no change in coal prices when 100% of the coal exported by the Project is assumed to solely originate in Montana PRB as compared to the $1 per ton price decrease that results in the 2015 Energy Policy scenario where coal exported by the Project is assumed to originate from MT and WY and a few other locations. See SEPA Coal Market Assessment Technical Report, April 2017, Table 5-1). MBTL_GHG_Analysis_FinalEIS.xlsx, Interpolated Results_25 worksheet, cells A263:W293. It is unlikely that the Montana PRB coal supply curve (where all of the exported coal is projected to originate) would be perfectly flat and cause no change in the U.S. coal price.

72 In the DEIS, Coal Market Assessment Technical Report, the No CPP scenario is equivalent to the Past Conditions which states that the Past Conditions results, "Thermal U.S. coal consumption at electric power plants is lower because once the terminal comes online and is exporting coal the U.S. coal prices increase slightly, which causes a downward shift in U.S. coal demand." (p. 6-15)

73 See section V.F., below, for an explanation of short-run marginal cost (SRMC). The U.S. EIA has documented the competitiveness of coal and natural gas power generation which has led to natural gas-fired power generation displacing coal-fired power generation. The U.S. EIA has documented the competitiveness of coal and natural gas power generation which has led to natural gas-fired power generation displacing coal-fired power generation.

74 FEIS, SEPA Greenhouse Gas Emission Technical Report, April 2017, Table 62.

75 In addition, the FEIS workpapers are not sufficiently detailed to revise this analysis more specifically. The lower Bound scenario includes a more robust representation of the competitiveness of fuels in the U.S. with an offset approximately equal to -66 $MMtCO_2e$. The 2015 Energy Policy Scenario may also understate the U.S. fuel competition and potential substitution associated with the coal price increase from the Project.

D. There is independent support from the U.S. Department of Energy that the Project is not likely to cause increased net GHG emissions

The NETL Report analyzed the net lifecycle GHG emissions estimates from exports of PRB coal to Asia.[76] This independent government study reaffirms the uncertainty of the lifecycle analysis. The NETL Report concludes that there is too much uncertainty to ensure that a definitive difference exists between the lifecycle GHG profiles between the PRB and alternative coal sources.[77]

The NETL Report provides a lifecycle net GHG emissions estimate for coal that originates in the PRB, Indonesia, and Australia and that is delivered to certain Asia Pacific destinations, including Japan, South Korea, and Taiwan.[78] The NETL Report assumes Japan, South Korea, and Taiwan to be the potential customers of PRB exports because of their historical reliance on steam coal imports, expected future steam coal demand, and logistically-feasible location for West Coast terminals.[79] The NETL Report deems Indonesia and Australia likely competitors of the PRB coal as they are current major suppliers of steam coal to Japan, South Korea, and Taiwan.[80]

The NETL Report compares GHG emissions from different sources serving Asia Pacific (PRB, Australia, and Indonesia). The analysis calculates a cradle-to-busbar[81] lifecycle GHG emissions estimate for each coal origin.[82] The cradle-to-busbar reference indicates that the quantification of GHG emissions includes the entirety of the potential GHG emissions beginning at the coal origin, i.e., from the mining of the coal, including the transport of the coal to its final market, through the combustion of coal to create electricity to provide to consumers.

The NETL Report concluded that there is no definitive difference between the lifecycle GHG for coal originating in the PRB, Australia, or Indonesia for delivery to Japan, South Korea, or Taiwan. The following are a few quotes from the NETL Report discussing its conclusion.

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76 Life Cycle Analysis of Coal Exports from the Powder River Basin, National Energy Technology Lab of the Department of Energy, August 2016.

77 *Id*., p.e 4.

78 *Id*., p 4.

79 *Id*., pp. 2 and 16.

80 *Id*.

81 Busbar refers to the electric power distribution system that supplies consumers.

82 Life Cycle Analysis of Coal Exports from the Powder River Basin, National Energy Technology Lab of the Department of Energy, August 2016, page 13. NETL and the FEIS are similar and yet different analyses. Specifically, NETL provides a lifecycle emissions estimate for certain locations to certain destinations to enable one to compare GHGs across alternative coal sources that could serve Asia. In addition, NETL reports the lifecycle GHG emissions estimates on a megawatt hour of power generation unit basis. Whereas, the FEIS estimates the incremental difference in lifecycle GHG emissions associated with coal moving from MBT-Longview to Asia less the vessel related GHG emission in the no action case which assumes absent MBT-Longview coal would originate from a different location, and therefore reports a net lifecycle emissions estimate. The NETL results could be made more equivalent to the FEIS results by comparing the lifecycle emissions estimate associated with PRB coal to that for one of the other source coals (assuming that PRB would be displacing that other source coal).

"Given the uncertainty in the model parameter values, there is not a definitive difference between the life cycle GHG profiles between sourcing coal from the U.S. (PRB), Australia, or Indonesia for Japan, South Korea, or Taiwan." NETL at 4.

"…[w]hen accounting for the uncertainty, it is difficult to attribute any significant difference between the various coal sources." NETL at 32.

"…[G]iven the uncertainty in the model parameter values, there is not a definitive difference between the life cycle GHG profiles between sourcing coal from the U.S. (PRB), Australia, or Indonesia for Japan, South Korea, or Taiwan." NETL at 32.

For these reasons, the NETL Report supports the conclusion that the Project is not likely to cause increased net estimated lifecycle GHG emission because the uncertainty is too large to ensure that a definitive difference exists between the lifecycle GHG profiles between the PRB and alternative coal sources.

E. The FEIS results do not support a probable impact of increased net GHG emissions

From an economic and statistical perspective, the FEIS results do not support a conclusion that there is a probable impact from the estimated net lifecycle GHG emissions attributed to the Project.

Within economic and statistical analyses, a probable event is one that is likely, highly likely, or nearly certain to occur. Probable infers a substantial degree of certainty in the likelihood of an outcome. An assessment of the probability or statistical likelihood of an event occurring and the consequences from that event can inform decisions by helping discern if an event is merely possible or if it is probable or not probable.

The totality of energy and economic evidence from the FEIS scenarios do not support the conclusion that the Project will lead to an increase in net estimated GHG emissions as a probable event. As shown in Figure 5, the 2015 Energy Policy scenario and two other scenarios (No CPP and Lower Bound) report reduce levels of estimated net GHG emissions from the Project with the entire lifecycle considered (with the coal mining offset) [83] Thus, three FEIS scenarios report negative levels of estimated net GHG emissions from the Project and the remaining scenario, the Upper Bound scenario, is implausible and unsupported as discussed at length above and in Appendix B.

[83] FEIS, SEPA Greenhouse Gas Emission Technical Report, April 2017, Table 62. These FEIS results include the coal mining offset. As discussed above, if a lifecycle analysis is relied upon for regulatory decision-making, the FEIS scenarios with the coal mining offset included in the analysis (-63.5 $MMtCO_2e$) because it is inappropriate to "pick and choose" pieces of the lifecycle emissions analysis to include, as the FEIS attempts to do so.

Figure 5: FEIS and Adjusted FEIS Net Estimated GHG Emissions (MMtCO$_2$e)

Scenario	FEIS[84] With Coal Mining Offset	FEIS Adjusted With Coal Mining Offset	FEIS Adjusted Without Coal Mining Offset
Lower Bound	-122.04	-129.20	-48.46
2015 Energy Policy	-63.54	-70.17	15.73
No CPP	-4.75	-24.32	32.18

Furthermore, as discussed above, the FEIS net estimated GHG emissions are conservative and overstate emissions. As shown in Figure 5, making the adjustments to the FEIS (reflected in the FEIS Adjusted scenarios) would further reduce the estimated net GHG emissions from the Project. As discussed above, even if the coal mining estimates were to be somewhat reduced, the FEIS Adjusted net estimated GHG emissions would still be *de minimis* or result in negative levels.[85]

An independent analysis from NETL reaffirms the reasonableness of the conclusion as no probable or definitive increase in estimated net lifecycle GHG emissions resulting from the Project can be concluded.

For all of these reasons, the FEIS scenarios (with the exception of the Upper Bound scenario, which is implausible) do not support a conclusion of a probable increase in the estimated net GHG emissions from the Project. To the extent that the probable impact requirement under the SEPA regulation has a statistical and economic underpinning, the FEIS does not support a conclusion of probable or statistically likely increased net GHG emissions.

F. There are substantial energy and economic reasons to expect the estimated net GHG emissions from the Project to be *de minimis* or negative levels

There are substantial reasons to expect the estimated net GHG lifecycle emissions from the Project to be *de minimis* or negative levels.[86]

First, the PRB coal that will be exported to Asia is generally higher quality (i.e., heat content) and lower GHG content than other potential substitute subbituminous coals.[87] The combustion of PRB coal would therefore have lower estimated GHG emissions than these other subbituminous coals.

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84 FEIS, SEPA Greenhouse Gas Emissions Technical Report, pp. 3-23 and Table 67. These FEIS results include the coal mining offset.

85 The 2015 Energy Policy scenario estimated net GHG emissions is equal to -27.64 if only 50% of the coal mining adjustment is incorporated (along with including the adjustments to account for the overstatement in vessel and railroad related emissions.)

86 Negative estimated net GHG lifecycle emissions for a FEIS scenario indicate that the changes from the Project caused the total net lifecycle emissions to be reduced as compared to the no action case. Therefore, the estimated net GHG lifecycle emissions are less than 1.

87 FEIS SEPA Greenhouse Gas Emissions Technical Report, Table 40.

Second, the Project should have little if any impact on additional estimated net estimated GHG emissions from the combustion of coal in Asia. This occurs for a few reasons. While the Project will increase coal supply in the Asia Pacific region, the coal price impact should be very small because the quantity of coal from the Project is small relative to the very large Asian market (approximately 1.3%).[88]

In addition, the economics of the short-run marginal cost (SRMC),[89] which is used to determine the rank order that power plants are turned on, demonstrates that coal-fired power plants are generally lower cost and do not compete with natural gas-fired power plants in South Korea, Japan, and Taiwan and would not be expected to compete in coastal China locations where PRB or other imported coal might be attractive.[90] A primary reason that natural gas-fired power plants are more expensive to operate in Asia is because they are reliant on imports of more expensive liquefied natural gas (LNG) and fuel costs are a substantial portion of the SRMC of a power plant.[91] Consequently, a small decrease in the price of coal is not likely to cause other plants to be more competitive and operate in their place. The Project's impact on estimated net GHG emissions in Asia should be negligible at best.[92]

Third, the Project should reduce estimated GHG emissions in the U.S. because the Project causes U.S. coal demand to rise and higher demand results in higher coal prices enabling lower GHG emitting fuels such as natural gas to be more competitive and substitute for coal-fired power generation. This result is contrary to the impact on Asian countries for two reasons: the coal price impact should be larger in the U.S. because the Project quantities represent a larger portion

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88 See for example Table 6-4 in FEIS SEPA Coal Market Assessment Technical Report, which shows 2016 Total Asian Coal Consumption of 3,395 million metric tons (for the No CPP, No-Action alternative), compared to exports of 44 MM metric tons (1.3% = 44/3,395).

89 In essence the SRMC analysis seeks to evaluate the potential impact of the lower coal price from the Project on the dispatch rank order of the power plants in the system, to discern if the plants would operate more often (i.e., likely to be dispatched more frequently, in advance of natural gas-fired power plants), thereby inducing coal demand and increasing GHG emissions in the Pacific Basin study region. Least-cost dispatch, also referred to as economic dispatch, is the power system approach to dispatching power plants (i.e., turning them on) over the course of a day based on each generating unit's SRMC. SRMC is the economic cost metric used to identify the rank order of the power plants to conduct the economic operations of a power system, with the lowest SRMC plants being dispatched first, and higher SRMC plants being dispatched as needed, up until the point where supply meets demand. SRMC is the cost that accrues when a power plant produces more electricity. SRMC excludes any fixed costs from the construction, operation and maintenance of the power plant. The least-cost dispatch approach is necessary because electricity demand, also referred to as electrical load or consumption, varies over the days of the week and the hours of the day. The pattern of electrical consumption is generally low in the middle of the night, slowly rising in the morning, peaking in the middle of the day, and falling in the evening hours

90 Millennium Bulk Terminals - Longview Coal Export Terminal. Comments on Draft Environmental Impact Statement (Draft EIS), June 13, 2016, Attachment 4- Greenhouse Gas Technical Reports and Memoranda.

91 Coastal China natural gas power plants are heavily reliant on LNG for natural gas and therefore face comparable SRMC economics of low SRMC for coal-fired power plants and higher SRMC for natural gas fired power plants leading to little competition and impact from a coal price change. Millennium Bulk Terminals - Longview Coal Export Terminal. Comments on Draft Environmental Impact Statement (Draft EIS), June 13, 2016, Attachment 4- Greenhouse Gas Technical Reports and Memoranda.

92 Further the small decrease in coal prices in Asia will have an even smaller impact on the consumers retail electricity rates, which is not likely to impact consumption of electricity (e.g., causing consumers to turn more lights, run more appliances, etc.). Millennium Bulk Terminals - Longview Coal Export Terminal. Comments on Draft Environmental Impact Statement (Draft EIS), June 13, 2016, Attachment 4- Greenhouse Gas Technical Reports and Memoranda.

of the smaller U.S. coal market;[93] and the SRMC economics demonstrate that coal-fired power plants generally compete with natural gas-fired power plants in the U.S. as a result of abundant local coal and natural gas resources.[94] There are a few additional factors to be considered, including the following:

Fourth, the Project will reduce estimated GHG emissions associated with different mining techniques from PRB coal compared to other international coals (i.e. coal mining offset) it will displace. The coal mining offset is the difference in coal mining-related GHG emission associated with PRB coal versus alternative international coals (e.g. China, Russia, Australia and Indonesia) that the FEIS assumes are displaced by the Project. PRB coal mining is generally lower estimated GHG emissions than international comparable coals (such as China and Russia) that it will displace.[95] The FEIS does not incorporate the coal-mining offset in its mitigation recommendation.

Fifth, the Project will cause a modest increase in estimated GHG emissions because different transportation routes to Asian destinations will result. Specifically, rail and vessel transportation for PRB origin locations have longer transportation routes.

- **Vessel-Related GHG emissions**: Regarding the vessel-related transportation, the longer U.S. routes to Asia should be offset for the transportation no longer needed from other origins and the FEIS attempts to do so. However, the FEIS assumes PRB coal is destined to more distant locations (China, Hong Kong, and Taiwan) rather than to nearer locations such as Japan and South Korea, which are more economical and consistent with commercial expectations. This assumption overstates the FEIS vessel-related estimated GHG emissions.

- **Railroad-related GHG emission**: As discussed in Section V.C. above, regarding railroad transportation, an offset is appropriate because PRB coal displaces other coal origins (such as China, Russia, Australia, and Indonesia) which require inland transportation of coal (rail/truck/barge) to deliver coal from the mines to the ports. The FEIS did not appear to include this offset.

Lastly, the Asian coal-fired power plant fleets (China, Japan, South Korea, and Taiwan) operate more efficiently than U.S. coal-fired power plants and therefore they use less coal to produce a single unit of electricity (kilo-watt-hour or kWh) thereby reducing GHG emissions as a result of the Project.[96] The operational efficiency of the Asian countries' fleets of coal-fired power plants is expected to be superior to the U.S. coal-fired power plant fleet during the operating life of the Project. Asian countries' coal-fired power plant fleet comprises newer plants equipped with

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93 Millennium Bulk Terminals - Longview Coal Export Terminal. Comments on Draft Environmental Impact Statement (Final EIS), April, 2017, Attachment 4- Greenhouse Gas Technical Report. p. 3-26.

94 Millennium Bulk Terminals - Longview Coal Export Terminal. Comments on Draft Environmental Impact Statement (Draft EIS), June 13, 2016, Attachment 4- Greenhouse Gas Technical Reports and Memoranda.

95 FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-6 and Table 45. Life Cycle Analysis of Coal Exports from the Powder River Basin, National Energy Technology Lab of the U.S. DOE, August 2016, p. B-3 (Table B-1).

96 Millennium Bulk Terminals - Longview Coal Export Terminal. Comments on Draft Environmental Impact Statement (Draft EIS), June 13, 2016, Attachment 4- Greenhouse Gas Technical Reports and Memoranda.

better technological capabilities that require a lower quantity of coal to produce a single kWh. On average the U.S. fleet of coal-fired power plants is approximately 15% less efficient than the South Korean and Japanese coal-fired power plant fleets, and approximately 10% less efficient than the Chinese fleet.[97]

VI. CAUSAL RELATIONSHIP AND IMPACT DETERMINATION

The relationship between GHG emissions and climate change effects is complex and occurs at a global level over a very long time horizon. Changes in the earth's climate depend on the balance between energy entering and leaving the earth's atmospheric system, and a number of both natural and human factors can affect the energy balance,[98] including changes in:

- The amount of energy from the sun reaching the earth;
- The reflectivity of earth's atmosphere and surface; and
- GHG concentrations that affect the amount of heat retained by earth's atmosphere (i.e., the greenhouse effect).

All three of these factors occur at a global level. In the case of GHG concentrations, while the emission of GHGs can occur at a local level, the functional linkage between climate change effects and the concentration of GHGs happens as a global phenomenon, as follows:

1. GHG emissions may occur at a local level, whether through a natural event or through human-induced activity.
2. Over very long time periods, the combined emissions from all local-level GHG sources in the world contribute to discernable changes in the overall global atmospheric concentration of GHGs.
3. Increased global concentrations of GHGs result in a warming effect by absorbing long-wave energy emitted from the earth's surface, preventing its immediate escape from the earth's system and then re-emitting this energy, warming the earth's surface and lower atmosphere.
4. The warming effect causes the temperature of the surface to increase, which then causes changes to the drivers of the global climate patterns as a whole.
5. The climate is changed globally, with differential changes of temperature, precipitation, storm intensity, wind profiles, and other effects experienced at local levels across the earth.

This functional relationship between GHGs and climate change creates complexity and uncertainty when seeking to establish the causal relationships required by NEPA and SEPA for analyses of an action's potential impacts.

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97 Millennium Bulk Terminals - Longview Coal Export Terminal. Comments on Draft Environmental Impact Statement (Draft EIS), June 13, 2016, Attachment 4- Greenhouse Gas Technical Reports and Memoranda.

98 See https://19january2017snapshot.epa.gov/climatechange_.html for a more detailed description.

A. The use of GHG regulatory thresholds as a proxy for significance does not ensure an apples-to-apples assessment and comparison between emission levels and "significant impacts"

The FEIS concludes that the estimated net GHG emissions attributable to the Project (as presented in the FEIS) are significant based on comparisons to GHG regulatory thresholds[99] from the Washington State Clean Air Rule and the U.S. Environmental Protection Agency's (U.S. EPA) Tailoring Rule[100]

> *"These standards provide guidance on assessing significance of various levels of greenhouse gas emissions… Since the net GHG emissions attributable to the Proposed Action in the preferred scenario exceed these standards, the emissions…are considered adverse and significant."* [101]

The Washington State Clean Air Rule establishes a compliance threshold of 100,000 metric tons of CO_2e[102] per year and only applies to direct emissions from certain stationary sources, petroleum fuel producers or importers distributing fuel in Washington State, and natural gas distributors in Washington State. The Project is not one of these sources. The U.S. EPA's Tailoring Rule applies to facility sources that emit more than 75,000 short tons of CO_2e per year and applies to direct GHG emissions. The Project is not one of these sources.

Neither of these thresholds was established from a risk or significance basis in a NEPA or SEPA context; rather, they represent intensity thresholds for defined boundary conditions, above which regulatory requirements are activated. As a result, the comparison applied in the FEIS does not use an apples-to-apples basis, and is misleading when considering environmental impacts under SEPA or NEPA.

B. The FEIS conclusion on significant impact overly simplifies the complex causal relationship between GHG emissions and climate risk

The FEIS's conclusion with respect to the significance of estimated net GHG emissions must be viewed with caution given the FEIS's context, which seeks to assess a particularly wide geographical scope in terms of GHG emissions (in the U.S., Asia Pacific, and in between during transportation) and a more local geographical scope of climate change effects in Washington State.

The FEIS does not link GHG emissions to any specific impacts that would only happen if the Project is approved. It generally describes climate change impacts with the implication that any incremental new GHG emissions contribute to those overall climate impacts; and the FEIS does

[99] Section 5.8.1.6, p. 5.8-20, FEIS.

[100] 40 Code of Federal Regulations [CFR] Parts 51, 52, 70 *et al*.

[101] FEIS, Section 5.8.1.6, Third paragraph, p. 5.8-20.

[102] CO_2e is a measure used to compare the emissions from various GHGs based upon their global warming potential; CO_2e is commonly used as a metric to sum GHG emissions.

not distinguish any differences in climate change impacts between the Project proposal and the no action alternative.[103]

For two reasons, it is not possible, with any degree of confidence, to attribute potential project-level GHG emissions to any local climate change impacts. The first reason is the nature of the functional relationship between GHGs and climate change, i.e., while GHG emissions do occur at a local level, the functional linkage between climate change effects and GHGs is a global phenomenon related to the aggregation of all the GHGs in the atmosphere and not sole emissions from any one project.

The substantial differences in the magnitude between local-level GHG and global concentrations contribute to the difficulty of assessing potential climate change impacts of project-level activities. For example:

- Typical project-level emissions can be thousands or millions of metric tons of CO_2e;
- Global annual emissions are at the level of billions of metric tons of CO_2e;[104] and
- The global CO_2 concentration recorded in March 2016 was 404 parts per million (ppm),[105] which equates to 3,153 billion metric tons (gigatons or Gt) CO_2.[106]

Second, the level of resolution available from modeling and analytical approaches does not allow for casual relationship to be established between project-level emissions and localized, climate-related impacts. Directly linking project-level emissions to climate change effects is not possible based upon current scientific, meteorological, and statistical methods and models. General Circulation Models (GCMs) are the best-available tools for simulating the response of the global climate system to increasing GHG concentrations. GCMs are complicated numerical models that represent physical processes in the atmosphere, ocean, cryosphere, and land surface; they are built and run at a global level and calibrated using historical trends and data. GCMs are used to project future changes in climate on the basis of differing GHG emissions scenarios.

The range of GCMs provides differing representations of the earth's response to man-made contributions and natural climate variability. Ensembles of GCMs can simulate the response to a range of different scenarios, map out a range of possible future projections, and facilitate

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103 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, Section 5.8.2.5, p. 5.8-40, FEIS, which states "*Ongoing and expanded operations in the project area* [for the No-Action Alternative] *would be affected by climate change as described for the Proposed Action.*"

104 Annual global GHG emissions reached 49.5 billion metric tons (giga tons or Gt) of CO_2e in the year 2010. Source: IPCC. 2014a. *Introductory Chapter. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

105 National Ocean & Atmospheric Administration/Earth System Research Laboratory (NOAA/ESRL). 2016. Trends in Atmospheric Carbon Dioxide (Global). Accessed May 30, 2016. Retrieved from: http://www.esrl.noaa.gov/gmd/ccgg/trends/global.html

106 Conversion using Common Conversion Factors from the Carbon Dioxide Information Analysis Center (http://cdiac.ornl.gov/pns/convert.html#3.) Accessed May 30, 2016.

understanding on associated uncertainties. For example, the latest Intergovernmental Panel on Climate Change (IPCC) projections[107] have been assembled from up to 39 different GCMs. The diversity of various modeling options for the climate system results in a range of climate change projections at global and regional scales. This diversity provides a basis for quantifying uncertainty in the projections. This uncertainty is inevitable and reflects the complexity of the climate system.

The GCMs and their data inputs and outputs are at a scale that is too large to allow individual project assessments. For example, the latest IPCC projections assume a series of cumulative GHG emission scenarios ranging from 510 to 7,010 Gt of CO_2,[108] compared to the FEIS estimate of estimated total lifecycle net GHG emissions (excluding coal mining as per the FEIS scope boundaries) for the Project's lifespan (2018–2038) for the 2015 Energy Policy scenario of 0.022 Gt of CO_2e.[109] The FEIS emissions represent between 0.004 to 0.0003% of the IPCC emission scenarios, which is non-detectable in the GCMs recognizing the inherent uncertainty. Furthermore, the projected climate change effects that the GCMs generate are relatively small compared to the global GHG emission scenarios. The IPCC cumulative GHG emission scenarios ranging from 510 to 7,010 Gt CO_2 anticipate temperature changes from 1.5 to 4.8 degrees Celsius.[110] The GCMs would not be able to detect statistically significant temperature changes attributable to the FEIS GHG estimates. GCMs cannot be run to assess differences attributable to a single project.

In conclusion, the FEIS's use of GHG proxies to enable a conclusion of "significance" overly simplifies the complex causal relationship between estimated net GHG emissions and climate risk.

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107 IPCC, 2014. Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

108 Table SPM.1, page 13, IPCC, 2014. Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

109 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, Section 5.8, Table 5.8-11 of the FEIS, pp. 5.8-20 and 5.8-24. Total emissions for the period 2018–2038 are stated as 22.36 million metric tons of CO_2e and these have been converted to Gt of CO_2e. The FEIS recommended mitigation, equal to 1.99 million metric tons CO2e per year, is based on the FEIS scenario excluding the coal mining offset. As discussed above, while the FEIS reports estimated net lifecycle GHG emissions from the Project with and without the coal mining offset, to the extent that a lifecycle analysis is relied upon, the FEIS scenarios with the coal mining offset should be used for regulatory decision-making as it is inappropriate to be selective of the phases to include in a lifecycle emissions analysis, as the FEIS attempts to do. As discussed in Section V, the FEIS presents estimated net GHG emissions with coal mining equal to -63.5 $MMtCO_2$e and without coal mining equal to 22.3 $MMtCO_2$e for the 2015 Energy Policy scenario. FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-22 to 3-23 and Table 66 and Table 67.

110 Table SPM.1, p. 13, Intergovernmental Panel on Climate Change (IPCC), 2014. Summary for Policymakers. In: Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Edenhofer, O., R. Pichs-Madruga, Y. Sokona, E. Farahani, S. Kadner, K. Seyboth, A. Adler, I. Baum, S. Brunner, P. Eickemeier, B. Kriemann, J. Savolainen, S. Schlömer, C. von Stechow, T. Zwickel and J.C. Minx (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

VII. CONSISTENCY IN GHG ACCOUNTABILITY FOR MITIGATION

As noted above, the FEIS currently includes a mitigation measure requiring 100% mitigation of the estimated net lifecycle GHG emissions from the operations of the Project at maximum capacity.[111] This means that the FEIS requires mitigation against both direct and indirect emissions across the entire lifecycle of the coal from origin to destination including combustion. Importantly, the indirect emissions are outside of the control and influence of MBT-Longview; and as discussed in Section V, these emissions are not probable.

There is strong precedent regarding regulatory frameworks allocating responsibility and accountability for GHG mitigation. In nearly all cases, direct or Scope 1 emissions form the basis for mitigation actions based on where ownership and control lies. Some examples include:

- At a State level, the Washington State Clean Air Rule applies to direct emissions generated by a facility or project. Direct emissions are considered to be from onsite combustion of fuels and other source categories identified in the U.S. EPA Mandatory Reporting Rule. The Washington State Clean Air Rule explicitly exempts emissions from imported and exported fuels. In addition, the Washington State Carbon Dioxide Mitigation Rule requires mitigation of the direct emissions of CO_2 from all new and certain modified fossil-fueled thermal electric generating facilities with station-generating capability of more than 25 megawatts of electricity. Direct emissions are considered to be from onsite combustion of fuels.

- At a national level, the National GHG Inventory[112] accounts for all man-made sources in the U.S. The inventory is developed based on emissions generated within the U.S. (i.e., direct emissions). The U.S. EPA Tailoring Rule follows a similar approach in that it applies to permitting of stationary sources that emit or may emit any regulated air pollutant (which includes CO_2e emissions), in other words direct or Scope 1 emissions.

- At an international level, GHG mitigation and commitments are influenced and framed by the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC came into being on March 21, 1994, and today has near-universal membership. In total, 197 countries known as "Parties to the Convention" have ratified the framework. The Convention specifies that all Parties, taking into account their specific national and regional development priorities, shall develop and disclose to the Conference of the Parties national inventories of anthropogenic emissions by sources and removals by sinks of all GHGs, using comparable methodologies to be agreed upon by the Conference of the Parties. National (country-level) GHG emission inventories are based only on emissions that fall under Scope 1. The pretext

111 The FEIS recommended mitigation, equal to 1.99 million metric tons CO2e per year, is based on the FEIS scenario excluding the coal mining offset. FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, Section 5.8, pp. 5.8-20 and 5.8-24. As discussed above, while the FEIS reports estimated net lifecycle GHG emissions from the Project with and without the coal mining offset, to the extent that a lifecycle analysis is relied upon, the FEIS scenarios with the coal mining offset should be used for regulatory decision-making as it is inappropriate to be selective of the phases to include in a lifecycle emissions analysis, as the FEIS attempts to do. As discussed in Section V, the FEIS presents estimated net GHG emissions with coal mining equal to -63.5 $MMtCO_2$e and without coal mining equal to 22.3 $MMtCO_2$e for the 2015 Energy Policy scenario. FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-22 to 3-23 and Table 66 and Table 67.

112 U.S. EPA Inventory of U.S. Greenhouse Gas Emissions and Sinks; Available at https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks.

under the UNFCCC is that emissions that fall under Scope 2 and Scope 3 for one country will always belong to Scope 1 for another country. At an international level, the principle that the Scope 1 emitter is ultimately responsible for the emissions must be adhered to, and Scope 2 and Scope 3 emissions do not get accounted for in national inventories specifically to avoid the potential for double or triple counting.

- The Asian governments that are likely end-use markets for the Project, including Japan, South Korea, Taiwan and China, are countries with a substantial central government planning role within the electricity sector. These countries have established commitments for GHG emissions reductions and mitigations at a national level. These GHG emission reductions focus on direct, Scope 1 GHG emissions within the countries, and include mitigation of end-uses that would use the coal transported through the MBT-Longview facility such as electricity generation. Appendix D provides further details of these policies.

VIII. CONCLUSION

The FEIS does not demonstrate that a probable estimated net GHG impact is likely to arise from the Project. Since the preponderance of evidence in the FEIS supports the conclusion that the Project will result in *de minimis* or negative estimated net GHG lifecycle emissions, any mitigation agreed to by MBT-Longview associated with the Project should be deemed as voluntary in nature and above and beyond any regulatory requirement.

For any such proposed mitigation, appropriate boundary considerations should be used. In particular, mitigation should focus on direct Scope 1 emissions, both to avoid potential double-counting (due to mitigation efforts being implemented by others across the different lifecycle stages) and to prevent mitigation of emissions that are speculative.

Appendix A

Review of the Scope of Assessment of Greenhouse Gas Emissions and Climate Change in Comparable Projects

This appendix provides a summary of a review of over 40 comparable projects across the U.S. that have, or are, undergoing State Environmental Policy Act (SEPA) and National Environmental Policy Act (NEPA) analyses. Projects were selected based on factors including project similarity (e.g., large infrastructure, resource extraction, and resource shipment) and potential greenhouse gas (GHG) intensity of the project.

The review assessed the environmental impact statement (EIS) scopes of these projects with respect to the boundary scope of analysis of GHG emissions (i.e. did they consider direct and/or lifecycle GHG emissions) and also their approach to determining significance. The table below provides a summary of the findings.

Project Name	Document Type	Document Date	Link	Project Type	Lifecycle GHG Analysis	Approach to Determining Significance
Oregon LNG and Washington Expansion Projects	Draft EIS	August-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=173881	New liquefied natural gas (LNG) project and associated infrastructure	No	No discussion
Westway Expansion Project	Final EIS	September-16	http://www.ecy.wa.gov/geographic/graysharbor/westwayterminal.html	Methanol and crude oil expansion	Yes - considers downstream end use emissions	Compared emissions to increase in total state-wide rail emissions. A comparative analysis of emissions related to operation to state-wide emission reduction, US emission reduction goals with China, total global emissions, and total remaining carbon budget for a 2°C increase was conducted
Surface Coal and Lignite Mining in Texas	Regional Draft EIS	July-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=172759	Coal and lignite mining	No	Compares emissions to US standard per person emissions
Magnolia LNG and Lake Charles Expansion Projects	Draft EIS	July-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=173293	Liquefaction project	No	No discussion
National Highway Traffic Safety Administration Corporate Average Fuel Economy Standards	Final EIS	August-16	https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/mdhd2-final-eis.pdf	Rulemaking for vehicle emission standards	Yes	Uses Social Cost of Carbon (SCC) and also performs modeling of climate projections to assess potential contribution
Great Northern Transmission Line	Draft EIS	June-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=171751	Electricity transmission line	No	No discussion

Project Name	Document Type	Document Date	Link	Project Type	Lifecycle GHG Analysis	Approach to Determining Significance
Four Corners Power Plant and Navajo Mine Energy Project	Final EIS	May-15	http://www.wrcc.osmre.gov/initiatives/fourCorners/documentLibrary.shtm	Coal mine and coal-fired power station	Yes - considers life cycle based on project itself considering coal extraction through to combustion	Provides analysis of SCC
New England Clean Power Link Project	Draft EIS	May-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=168887	Electricity transmission line	No	No discussion
Tongue River Railroad	Draft EIS	April-15	http://www.stb.dot.gov/decisions/readingroom.nsf/fc695db5bc7ebe2c852572b80040c45f/e7de39d1f6fd4a9a85257e2a0049104d?OpenDocument	Rail transport of coal	Yes - looks at the upstream coal mining emissions and also the downstream coal combustion	Uses comparative numbers to give context including number of passenger vehicles on the road, US reduction commitments and the Clean Power Plan
Schofield Generating Station Project at USAG-HI	Final EIS	October-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=179841	Multi-fuel power plant	Yes - looks at life cycle emissions of different fuels including basic transportation, storage, and processing. Over ocean transportation to and from Hawaii are not included.	No discussion

Project Name	Document Type	Document Date	Link	Project Type	Lifecycle GHG Analysis	Approach to Determining Significance
Lake Charles Liquefaction Project	Final EIS	August-15	https://www.ferc.gov/industries/gas/enviro/eis/2015/09-30-15-eis.asp	Liquefaction project	No - looks at GHG emissions from facility construction and operation, but states that "any life-cycle analysis of the emissions from the LNG vessel transits to possible Asian markets or the emissions resulting from the end use combustion of natural gas is too speculative to permit any meaningful consideration."	No discussion
TransWest Express Transmission Project	Final EIS	April-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=89330	Electricity transmission line	No	No discussion
White River Field Office Oil and Gas Development	Final EIS	March-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=89300	Oil and gas production	No - commentary on life cycle issues such as fuel displacement, but no quantitative analysis	Uses Colorado's emissions for comparison
Gulf Coast of Mexico OCS Oil and Gas Lease Sales: 2017-2022	Final EIS	March-17	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=228585	Oil and gas production lease area	No - commentary on life cycle analysis, but no quantitative analysis found	No discussion

Project Name	Document Type	Document Date	Link	Project Type	Lifecycle GHG Analysis	Approach to Determining Significance
Aguirre Offshore Gas Port Project	Final SEIS	February-15	http://energy.gov/sites/prod/files/2015/02/f20/EIS-0511-FEIS-Volume1-2015.pdf	Offshore Gasport, moving LNG by boat	No	Compared to Puerto Rico's reported emissions based upon U.S. Environmental Protection Agency Greenhouse Gas Reporting Program
Greens Hollow Federal Coal Lease Tract UTU-84102	Final SEIS	February-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=89244	Coal mine leasing areas	No - commentary on life cycle issues but no quantitative analysis	Uses US and global coal production for comparison
Chukchi Sea Planning Area Oil and Gas Lease Sale 193	Final Second SEIS	February-15	http://www.boem.gov/ak193/	Oil and gas lease area	No - public comment raised on need for life cycle considerations (i.e., combustion) but response of Bureau of Ocean Energy Management (BOEM) is that final extent of production and end uses not foreseeable	Compares to US emissions. SCC raised in public comments, but BOEM concluded not appropriate to use SCC.
White River National Forest Oil and Gas Leasing	Final EIS	December-14	http://a123.g.akamai.net/7/123/11558/abc123/forestservic.download.akamai.com/11558/www/nepa/61875_FSPLT3_2395824.pdf	Oil and gas lease area	No - commentary on life cycle emissions and fuel substitution, but no quantitative analysis. Public comment asks about life cycle emissions, and United States Forest Service (USFS) concludes that NEPA does not compel analysis of life cycle emissions.	Compares to CO and US emissions. SCC raised in public comments, but USFS conclude not appropriate to use SCC.

Project Name	Document Type	Document Date	Link	Project Type	Lifecycle GHG Analysis	Approach to Determining Significance
Pawnee National Grassland Oil and Gas Leasing Analysis	Final EIS	December-14	http://www.fs.usda.gov/wps/portal/fsinternet/!ut/p/c5/04_SB8K8xLLM9MSSzPy8xBz9CP0os3hvXxMjMz8Dc0P_kFALA09zLzNDowAXYwMLE6B8pFm8kQEEOFoY-Ht4hPmF-UAFDIjRbYADOIJ1G_ibGHgahjk6WRq4GnkHm5oamMDMhujGLY_f7nCQX_G7HWw_btf5eeTnpuoX5IaGRhhkmQAAoYKgoA!!/dl3/d3/L2dJQSEvU	Oil and gas lease area	No - reason provided that cannot at this stage know what the volume and quantity of end-products will be	Compares to US emissions.
Jordan Cove Energy and Pacific Connector Gas Pipeline project	Final EIS	September-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=178660	LNG export terminal and pipeline	No - looks at GHG emissions from facility construction and operation, but states that "any life-cycle analysis of the emissions from the LNG vessel transits to possible Asian markets or the emissions resulting from the end use combustion of natural gas is too speculative to permit any meaningful consideration."	No
California Pacific Electricity Company 625 and 650 electrical line upgrade project	Final EIS	November-14	http://www.trpa.org/wp-content/uploads/Part-1_CalPeco-FEIS-EIS-EIR_09-2014.pdf	Electricity transmission line	No	No - just mentions reporting thresholds as a comparison

Project Name	Document Type	Document Date	Link	Project Type	Lifecycle GHG Analysis	Approach to Determining Significance
Corpus Christi Liquefied Natural Gas (LNG) project	Final EIS	October-14	http://energy.gov/sites/prod/files/2014/10/f18/EIS-0493-FEIS-2014.pdf	New natural gas liquefaction and export plant	No	Partial - uses comparative numbers to give context, namely emissions of Texas
Constitution Pipeline and Wright Interconnect Projects	Final EIS	October-14	https://www.ferc.gov/industries/gas/enviro/eis/2014/10-24-14-eis.asp	Impacts for constructing and operating an interstate natural gas line	No - just a commentary that because fuel oil is widely used as an alternative to natural gas in the region of the project, it is anticipated that the project would result in the displacement of some fuel oil use, thereby potentially offsetting some regional GHG emissions.	Yes - simple calculation of SCC provided
Gulf of Mexico OCS Oil and Gas Lease Sales: 2015-2017, Central Planning Area Lease Sales 235, 241, and 247	Final Supplemental EIS	September-14	http://www.boem.gov/nepaprocess/	Oil and gas lease area	No	Partial - relates emissions to global emissions
Champlain Hudson Power Express Transmission Line Project	Final EIS	August-14	http://chpexpresseis.org/library.php	Electricity transmission line	No - but provides commentary that line will provide mainly renewable energy and this will have an impact	Partial - comparison to NY State and US emissions
Freeport LNG Liquefaction Project and Phase II Modification	Final EIS	June-14	http://energy.gov/sites/prod/files/2014/07/f17/EIS-0487-FERC-FEIS-2014.pdf	Modification of facilities at Freeport LNG's existing terminal	No	No

Project Name	Document Type	Document Date	Link	Project Type	Lifecycle GHG Analysis	Approach to Determining Significance
BP Cherry Point Dock	Draft EIS	May-14	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=87724	Operational assessment of cumulative impacts of a terminal dock	No	Partial - provides comparison with WA state and US emissions
Downeast Liquefied Natural Gas (LNG) Project	Final EIS	May-14	https://www.ferc.gov/industries/gas/enviro/eis/2014/05-15-14-eis.asp	Marine terminal and LNG facility	No	No
Cameron Liquefaction Project	Final EIS	April-14	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=88267	A LNG terminal Expansion and Pipeline Expansion	No	No
McClellanville 115 KV transmission project	Draft EIS	April-14	http://www.rd.usda.gov/files/UWP_SC50-SouthCentral_McClellanville_DEIS.pdf	Building and operating an electrical transmission line	No	No
Sierrita Pipeline Project	Final EIS	March-14	http://permanent.access.gpo.gov/gpo50483/	Pipeline to transport natural gas	No	No
Southline Transmission Line Project	Final EIS	October-15	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=180883	Electricity transmission line	No	Yes - compares operation emissions to the GHG mandatory reporting threshold of 25,000 tpy and CEQ guidance
San Juan Basin Energy Connect Project	Draft EIS	March-14	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=88004	Electricity transmission line	No	No
Keystone XL Project	Final SEIS	January-14	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=87872	Oil pipeline	Yes - looks at upstream and downstream emissions	Partial - comparison to equivalent emissions

Project Name	Document Type	Document Date	Link	Project Type	Lifecycle GHG Analysis	Approach to Determining Significance
Monument Butte Oil and Gas Development Project	Final EIS	June-16	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=210530	Oil and Gas lease area	No	Partial - compares emissions to US levels
Teckla-Osage-Rapid City 230 kV Transmission Line Project	Final EIS	November-14	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=89128	Electricity transmission line	No	No
Ruby Pipeline Project	Final SEIS	November-13	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=88561	Gas pipeline	No	No
Sunzia Southwest Transmission Project	Final EIS	June-13	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=89028	Electricity transmission line	No	No
Alaska Standalone Gas pipeline	Final EIS	October-12	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=84573	Gas pipeline	No - commentary on life cycle issues such as fuel displacement, but no quantitative analysis	Partial - uses US and Alaska State emissions for comparison
Alaska Standalone Gas Pipeline	Draft Supplemental EIS	June -17	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=234672	Gas Pipeline	Yes – There is commentary on life cycle assessment of the pipeline. The supplement provides an estimate of GHG's along the life cycle as a percentage, however the downstream GHGs from combustion were provided.	No

Project Name	Document Type	Document Date	Link	Project Type	Lifecycle GHG Analysis	Approach to Determining Significance
Wright Area Coal Lease Applications	Final EIS	June-10	https://babel.hathitrust.org/cgi/pt?id=ien.35556039553433;view=1up;seq=5	Coal mining lease areas	Yes - considers life cycle emissions of coal combustion	Partial - uses comparative numbers to give context including number of passenger vehicles on the road, US reduction commitments and the Clean Power Plan
Mountaineer Xpress and Gulf Xpress Projects	Final EIS	September - 17	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=236704	Gas Pipeline	No	No
Federal Coal Lease Modifications COC-1362 and COC-67232	Final Supplemental EIS	September - 17	https://cdxnodengn.epa.gov/cdx-enepa-II/public/action/eis/details?eisId=238724	Coal Lease	Yes – Considers GHG emissions of combustion of coal	No

Appendix B

FEIS Energy Market and Economic Modeling Analysis

Summary

The final environmental impact statement (FEIS) includes an energy market and economic modeling analysis and projected estimated net lifecycle GHG emissions to result from the Project over a time horizon extending from 2018 through 2038. The FEIS energy and economic analysis underlying the estimated net GHG emissions from the Project is a substantial and sufficiently-detailed energy market and economic analysis (across a wide geography (U.S. and Asia), the entire lifecycle and for a 20 year time horizon); however, it is also a highly-uncertain analysis. The process that the FEIS utilizes is well-defined and generally follows reasonable practices for analyzing such impacts (with a few possible adjustments that make it a conservative estimate). Despite following generally-reasonable practices, the FEIS results are still highly uncertain for many reasons. These include the broad geographic scope across many countries and jurisdictions, long time horizon for the analysis, and uncertainty in global commodity markets and downstream energy market dynamics.

As discussed further below, an extensive energy market and economic modeling analysis such as the FEIS's long-term forecast with a broad geographic scope is substantially more uncertain and less reliable than a traditional environmental impact assessment that limits the analysis to a narrower local geographic region and with fewer input assumptions that are likely to change. To demonstrate the relatively greater uncertainty, and therefore lower reliability, a statistical analysis was conducted on the estimated net lifecycle GHG emissions associated with the FEIS scenarios as compared to a narrower local geographic region in a traditional environmental impact assessment (e.g. Cowlitz County). This statistical analysis provides evidence that a much higher and substantial degree of variation is inherent in the FEIS scenarios when compared to the traditional environmental impact analysis with a smaller geographic footprint and with fewer input assumptions that are likely to change.

The FEIS Is Based on Detailed Energy Market and Economic Modeling

The FEIS energy market modeling includes a very detailed energy economic modeling analysis. Specifically, the FEIS analyzes the estimated net lifecycle GHG emissions from the Project operations and the combustion of coal in downstream markets in the Pacific Rim and the U.S. resulting from the Project over the period from 2018 through 2038, as compared to the No-Action scenario.

The FEIS includes a detailed energy market modeling analysis that simulates the Pacific Rim and U.S. coal and electricity markets with and without the Project. The analysis relies on an electricity production simulation model for much of the U.S. analysis, using a modified version of ICF's Integrated Planning Model (IPM), a model that is routinely used in the energy industry.[1] The IPM simulates the economics of fuel commodity market analyses (coal, natural gas, etc.) including transportation and downstream U.S. regional power markets. The model's simulation of U.S. regional power markets is based on the economics of individual power generation facilities, regional electricity transmission system constraints, and customer demand for electricity, among many other factors.

The IPM was modified to analyze international coal markets, through the inclusion of Pacific Rim coal supplies and Pacific Rim coal demand based on an elasticity of demand in the Pacific Rim markets. The FEIS modeled coal supply curves for primary production sources to the Pacific Rim markets, including Indonesia, Australia, China, Russia, and others. The FEIS also represented electric sector demand for coal from Pacific Rim countries, including Australia, China, Hong Kong, India, Indonesia, Japan, South Korea, and Taiwan.

The modeling results in the FEIS include changes (Proposed Action minus No Action) at the country level in coal production, coal consumption, and seaborne coal imports. Results also include the distribution of the coal exported from MBT-Longview.

<u>The FEIS Includes Several Potential Scenarios</u>

The FEIS analyzes four scenarios to estimate the Project's incremental net GHG emissions on a lifecycle basis under different input assumptions. The four scenarios are:

1) 2015 U.S. and International Energy Policy (2015 Energy Policy)
2) No Clean Power Plan (No CPP)
3) Lower Bound
4) Upper Bound

The scenarios differ along six parameters:

1) International coal curves[2];
2) International thermal coal demand[3];
3) Coal price elasticity of demand[4];
4) Powder River Basin (PRB) and Uinta Basin coal curves[5];
5) U.S. rail transport costs[6]; and

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1 Additional information about the IPM is included in Section 4.1 of the SEPA Coal Market Assessment Technical Report (April 2017).

2 Base coal curves were used for 2015 Energy Policy and No CPP; 10% less supply for Lower Bound; and increase 50% for Upper Bound.

3 Base demand levels for No CPP; IEA's WEO 2015 New Policies scenario for 2015 Energy Policy and Lower Bound; and increased coal demand based on 2000-2012 for Upper Bound.

4 Base coal price elasticity of demand assumption for No CPP; -0.32 for China and -0.11 for elsewhere for 2015 Energy Policy and Lower Bound; and -0.68 for China and -0.11 for elsewhere for Upper Bound.

5 Base for 2015 Energy Policy and No CPP; increase curves 25% for Lower Bound; decrease curves by 15% for Upper Bound.

6) U.S. and international climate policy.[7,8]

The results from these four scenarios define the range in estimated lifecycle net GHG emissions over the period from 2018 through 2038 included in the FEIS.

The FEIS Energy Market Modeling Approach is Generally Acceptable

The modeling approach in the FEIS is well defined and generally follows best practices for analyzing such impacts (with some differences noted). The approach defines the changes in energy and fuel markets that could result from the project, and then quantifies each of the different components to determine the estimated net GHG emission (noted below). The different components include changes in consumption of fuel types in the U.S. and the Pacific Asia region, as well as changes arising from different origin mining and transportation routes.

- **Estimated GHG Emissions from Coal Combustion in Pacific Rim**: The exports from the Project have the potential to displace coal production from other parts of the world that are currently supplying the Pacific Rim. The PRB coal exported through the project has different GHG characteristics than the coal currently supplied and consumed, which would lead to estimated increases or decreases in GHGs when the coal is combusted.

- **Estimated GHG Emissions from Coal and Natural Gas Combustion in U.S.**: While exporting coal to the Pacific Rim potentially reduces coal prices in that region, removing that coal from the available supply in the U.S. has the opposite effect; some U.S. coal prices in the relatively smaller U.S. market could increase. The higher prices for some U.S. coal would make plants that burn that coal less competitive with other competing fuel sources (e.g., natural gas) leading to decreases in coal consumption and associated estimated GHG emissions, which would be partially offset to the extent that the replacement fuel source is natural gas. Emissions from natural gas-fired generation are about one-half of those from coal-fired generation on a per MWh basis.

- **Incremental Changes in Estimated GHG Emissions from Production/Mining**: The FEIS reports estimated net lifecycle GHG emissions from the Project with and without the coal mining offset. However, the FEIS chooses a scenario on which to base its recommend mitigation requirement (equal to 1.99 million metric tons CO_2e[9] per year) that does not include the coal-mining offset.[10] The coal mining offset is the difference in

6 Base for 2015 Energy Policy and No CPP; increase cost by 20% for Lower Bound; and decrease costs by 20% for Upper Bound.

7 Clean Power Plan and international commitments for 2015 Energy Policy and Lower Bound; no U.S. or international policies for No CPP and Upper Bound.

8 See Table 5-1, SEPA Coal Market Assessment Technical Report, April 2017, for additional details.

9 Million metric tons CO_2e (MMTCO2e) or million metric tons of carbon dioxide equivalent.CO_2e is a measure used to compare the emissions from various GHGs based upon their global warming potential; CO_2e is commonly used as a metric to sum GHG emissions.

10 FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, Section. 5.8, page 5.8-20 and 5.8-24. FEIS, SEPA Greenhouse Gas Emissions Technical Report, pp. 3-22 to 3-23 and Table 66 and Table 67.

coal mining-related GHG emissions associated with PRB coal versus alternative international coals (e.g. China, Russia, Australia and Indonesia) that the FEIS assumes are displaced by the Project. The exports from the Project result in an increase in U.S. coal production and an offsetting decrease in production by different countries that currently supply the Pacific Basin coal market, most notably Australia, China, Indonesia, and Russia. The estimated changes in net GHG emissions from production/mining are a function of the overall emissions per ton of mined coal, which depends on the assumptions about the diesel fuel usage, the electricity usage, and the methane released during the mining process. According to the FEIS, in general, the U.S. has lower estimated GHG emissions from mining/production than the countries whose production could be displaced by the Project.[11] The FEIS's preferred GHG emissions scenario, the 2015 U.S. and International Energy Policy (hereafter 2015 Energy Policy), reports that the Project will result in a reduction in estimated net GHG emissions with the coal mining offset (-63.5 $MMtCO_2e$) and the Project will result in an increase in estimated net GHG emissions without the coal mining offset (22.3 $MMtCO_2e$).[12] If a lifecycle analysis is deemed to be the appropriate boundary to use in regulatory decision-making, the FEIS scenario with the coal mining offset should be included to represent a complete lifecycle analysis (i.e. with all of the necessary components).[13] The FEIS's claim that the coal mining-related GHG offset is too uncertain is unsubstantiated as it is no more uncertain than the entire analysis.[14]

- **Incremental Changes in Estimated GHG Emissions from Coal Transportation**: Exporting coal from the Project to countries in the Pacific Rim requires a combination of transportation methods including rail from the mines to the Project, and then ocean vessels from the Project to the port of destination. If coal exports from the Project displace exports from other countries then the estimated increase in GHG emissions associated with the transportation of the coal from the U.S. needs to be offset by the estimated decrease of GHG emissions associated with transportation of coal from the countries that are being displaced. The FEIS assumes that the estimated GHG emissions from transportation of coal from non-U.S. countries to countries where the coal is consumed is based on the nautical miles traveled on ocean vessels from the port of export to the importing country. In general, the longer the distance that U.S. exports must travel to get to consuming countries results in increased estimated GHG emissions from coal transportation. However, as discussed elsewhere, the FEIS analysis does not appear to include appropriate offsetting estimated GHG emissions from reduced rail and other transportation from coal movements that the Project displaces. Further, the emissions associated with vessel transportation may be overstated based on the FEIS's analysis showing a relatively small share of the Project's coal exports going to Japan, South

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[11] See Tables 7 and 8 from the SEPA Greenhouse Gas Emissions Technical Report, April 2017. The largest differences are from the coal mine methane emissions.

[12] FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-22 to 3-23 and Table 66 and Table 67.

[13] SEPA Greenhouse Gas Emissions Technical Report, Figure 4. p 2-6 .

[14] FEIS, SEPA Chapter 5. Operations: Existing Conditions, Project Impacts and Proposed Mitigation Measures, p. 5.8-19. FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 2-21 to 2-28.

Korea, and Taiwan. MBT-Longview expects these countries to be the largest destinations for the Project's coal given the closer proximity, rather than China and Hong Kong, which would require additional transport costs.

- **Estimated Induced Demand for Coal**: The increased supply of coal in the Pacific Rim market from the Project's exports tends to decrease coal prices. The lower coal prices theoretically could induce greater demand for coal and hence, greater estimated GHG emissions from the combustion of the coal. This is only a relevant issue for the Upper Bound scenario in the FEIS, and one that is critiqued extensively elsewhere.

The FEIS Energy Market and Economic Modeling Analysis is Acceptable Though Highly Uncertain

The FEIS energy market and economic modeling analysis is an extensive and substantial analysis with generally reasonable modeling and input assumptions (with exceptions denoted below and elsewhere). However, projections of estimated net GHG emissions from Project operations and the combustion of coal in downstream markets in a very broad geographic market over a long time horizon is inherently uncertain given the nature of the broad scope and difficulty in forecasting commodities in a complex environment. In summary, it is a very challenging and complicated endeavor that is nearly impossible to do precisely.

The quality of such projections is driven by the overall analytical approach and assumptions about key inputs and market interactions. The process undertaken in the FEIS is generally strong (with a few notable exceptions), and utilizes reasonable estimates for key inputs based on information known today, with a few exceptions as discussed elsewhere. However, estimates vary over time and have varied much more so in recent years.

The substantial uncertainty that remains in this highly-complex analysis and the results exists for many reasons, including:

- **Wide geographic scope**: The analysis focuses on coal production in the U.S. and key countries supplying the Pacific Rim market including Australia, China, Indonesia, and Russia. The analysis also includes coal consumption by the U.S., Australia, China, Hong Kong, India, Indonesia, Japan, South Korea, and Taiwan. To ensure that supply matches demand in each year there must also be a detailed cost matrix that connects each producing country with each consuming country. The end product is a nearly global analysis of coal markets, including markets with relatively limited information available to guide important assumptions about how those energy markets currently operate and how they will be expected to operate in the future.

- **Long-term time horizon**: The analysis is focused on the years 2018 through 2038. During this time horizon many factors could contribute to key inputs changing. Examples of such changes include changes in coal supply curves (costs of producing coal in different regions could decrease or increase in unforeseen ways) and electric sector demand for coal in each country could increase or decrease depending on technology changes, government policies, and costs of competing technologies such as natural gas-fired generation, nuclear power, and renewables.

- **Thousands of inputs and assumptions are required**: To develop the coal supply curves in each country requires assumptions about mine-level costs and reserves, which are a function of the technology available to mine the coal, labor costs, and equipment fuel costs as well as coal quality and environmental related assumptions. The demand for coal in each country is based on assumptions about existing generators and future generators, the operating, economic and environmental modeling assumptions for each generator, and the transmission system and power market these generators are assumed to operate in. These assumptions are themselves subject to change depending on assumptions about technology development, fuel prices, economic growth, and government policy and a myriad of other factors. The transportation costs from each producing country to each consuming country are based on assumptions about the mode of transport, the size of the vessel, the relative efficiency of the vessel, the nautical miles between ports, transportation from the port to the plant, and if the vessel returns to the port of origin full or empty. There are many more inputs and assumptions that are required to estimate the net GHG emissions for each scenario in each year, and these inputs/assumptions are interrelated such that a change in one input in one location can have a ripple effect of related consequences that could significantly change the results.

- **The present time appears to be a particularly dynamic period in U.S. and international energy markets**: There have been rapid changes in technology development that have led to significant changes in natural gas extraction in the U.S. and renewable technology costs. There have been significant policy shifts (e.g., Paris Accord and Clean Power Plan and its subsequent elimination in the U.S.), market shocks, and other factors. Whether or not these trends will continue, reverse, or other trends will take over is unknown, but all of these add to the uncertainty of the analysis.

Uncertainty Analysis of the FEIS

To demonstrate the relatively greater uncertainty and lower reliability of the FEIS compared to narrower regions, a statistical analysis was conducted that shows a much higher standard deviation and a coefficient of variation in the estimated net lifecycle GHG emissions associated with the FEIS scenarios as compared to a narrower local geographic region in proximity to the Project in a traditional environmental impact assessment (here, Cowlitz County).

Specifically, Table 1 below presents the net estimated GHG emissions for the entire geographic region assumed by the FEIS lifecycle analysis (Total FEIS with and without the coal mining offset), the DEIS lifecycle analysis as well as smaller a geographic scope representing Cowlitz County. The average net estimated GHG emissions, standard deviations and the coefficient of variation (CV) statistics also are reported.[15] This analysis demonstrates that the FEIS estimated

[15] CV is a commonly-used statistic calculated by dividing the standard deviation by the mean (in this case, the standard deviation of emissions by the average emissions across different FEIS scenarios). Source: Brown C.E. (1998), Coefficient of Variation. In: Applied Multivariate Statistics in Geohydrology and Related Sciences. Springer, Berlin, Heidelberg.

net lifecycle GHG emissions analysis is substantially more uncertain and less reliable from a statistical perspective than a traditional environmental impact assessment that limits the analysis to a narrower local geographic region in proximity to a project.

Table 1 reports the standard deviation for the different regions. The standard deviation is a measure that is used to quantify the amount of variation or dispersion of a set of data values. As Table 1 shows limiting the FEIS scenarios to a narrower geographic scope, such as Cowlitz County yields a very low standard deviation equal to 0 MMtC02e. However, the standard deviation for the Total FEIS (with coal mining) scenarios and the Total FEIS (without coal mining) scenarios is substantially higher, 435.1 and 386.7 MMtC02e, respectively.

Further, Table 1 reports the CV statistic, which provides another measure of variation such that a CV greater than 1 indicates high variation and a CV statistic equal to or less than 1 indicates low variation. Based on calculated CV values for each region, Cowlitz County can be characterized as having a statistically low level variation in estimated net GHG emissions, where the CV values are equal to 0 for Cowlitz County. Conversely, the calculated CV values for the FEIS is greater than 1 which is indicative of a statistically high level variation in estimated net GHG emissions.

Table 1. Estimated Net GHG Emissions in Cowlitz County Compared to the FEIS and DEIS Lifecycle Analysis (MMtC02e) (2018-2038)

Region	Source(s)	2015 Energy Policy	Lower Bound	Upper Bound	No CPP	Average of All Scenarios	Standard Deviation	Coefficient of Variation
Cowlitz County	A	1.0	1.0	1.0	1.0	1.0	-	-
Total FEIS (with coal mining offset)	B	(63.5)	(122.0)	801.5	(4.8)	152.8	435.1	2.8
Total FEIS (without coal mining offset)	C	21.8	(41.9)	779.8	51.2	202.7	386.7	1.9
Total DEIS	D	32.1	(30.5)	438.2	(14.0)	106.4	222.7	2.1

Sources: A – FEIS SEPA Greenhouse Gas Emissions Technical Report - Table 48,49,66; B - FEIS - Table 47,60,65; C – FEIS - Table 47, 61,62, 63, 66, 67; D- DEIS -Table 34, 46, 47, 48.

Based on the statistical analysis, the FEIS's estimated net lifecycle GHG emission is substantially more uncertain and less reliable from a statistical perspective than a traditional environmental impact assessment that limits the analysis to a narrower local geographic region in proximity to a project and includes fewer input assumptions that are likely to change. The entirety of the uncertainty inherent in the many input assumptions underlying the FEIS is not captured by this analysis.

Appendix C

FEIS Upper Bound Scenario

Summary

The FEIS presents an implausible Upper Bound scenario that is driven predominantly by an unsupported and unrealistic assumption regarding induced coal demand, as well as its unsupported assumed growth in coal demand. The FEIS Upper Bound scenario was defined by higher prices for international coal supply, increased international coal demand, higher coal price elasticity of demand in China, lower coal prices for PRB/Uinta basin coal supply, decreased U.S. rail transport costs, and no climate policies (U.S. or international). These assumptions combine to create an implausible Upper Bound scenario that is driven predominantly by an unsupported and unrealistic assumption regarding induced demand and to a lesser extent unsupported assumed growth in coal demand.

Price elasticity of demand is an economic measure that represents the responsiveness of the quantity demanded of a good or service to a change in its price, all other things being equal. The FEIS refers to the additional quantity demanded as a result of the change in price as induced demand.

As discussed below, the Upper Bound scenario reports a significantly higher estimate of net GHG emissions from the Project than the other FEIS scenarios, equal to approximately 800 MMtC0$_2$e over the life of the Project as compared an increase of approximately 801 MMtCO$_2$e or 779.8 MMtCO$_2$e in the FEIS scenarios with and without the coal mining offset, respectively.[1] These include the 2015 Energy Policy scenario (-64 MMtC0$_2$e), Lower Bound scenario (-122 MMtC0$_2$e), and the No Clean Power Plan (No CPP) scenario (-5 MMtC0$_2$e).[2] By any statistical, mathematical, or other means of comparison, the Upper Bound scenario is highly divergent from the other scenario directionally as well as the order of magnitude of the estimated net GHG emission from the Project.

The significantly higher estimated net GHG emissions reported for the FEIS Upper Bound scenario is largely driven by an assumed coal price elasticity of -0.68 for China. The FEIS Upper Bound scenario produces estimated net GHG emissions from the Project that are almost 15 times higher than the estimated net GHG emissions if the Upper Bound scenario were to exclude the induced demand component.[3]

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1 FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-22 and 3-23 and Table 66 and 67.

2 FEIS, *SEPA Greenhouse Gas Emissions Technical Report*, p. 3-23 and Table 67. These results include the coal mining offset.

3 14.73 = 801.49 / 54.42. As discussed below, this calculation is based on the FEIS scenarios that include the coal mining offset.

The FEIS assumed coal price elasticity for China of -0.68, which is primarily based on the literature review from five studies,[4] is unsupported and overstated because these studies are inapplicable:

- The EIA study is about the U.S. instead of China;[5]
- The Burke, Paul J., Liao, Hua study focuses on all types of coal (e.g., metallurgical and thermal coals) and does not separately analyze steam coal (e.g. bituminous and subbituminous coal) applicable to the FEIS;[6]
- The Parry, Veung and Heine study merely assumes a price elasticity instead of calculating it and the secondhand study it relies on uses outdated data (1953-1994);[7]
- The Jiao, Fan and Wei uses outdated data (1980-2006), fails to include the statistical analysis to evaluate its reliability and appear to study all types of coal and not separately analyze steam coal (e.g. subbituminous and bituminous coal) applicable to the FEIS;[8] and
- The Ma and Stern study reports a range of price elasticity of coal demand between -0.03 and -0.199, which is substantially smaller than the FEIS assumption of -0.68 and which is not applicable to the Project because it excludes coal used to generate electricity and heat, such as subbituminous and bituminous coal applicable to the FEIS.[9]

Secondarily, as discussed below, the FEIS Upper Bound scenario is unrealistic about the assumed substantial surge in future coal demand well above levels forecast by independent forecasting agencies (including the International Energy Agency, or IEA). While the FEIS relies upon IEA for its coal demand growth forecasts in other scenarios, for the Upper Bound scenario the FEIS does not rely on the IEA or any other publicly-developed coal demand forecast. Instead, the FEIS relies upon an ICF-developed coal demand growth forecast based on historical

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4 Burke, Paul J., Liao, Hua. Is the price elasticity of demand for coal in China increasing?, China Economic Review, Volume 36, December 2015, pp. 309-322.

5 U.S. Energy Information Administration, 2012. *Fuel Competition in Power Generation and Elasticities of Substitution*. April.

6 Burke, Paul J., Liao, Hua. Is the price elasticity of demand for coal in China increasing?, China Economic Review, Volume 36, December 2015, pp. 309-322.

7 Parry, Ian, Chandara Veung, and Dirk Heine, *How Much Carbon Pricing is in Countries' Own Interests? The Critical Role of Co-Benefits*. CESifo Working Paper No. 5015, October 2014.

8 Jiao, Jian-Ling, Ying Fan, Yi-Ming Wei, The Structural Break and Elasticity of Coal Demand in China: Empirical Findings from 1980 – 2006, *International Journal of Global Energy Issues* 31(3):331-344, January 2009.

9 Ma, C. and Stern, D.I. 2016. *Long-run estimates of interfuel and interfactor elasticities*, CCEP Working Paper 1602, Jan. Caryrawford School of Public Policy, The Australian National University. Available at: http://www-bcf.usc.edu/~gareth/ISL/ISLR%20First%20Printing.pdf

growth levels from 2000 through 2012, when coal demand was rapidly increasing.[10] The magnitude of coal growth assumed in the FEIS Upper Bound scenario is unlikely, as global energy markets have become increasingly diversified in fuel supply sources suggesting such an ambitious coal demand growth target is unrealistic.[11]

For all of these reasons the FEIS presents an implausible Upper Bound scenario that is driven predominantly by an unsupported and unrealistic assumption regarding induced coal demand, as well as unsupported assumed growth in coal demand, and should not be considered. One specific identifiable change is to adjust the induced demand component for coal should be adjusted from -0.68 to -0.1.

<u>Detailed Response</u>

In order to evaluate the reasonableness of the Upper Bound scenario and the range of possible outcomes, we compared the primary components of the FEIS scenarios and respective net GHG emissions.

Specifically, as illustrated in Table 1 below, the Upper Bound scenario reports a significantly higher estimated net GHG emissions from the Project than the other FEIS scenarios, equal to an increase of approximately 801 $MMtCO_2e$ or 779.8 $MMtCO_2e$, respectively, in the FEIS scenarios with and without the coal mining offset.[12] These high estimated net GHG emissions compare to the negative net estimated GHG emission from the rest of the scenarios when coal mining emission estimates are included in the analysis.[13] Further, the Upper Bound scenario reports estimated net GHG emissions that are 36 times higher than the 2015 Energy Policy scenario when coal mining emission estimates are excluded from the FEIS analysis.[14] By any statistical, mathematical, or other means of comparison, the Upper Bound scenario is highly divergent from the other scenarios directionally and by the order of magnitude of the estimated GHG emissions from the Project.[15] For these reasons, the FEIS's Upper Bound scenario is implausible and unsupported and should not be considered.

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[10] FEIS, SEPA Coal Market Assessment Technical Report, p. 5-3 and Table 5-1.

[11] Moreover, the only potential factor that could lead to such high coal demand increases in the future is if breakthrough in a GHG mitigation technology solution (e.g., carbon capture and sequestration) occurs, which would greatly reduce the potential estimates of net GHG emissions from the Project in the Upper Bound scenario.

[12] CO_2e is a measure used to compare the emissions from various GHGs based upon their global warming potential; CO2e is commonly used as a metric to sum GHG emissions.

[13] FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-23 and Table 67.

[14] 35.77 = 779.8 / 21.8

[15] As discussed in the main report there is inadequate support to exclude the coal mining offset from the FEIS net estimated life cycle GHG analysis.

Table 1: FEIS Net Estimated GHG Emissions ($MMtCO_2e$)[16]

Scenario	FEIS with Coal Mining	FEIS without Coal Mining
2015 Energy Policy	-63.5	21.8
Lower Bound	-122.0	-41.9
No CPP	-4.8	51.2
Upper Bound	801.5	779.8

To provide additional detail, Table 2 shows the total net GHG emissions from the largest emissions components in the FEIS, which include the Pacific Basin and U.S. market-related emissions, as well as net emissions from international shipping, rail transportation, and coal extraction attributed to the Project by the FEIS. This table includes the coal mining offset of the estimated net lifecycle GHG analysis. This table also reaffirms that the Upper Bound scenario is an outlier value relative to the other possible outcomes presented in the FEIS. The values for the other three scenarios (No CPP, Lower Bound, 2015 Energy Policy) are relatively close together, i.e., statistically represented with a tighter central tendency. When an estimate is substantially different from the rest of the range of potential outcomes, it should be closely evaluated for its reasonableness.

Table 2: FEIS Net Estimated GHG Emissions ($MMtC0_2e$) with Primary Components (2018-2038)[17]

	2015 Energy Policy	% Total	Lower Bound	% Total	Upper Bound	% Total	No CPP	% Total
Pacific Basin Market								
Induced	-	0%	0.00	0%	747.07	93%	-	0%
Coal Substitution	5.47	-9%	(7.86)	6%	1.62	0%	23.95	-504%
U.S. Market								
Decrease Coal	(14.02)	22%	(93.59)	77%	0.77	0%	(0.04)	1%
Increase Gas	0.89	-1%	27.78	-23%	(0.24)	0%	0.00	0%
Vessel	15.16	-24%	16.17	-13%	16.87	2%	13.32	-280%
Rail	9.50	-15%	10.63	-9%	9.29	1%	8.96	-189%
Coal Extraction	(85.90)	135%	(80.74)	66%	21.07	3%	(56.50)	1189%
Other	5.36	-8%	5.57	-5%	5.04	1%	5.56	-117%
Total	**(63.54)**		**(122.04)**		**801.49**		**(4.75)**	
Total (No Induced Upper)	(63.54)		(122.04)		54.42		(4.75)	

[16] FEIS, SEPA Greenhouse Gas Emissions Technical Report, p. 3-22 to 3-23 and Table 66-67.

[17] Net total GHG emissions from the primary components includes: Pacific Basin and U.S. markets plus shipping and rail transportation as well as coal extraction and a category for other emissions (largely direct). *SEPA Greenhouse Gas Emissions Technical Report*, p 3-3, 3-7, 3-9 3-10, 3-18, 3-19, 3-20, 3-21, 3-22 and 3-23.

In light of the substantial difference from the other forecasts, we conducted a more detailed evaluation of the Upper Bound scenario. Specifically, Figure 1 shows the substantial portion of net GHG emissions in the Upper Bound scenario associated with induced demand. Adjusting the induced demand component makes the Upper Bound scenario forecast more in line with the other scenarios. More specifically, adjusting the Upper Bound scenario forecast based on the price elasticity of demand assumption from -0.68 to -0.1, results in more reasonable Upper Bound scenario forecast, as shown in Figure 1.

Figure 1: FEIS Summary of Scenarios: Net GHG Emissions (MMtC0$_2$e) (2018-2038) and the FEIS Upper Bound Scenario Excluding Induced Demand[18]

Induced Demand Component

The induced demand component aims to capture the increase in coal demand that may result from a decrease in price of coal that the FEIS estimates would result from increasing the quantity of coal due to the Project. [19]

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18 Net total GHG emissions from the primary components includes: Pacific Basin and U.S. markets plus shipping and rail transportation as well as coal extraction and a category for other emissions (largely direct). *SEPA Greenhouse Gas Emissions Technical Report*, p. 3-3, 3-7, 3-9,3-10, 3-18, 3-19, 3-20, 3-21, 3-22 and 3-23.

19 FEIS, *SEPA Coal Market Assessment Technical Report*, pp. 4-30 and 4-31.

According to the FEIS, the price elasticity of coal in the Upper Bound scenario was assumed to be equal to -0.11 for all international countries except China, which was set equal to -0.68.[20,21] The FEIS assumes that China uses coal for both power generation and space heating, while other countries primarily use coal for power generation.[22]

In the FEIS, the assumed coal price elasticity of -0.68 for China is principally based on the literature review from different studies.[23] This assumed price elasticity of coal for China is unsupported and overstated. The FEIS relies on five studies to support the price elasticity of coal demand assumption. These studies are either inapplicable or unsupported for the following reasons:

- The EIA study for the U.S. instead of China;[24]
- The Burke, Paul J., Liao, Hua study focuses on all types of coal and does not separately analyze steam coal (e.g. bituminous and subbituminous coal) applicable to the FEIS;[25]
- The Parry, Veung and Heine study merely assumes a price elasticity instead of calculating it and the secondhand study it relies on uses outdated data (1953-1994);[26]
- The Jiao, Fan and Wei uses outdated data (1980-2006), fails to include the statistical analysis to evaluate its reliability and appear to study all types of coal and not separately analyze steam coal (e.g. subbituminous and bituminous coal) applicable to the FEIS;[27] and
- The Ma and Stern study reports a range of price elasticity of coal demand between -0.03 and -0.199, which is substantially smaller than the FEIS assumption of -0.68 and

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20 *Id.*, p. 4-31.

21 Available evidence and economic analysis demonstrate that the elasticity of demand for subbituminous coal that is expected to be exported from the Project to the Pacific Basin region is likely to be *de minimis* and have a negligible impact on coal consumption in the countries that will likely receive deliveries of this coal (South Korea, Japan, and Taiwan) as well as China. Millennium Bulk Terminals - Longview Coal Export Terminal. Comments on Draft Environmental Impact Statement (Draft EIS), June 13, 2016, Attachment 4- Greenhouse Gas Technical Reports and Memoranda.

22 FEIS, *SEPA Coal Market Assessment Technical Report*, p. 4-31.

23 Burke, Paul J., Liao, Hua. Is the price elasticity of demand for coal in China increasing?, China Economic Review, Volume 36, December 2015, pp. 309-322.

24 U.S. Energy Information Administration, 2012. *Fuel Competition in Power Generation and Elasticities of Substitution*. April.

25 Burke, Paul J., Liao, Hua. Is the price elasticity of demand for coal in China increasing?, China Economic Review, Volume 36, December 2015, pp. 309-322.

26 Parry, Ian, Chandara Veung, and Dirk Heine, *How Much Carbon Pricing is in Countries' Own Interests? The Critical Role of Co-Benefits*. CESifo Working Paper No. 5015, October 2014.

27 Jiao, Jian-Ling, Ying Fan, Yi-Ming Wei, The Structural Break and Elasticity of Coal Demand in China: Empirical Findings from 1980 – 2006, *International Journal of Global Energy Issues* 31(3):331-344, January 2009.

> which is not applicable to the Project because it excludes coal used to generate electricity and heat, such as subbituminous and bituminous coal applicable to the FEIS.[28]

As discussed above, the price elasticity of demand measures the amount of quantity demanded when the price of a good changes. The price and demand are often inversely related (i.e., an increase in price of a good is associated with a decrease in the amount consumed of that good). Based on our review of these five studies, the price elasticity of coal demand assumption on the Upper Bound scenario (i.e., price elasticity of -0.68) for China is overstated and flawed for the following reasons:

The FEIS references five studies as sources of estimates of price elasticity of demand for coal, as shown in Table 1. These studies employed different empirical methods, data, and time-periods to estimate the price elasticity of coal demand in China. The FEIS's assumption of a price elasticity of -0.68 of coal for the Upper Bound scenario appears to be based on the highest estimate in Burke and Liao (2015) study or the higher range in the Jiao, Fan and Wei study, while the rest of the literature cited has significantly smaller elasticity estimates than -0.68.

Table 1. Literature Cited in the FEIS to Support Price Elasticity of Coal Demand in China

Study by	Range of Elasticity of Coal Demand in China
FEIS Upper Bound	-0.32 and -0.68
Ma and Stern (2016)	-0.030 and -0.199
Burke and Liao (2015)	-0.3 and -0.68
EIA (2014)*	0.02 and -0.53
Parry, Veung and Heine (2014)**	-0.25 and -0.28
Jiao, Fan and Wei (2009)	-0.0665 and -1.161

* This study provides price elasticity of coal demand in the U.S.
** This study does not conduct any analysis to calculate price elasticity of coal demand but utilizes from other studies as an input in their modelling for another research question.

The following section discusses each of the studies referenced in the FEIS.

Burke and Liao (2015)[29]
The Burke and Liao (2015) study focuses on an average quality coal use in China, rather than thermal coal consumption which is central to the FEIS.[30] Therefore, the estimated price elasticity of -0.68 is not appropriate for the Upper Bound assumption for China, as suggested in the FEIS.

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[28] Ma, C. and Stern, D.I. 2016. *Long-run estimates of interfuel and interfactor elasticities*, CCEP Working Paper 1602, Jan. Caryrawford School of Public Policy, The Australian National University. Available at: http://www-bcf.usc.edu/~gareth/ISL/ISLR%20First%20Printing.pdf

[29] Burke, Paul J., Liao, Hua. Is the price elasticity of demand for coal in China increasing?, China Economic Review, Volume 36, December 2015, pp. 309-322.

[30] *Id.*, p. 2, 14, 23.

As shown in Table 1, the Burke and Liao (2015) study provides a range of elasticity estimates for coal demand in China, including the -0.68 relied upon by the Upper Bound scenario assumption for China. However, due to the data limitations, this study uses time-series data on the total tonnes of coal used by each province in China, which includes various coal types and different qualities. Therefore, the estimated price elasticities of coal demand in this study only reflect the price elasticity for an average of all types of coal.[31] The coal sector in China is comprised of different types of coal used for different purposes and some types of coal are irrelevant to the FEIS.[32] Since this study does not appear to appropriately distinguish between different types of coal, the estimated price elasticity of coal demand (i.e., -0.68) from Burke and Liao (2015) is not a suitable reference for the FEIS assumptions.

<u>Jiao, Fan and Wei (2009)</u> [33]

The estimated price elasticities of coal demand by Jiao, Fan and Wei (2009) is flawed for numerous reasons including (1) it is outdated using 1980-2006 data, (2) it does not include standard errors, and therefore lacks necessary statistical evidence supporting the meaningfulness of the results, and (3) This elasticity of demand studies of China does not appear to appropriately distinguish between different types of coal. This study estimated short-run and long-run price elasticity of coal demand in China based on outdated historical data extending from 1980 to 2006. Their study estimated short-run price elasticity as -0.0665 and long-run elasticity as -1.161.[34] This study fails to provide an important component of empirical analysis, which are standard errors[35] for the estimated price elasticity of coal demand. [36] The study recognized this issue but did not sufficiently address it. The study indicates that the high price elasticity estimate is due to extensive economic growth in China but the authors do not include any economic or

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[31] While the study completed a co-integration test to evaluate the stationary data series in terms of directional relationship, this test is not sufficient to conclude that the result is statistically reliable. The study could have investigated a different functional form for the model, such as instrumental variable approach (or two stage least squares) that may provide a statistically reliable estimate of the elasticity of demand. Further, it is possible that the model observes an endogeneity problem, which occurs when an explanatory variable is correlated with the error term and can result from simultaneous causality. The study did not conduct this test.

[32] Steam coal for electricity is the relevant product for the study of the Project. The coal sector in China comprises different types of coal used for different purposes, some are irrelevant to the FEIS. For example, the iron and steel industry utilizes coal as both a fuel and a raw material (coking coal). Coking coal is used for production of building materials, delivered heating, and chemical productions. In addition, anthracite coal is mainly used in specific industrial applications. Sylvie Cornot-Gandolphe. *China's Coal Market: Can Beijing Tame 'King Coal'*. December 2014, p. 13 and 76. https://www.oxfordenergy.org/wpcms/wp-content/uploads/2014/12/CL-1.pdf

[33] Jiao, Jian-Ling, Ying Fan, Yi-Ming Wei, The Structural Break and Elasticity of Coal Demand in China: Empirical Findings from 1980 – 2006, *International Journal of Global Energy Issues* 31(3):331-344, January 2009.

[34] Short-run price elasticity is less than long-run price elasticity of coal demand, while long-run price elasticity of demand is greater than 1 in absolute terms indicating a perfectly elastic coal demand in China.

[35] Standard error is a statistical measure to calculate how far the estimation of the population mean of a random variable from its actual mean . James, G., Witten D., Hastie, T. and Tibshirani, R. (2003). An Introduction to Statistical Learning with Applications in R. Springer Science and Business Media, New York.

[36] A standard error enables one to interpret whether the estimated price elasticity of coal demand is statistically meaningful. In Jiao, Jian-Ling, Ying Fan, Yi-Ming Wei, The Structural Break and Elasticity of Coal Demand in China: Empirical Findings from 1980 – 2006, *International Journal of Global Energy Issues* 31(3), page 340, January 2009.

demographic parameters (e.g., population, employment or GDP) in its model to test whether economic activity affects coal demand in the estimated models. This elasticity of demand study of China does not appear to appropriately distinguish between different types of coal. In addition, studies of China's coal market need to address the different economic conditions for coal in the coastal regions as compared to the large interior coal production and consumption region in China, and this study does not account for separate regions in China's coal market.[37] This study does not appear to adequately control for substantial coal demand growth in China.[38] This potential flaw can overstate the elasticity of demand estimate by creating a false positive result from misinterpreting increased demand to have been caused by price changes rather than other factors.[39,40] For these reasons, this study is not suitable to be cited as a reference for the demand elasticity assumption in the FEIS.

Parry, Veung and Heine (2014)[41]

The Parry, Veung and Heine (2014) study did not conduct an analysis of the price elasticity of coal demand but merely assumed a price elasticity estimate from other studies. Specifically, the Parry and Dirk (2014) study references price elasticity of coal estimates ranging between -0.25

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[37] Specifically, the study does not account for geographical fixed effects in the econometric model as the demand equation does not specify different regions (page 340). Rather, the model assumes that coal market in China is uniform in nature, which is inconsistent with the how the coal sector operates as different economic drivers impact the interior region of the country as compared to the Coastal Provinces of China. The impact of this error is that it could create an omitted variable bias, which means that the model failed to include indicator variables for different regions or provinces to control for the unobserved coal market characteristics in different regions. Not controlling for these regional differences assumes that coal market is uniform across the country, which is not a valid assumption. Jiao, J-L., Fan, Y. and Wei, Y-M. (2009) 'The structural break and elasticity of coal demand in China: empirical findings from 1980--2006', Int. J. Global Energy Issues, Vol. 31, Nos. 3/4, pp.331-344 (specifically page 340).

[38] Special care is required to ensure statistically reliable results in very high demand growth cases, such as China's historical coal demand growth. Statistical analysis of high coal demand growth is susceptible to misreporting a similar pattern of movements in price and demand as if the price change caused the demand increase. This phenomenon may be referred to as simultaneous or reverse causality which conveys the dynamic relationship of price and quantity demand where the change in price determines the quantity demand and simultaneously the quantity demanded impacts the price.

[39] Jiao, J-L., Fan, Y. and Wei, Y-M. (2009) 'The structural break and elasticity of coal demand in China: empirical findings from 1980--2006', Int. J. Global Energy Issues, Vol. 31, Nos. 3/4, pp.331-344 (specifically page 341). The study recognized this issue but did not sufficiently address it. The study indicates that the high price elasticity estimate is due to extensive economic growth in China but the authors do not include any economic or demographic parameters (e.g., population, employment or GDP) in its model to test whether economic activity affects coal demand in the estimated models.

[40] While the study completed a co-integration test to evaluate the stationary data series in terms of directional relationship, this test is not sufficient to conclude that the result is statistically reliable. The study could have investigated a different functional form for the model, such as instrumental variable approach (or two stage least squares) that may provide a statistically reliable estimate of the elasticity of demand. Further, it is possible that the model observes an endogeneity problem, which occurs when an explanatory variable is correlated with the error term and can result from simultaneous causality. The study did not conduct this test.

[41] Parry, Ian, Chandara Veung, and Dirk Heine, *How Much Carbon Pricing is in Countries' Own Interests? The Critical Role of Co-Benefits*. CESifo Working Paper No. 5015, October 2014.

and -0.28 in China from Truby and Paulus (2011).[42] The Truby and Paulus (2011) study also does not use empirical methods to estimate price elasticity of thermal coal in China but rather conducts a literature review of previous studies that is substantially outdated, including analyses of 1953 to 1994, and is therefore unreliable. [43]

Ma and Stern (2016) [44]
The Ma and Stern (2016) study estimated the price elasticity of coal demand using multiple estimation methods. Among the estimation methods, the highest estimated price elasticity of coal demand in China was -0.199, which is much lower than the FEIS assumed price elasticity of coal demand. In addition, this study excluded the energy used as intermediate inputs such as generating electricity from their study.[45] The study eliminated thermal coal from their analysis that is used for generating electricity and heat.[46] The study included steam coal, coking coal, coke, briquettes, coal gas, gasoline and diesel and electricity in their fuel cost function. However, the FEIS states that China is the only country that has a large sector with direct use of coal for space heating,[47] and therefore, the estimated price elasticity from this study does not apply to the analysis in the FEIS. In addition, this study aggregates various types of coal into a single coal input. More specifically, this study does not consider the differences in the economic value of coal across difference coal types and coal grades. In addition, the estimated price elasticity estimated by this study is only attributable to specific sectors because the data used for estimating price elasticity was limited to these specific sectors.[48]

EIA (2014) [49]
The EIA (2014) study focuses on price elasticity of coal in the United States. As such, this resource is not an appropriate reference for price elasticity of coal in China. This study demonstrated the regional differences in elasticity estimates within the United States and demonstrated the significant differences in price elasticity estimates across regions.[50] The main drivers of these differences include the price of coal, economic and demographic differences, and demand for electricity. [51] Therefore, estimated elasticity of coal demand for the United States

[42] Truby, J. and Paulus, M., 2011. Market Structure Scenarios in International Steam Coal Trade. Institute of Energy Economics at the University of Cologne. EWI Working Paper, No. 11/02, page 13

[43] *Id.*

[44] Ma, C. and Stern, D.I. 2016. *Long-run estimates of interfuel and interfactor elasticities,* CCEP Working Paper 1602, Jan. Caryrawford School of Public Policy, The Australian National University.

[45] *Id.,* p. 18-19.

[46] *Id.,* p. 18.

[47] FEIS, *SEPA Coal Market Assessment Technical Report*, p. 4-31.

[48] *Id.,* p. 18. Sectors in the scope of this study include Farming, Forestry, Animal Husbandary, Fishery and Water Conservancy, Industry, Construction, Transport, Storage and Post and Wholesale, Retail Trade, Hotel and Catering.

[49] U.S. Energy Information Administration, 2012. *Fuel Competition in Power Generation and Elasticities of Substitution*. April.

[50] *Id*., p.9-10.

[51] *Id*. pp. 5-8.

cannot be appropriate for China since these two countries have very different thermal coal markets and consumption patterns for power generation.

Coal Demand Growth

Another input assumption used in the Upper Bound scenario that impacts the GHG emissions is the unsupported increase in coal demand. The FEIS used the IEA's World Energy Outlook 2015 (IEA/WEO 2015) New Policies Scenario coal demand forecast for the 2015 Energy Policy scenario and the Lower Bound scenario, and it used the IEA/WEO 2015 Current Policy Scenario for the No CPP Scenario.[52] However, for the Upper Bound scenario the FEIS did not rely on the IEA or any other publicly-developed coal demand forecast. Instead, the FEIS relied upon an ICF-developed coal demand growth forecast based on historical growth levels from 2000 through 2012 when coal demand was rapidly increasing.[53] The FEIS provides no support for its Upper Bound scenario coal demand forecast, which greatly exceeds any of the growth projections developed by the IEA in its WEO outlook.[54] This approach to develop a larger than forecasted increase in coal demand stands in contrast to the FEIS's lack of a unique Lower Bound scenario coal demand forecast (instead relying on the same coal demand forecast used in the 2015 Energy Policy scenario).[55] The IEA provides a lower coal demand forecast to represent a potential outcome consistent with the goal of limiting the global increase in temperature to 2°C by limiting GHGs to approximately 450 parts per million of $_{CO2.}$[56]

A surge in future coal demand seems unlikely as global energy markets have become increasingly diversified in fuel supply sources. One possible factor that could cause a dramatic increase in future coal demand is if a carbon capture or other mitigation technology breakthrough, like carbon capture and sequestration (CCS), occurs.[57] Such a breakthrough could virtually eliminate carbon emissions from coal-generating power plants. CCS technology is most suitable for larger, more efficient (i.e., younger and new) coal plants, which generally characterize the Asian power fleet as compared to the U.S. fleet.[58] In addition to CCS technology, other technological developments are underway that would eliminate GHG

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[52] FEIS, *SEPA Coal Market Assessment Technical Report*, Table 5-1.

[53] Ibid.

[54] International Energy Agency (2015). World Economic Outlook. pp. 278-279. Table 7-2 and Figure 7.6.

[55] Ibid. pp. 278-279.

[56] International Energy Agency. https://www.iea.org/publications/scenariosandprojections/

[57] Petra Nova, a 50/50 joint venture between NRG and JX Nippon Oil & Gas Exploration, operates a commercial-scale post-combustion carbon capture facility at NRG's WA Parish generating station southwest of Houston, Texas. This facility captures more than 90 percent of the carbon dioxide (CO2) from a 240 MW slipstream of flue gas for the use and ultimate sequestration of 1.6 million tons of this greenhouse gas annually. Petra Nova came online in 2016. The Captured CO2 will employ Enhanced Oil Recovery to enhance production at the West Ranch oil field, which is operated by Hilcorp Energy Company. It is expected that oil production will be boosted from around 300 barrels per day today to up to 15,000 barrels per day while also sequestering CO2 underground. This field is currently estimated to hold approximately 60 million barrels of oil recoverable from EOR operations. http://www.nrg.com/generation/projects/petra-nova/

[58] Barnes, I. "Upgrading the Efficiency of the World's Coal Fleet to Reduce CO_2 Emissions." International Energy Agency (IEA). July 2014, pp. 13-14.

emissions from coal-fired power plants. Given the state of technological innovation more developments could occur over the course of the long forecast period analyzed in the FEIS.[59]

For these reasons a 50% surge in coal demand is unlikely and it may only be likely to occur in conjunction with the use of new emissions reduction technologies that would avoid material increases in GHG emissions as a result of increased coal use.

The Upper Bound scenario has other unrealistic assumptions including a combination of coal prices and coal demand for the Asia Pacific region.[60]

Conclusion

For all of these reasons the FEIS presents an implausible Upper Bound scenario that is driven predominantly by an unsupported and unrealistic assumption regarding induced coal demand, as well as its unsupported assumed growth in coal demand and should not be considered. One specific identifiable change is to adjust the induced demand component for coal should be adjusted from -0.68 to -0.1.

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[59] For example, Further, Net Power has developed technology to capture the carbon as part of the combustion process itself at no extra cost, resulting in zero air pollution (i.e., full capture of the carbon). Net Power is working with several companies including Exelon Generation, a power utility; CB&I, an engineering, procurement, and construction services-infrastructure firm; and Toshiba, a turbine manufacturer. “Fossil fuel electricity with no pollution? This company is building a power plant to prove it.” Vox Energy and Environment. April 5, 2016. http://www.vox.com/2016/4/5/11347962/net-power

[60] The Total Asian Coal Consumption in the Upper Bound scenario is more than 30% higher than in the 2015 Energy Policy’s (for the 2025-2040 average). While it is plausible for one scenario to have higher coal consumption than another scenario, it does not make economic sense that the Upper Bound scenario would have the higher coal consumption since coal prices in that scenario are 50% higher than in the 2015 Energy Policy scenario. This is inconsistent with economic theory and practice where higher prices should lead to lower consumption. See FEIS, SEPA Coal Market Assessment Technical Report, Tables, 5-1, 6-44 and 6-61.

Appendix D

Energy Planning and Emission Mitigation in Asia

Summary

This appendix provides background information on the planning processes in Asian countries that will potentially be importing coal from the Powder River Basin and Uinta Basin mining regions through the Project, with a specific focus on the government planning role in the decision-making to build new coal-fired power plants and how that fits with country-specific greenhouse gas (GHG) mitigation plans.

For Japan, South Korea, Taiwan, and China, the nature of the central government's planning role within the electricity sector paired with recent government policy in the form of Intended Nationally Determined Contributions (INDCs), Nationally Determined Contributions[1] (NDCs) and other policies, make it quite unlikely that coal demands within the electricity sector could significantly increase, as projected in the Upper Bound scenario of the Millennium Bulk Terminals—Longview (MBT-Longview) State Environmental Policy Act (SEPA), Final Environmental Impact Statement (FEIS).[2]

The Asian governments that are likely end-use markets for the Project, including Japan, South Korea, Taiwan and China, are countries with a substantial central government's planning role within the electricity sector. These countries have established commitments for GHG emissions reductions and mitigations at a national level. These GHG emission reductions focus on direct, Scope 1 GHG emissions within the countries, and include mitigation of end-uses that would use the coal transported through the MBT-Longview facility such as electricity generation..

Japan

Planning Processes

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[1] According to Article 4 paragraph 2 of the Paris Agreement (an international climate agreement established at the U.N. Framework Convention on Climate Change Conference of the Parties, COP21, in Paris in December 2015), each country (referred to as Party) shall prepare, communicate and maintain successive nationally determined contributions (NDCs). NDCs are the primary means for governments to communicate internationally the steps they will take to address climate change in their own countries. NDCs reflect each country's ambition for reducing emissions, taking into account its domestic circumstances and capabilities. Under the provisions of the Paris Agreement, countries will be expected to submit an updated NDC every five years. In anticipation of the Paris Agreement, countries publicly outlined what actions they intended to take through what were known as Intended Nationally Determined Contributions (INDCs). Once countries formally joined the Paris Agreement, the "intended" is dropped. See http://unfccc.int/focus/ndc_registry/items/9433.php for more details.

[2] Millennium Bulk Terminals—Longview, LLC (MBT-Longview). SEPA Final Environmental Impact Statement (FEIS) released by Cowlitz County and the Washington State Department of Ecology on April 28, 2017.

Japan, a resource scarce country, is required to import the majority of the fuels it uses to generate power. Therefore, one of Japan's main goals in assessing energy security and stability issues to limit the country's dependence on foreign fuel sources. In April 2014, Japan published the Fourth Strategic Energy Plan that outlined the country's long-term comprehensive and systematic energy policy through 2020.[3] This plan addressed market conditions following the effects of the Fukushima nuclear accident.

The Fourth Strategic Energy Plan describes Japan's basic viewpoint on energy policy, which focuses on three principles:[4]

1. Energy Security: ensuring stable supply
2. Economic Efficiency: realizing low-cost energy supply by enhancing its efficiency on the premise of safety
3. Environment: initiating maximum efforts to pursue environment suitability.

The energy policy goal set forth in the Fourth Strategic Energy Plan is focused on reducing carbon emissions, which would require a move away from coal-fired power. However, since coal remains a low-cost option, the Fourth Strategic Energy Plan indicated a need to rely on higher efficiency coal technologies.[5]

The Ministry of Economy Trade and Industry (METI) established a Long Term Energy Supply and Demand Outlook, and a committee within METI was tasked with developing the Outlook.[6] In June 2015, the cabinet of Japanese Prime Minister Shinzo Abe formally approved the Long Term Energy Supply and Demand Outlook, touting its greenhouse gas emission reduction target of 26% by 2030 (compared to 2013 levels), and articulating the requirements to restart the country's nuclear reactors.[7,8] The Outlook also requires increased efficiency of coal-fired power plants to increase performance consistent with achieving environmental goals.[9] This increased efficiency will likely be met with new higher efficiency coal-fired power plants.[10]

Through the energy planning process described above, the Japanese government policy determines the types of energy sources that will be used in the future. Public and private energy firms are involved in implementation of the plan with final government approval.[11]

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3 Fourth Strategic Energy Plan. Government of Japan, Ministry of Economy Trade and Industry. April 2014, p 4.

4 *Id*, p 17.

5 *Id*, pp 23-25.

6 Long Term Energy Supply and Demand Outlook. Ministry of Economy Trade and Industry. July 2015, p 1.

7 Japan Adopts Plan to Cut GHG Emissions 26 Percent by 2030, Restart Nuclear Program. *BNA Bloomberg*. June 3, 2015.

8 Long Term Energy Supply and Demand Outlook. Ministry of Economy Trade and Industry. July 2015, p 11.

9 *Id*, p 10.

10 To meet the emissions target, analysts expect new coal-fired power plants to have technology that reduces emissions. Source: Japan's Reliance on Coal Poses Emission Cut Challenges. *BNA Bloomberg*. July 29, 2015.

11 US EIA Country Overview: Japan. January 2015, p 3.

Mitigation Plans

In November 2016, Japan ratified the Paris Agreement, which defined its NDC as an emission reduction of 26% below 2013 levels by 2030. Japan's stated long-term goal is an 80% reduction by 2050 (base year not specified).[12]

Summary

To meet its 2030 emission reduction commitments, Japan would likely not be able to increase its generation from coal by any significant amount, unless such coal-fired generation also included carbon capture and sequestration (CCS). Given the central role of the Japanese government in energy planning, it seems reasonable to assume that the government will be able to limit new coal builds without CCS, thereby limiting any significant increases in coal demand and the resulting GHG emissions from coal-fired generation that does not have CCS.

South Korea

Planning Processes

The government of South Korea is heavily involved in energy industry planning, including a role in decision-making regarding the types of power plants that will be built.

The South Korea Ministry of Trade, Industry and Energy (MTIE) conducts long-term energy planning and creates a Basic Plan for Long-Term Electricity Supply and Demand (BPE) pursuant to Article 25 of the Electricity Business Act (EBA), which requires a stable supply and demand of electricity.

The most recent plan, the 7th BPE, outlines the structure of power generation and load capacity, and forecasts demand for the period from 2015-2029. The plan includes the development of a long-term outlook for electricity supply and demand; plans for generation facilities, transmission facilities, and transformation facilities; electricity demand management; and an evaluation of the previous BPE.[13] These forecasts create a path that policy makers use to dictate the growth rate in the energy sector and subsequently decide on a strategy for the energy mix necessary to meet forecasted demand.[14]

Each energy plan must evaluate the recent historical power generation capacity and energy mix and develop future goals to ensure that the necessary capacity is available to meet peak demand. Further, political objectives are built into the energy plans. For example, certain policy goals are set regarding the development of power generation technology with supercritical CO_2 capabilities and other efforts to reduce carbon emissions. The 7th BPE states: "Replacement of Aged Facilities with Environmentally-friendly Facilities: Greenhouse gas emissions are now under control by allowing the aged coal-fired power plants to be replaced within the capacity

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[12] Overview of the Plan for Global Warming Countermeasures, Cabinet decision on May 13, 2016, Ministry of the Environment, Japan. Available at: https://www.env.go.jp/press/files/en/676.pdf.

[13] *7th Basic Plan for Long Term Electricity Supply and Demand (2015-2029).* South Korean Ministry of Trade, Industry and Energy. July 2015, p 1.

[14] *Id*, pp 7-8.

only when they were upgraded for the environment. The aged power plants here mean the power plants that have been operating over 40 years since construction."[15]

When additional generation capacity is deemed necessary, the MTIE conducts an assessment to determine the amount of additional capacity and the method by which that capacity will be delivered. The final decisions are made by MTIE by awarding permits in line with the new generation capacity by year and by fuel.[16]

The 7th BPE projects that coal-fired generation is expected to drop from 39.1% of the generation mix in 2014 to 32.3% by 2029.[17]

The primary power company operating in South Korea is the Korea Electric Power Corporation (KEPCO) which is a state-owned enterprise. The Korean Government and Korea Development Bank, also state owned, hold a 51.1% interest in KEPCO.[18]

Mitigation Plans

In November 2016, South Korea ratified the Paris Agreement, which defined its NDC as an emission reduction of 37% below business as usual levels. South Korea did not include any long-term goals in its INDC.

Summary

South Korea is likely to continue using coal-fired generation for a significant portion of its electricity supply, but this share is expected to decline. The country's NDC is likely to further limit coal's role in the electricity supply mix.

Taiwan

Planning Processes

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15 *Id*, pp 9, 12 and 47.

16 According to the 7th BPE, "Intents for construction of thermal power plants were not surveyed because there was no need for new installations." Only one firm submitted an intention to construct two nuclear power plants. *7th Basic Plan for Long Term Electricity Supply and Demand (2015-2029).* South Korean Ministry of Trade, Industry and Energy. July 2015, pp 24-25, 35.

17 *7th Basic Plan for Long Term Electricity Supply and Demand (2015-2029).* South Korean Ministry of Trade, Industry and Energy. July 2015, pp 6, 12.

18 United States Securities and Exchange Commission Form 20-F Filing FY15. Korea Electric Power Corporation, p 105.

Taiwan energy markets are largely autonomous from China, and the Taiwanese government utilizes its own energy policies. The Taiwan Power Company is the primary utility company in Taiwan and is a state-owned enterprise, administered by the Bureau of Energy within the Ministry of Economic Affairs. Taiwan has a limited domestic supply of energy resources, including fossil fuels, and therefore imports the majority of its energy fuels. Coal comprises 31% of Taiwan's total primary energy consumption in 2014.[19] Coal is expected to remain in Taiwan's energy mix, given current market and political constraints resulting from nuclear energy being politically unpopular.[20]

The Taiwanese government has a long-standing policy of price intervention in its state-owned power companies to maintain stability in the domestic energy market and competitiveness in export industries.[21] For example, the Taiwanese government has consistently subsidized energy costs in an effort to maintain a competitive advantage in the global export and manufacturing markets.[22] These policies have been somewhat loosened in recent years due to pressure to reduce carbon emissions while maintaining efficiency.

The New Energy Policy currently in effect has stated plans to "reduce nuclear energy dependence" in the wake of nuclear power plant accidents in Japan, while creating a "low-carbon green energy environment" for Taiwan.[23] Taiwan plans to achieve this policy through efficient use of energy and full exploration of renewable energy, thus stabilizing their power supply and reducing carbon emissions.[24]

Taiwan's Guideline on Energy Development identifies the country's priorities, including:

> *"To ensure energy security and to satisfy people's basic needs, while taking into consideration of environmental protection and economic development, and promoting sustainable energy development under the principles of social justice and cross-generation fairness."*[25]
>
> and
>
> *"To ensure the balanced and stable energy supply and demand in the short, medium and long terms and to achieve the above-mentioned energy development goals, the Guideline has regulated the energy policies principles and strategies, which serve as the basis for general energy development planning. This Guideline*

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[19] Taiwan Profile. US Energy Information Administration. September 2015, p 1.

[20] Taiwan's Energy Problem. *Asia Program Special Report*. Woodrow Wilson Center for Scholars, pp 1, 10.

[21] *Id*, p 11.

[22] Wei-han C. Nobel laureate criticizes energy policy, subsidies. *Taipei Times*. April 18, 2016. Accessed May 25, 2016. http://www.taipeitimes.com/News/taiwan/archives/2016/04/18/2003644231.

[23] New Energy Policy of Taiwan. Bureau of Energy, Ministry of Economic Affairs. February 24, 2016. Accessed May 25, 2016. http://web3.moeaboe.gov.tw/ECW/english/content/Content.aspx?menu_id=969.

[24] *Id*, p 2.

[25] *Id*, p 1.

> *serves as the guidance for national energy development, related energy policy, standards and action plans."*[26]

Taiwan's specific development prospects identified in the Guideline on Energy Development requires the government to construct an energy supply and demand system that is safe, stable, efficient, and clean. It further requires the government to build an environment that helps energy-saving and carbon-reduction. These requirements are intended to facilitate achieving energy saving and carbon reduction targets and realization of sustainable development of energy in Taiwan.[27]

Taiwan's Guideline on Energy Development sets forth the requirement regarding supply-side power generation resource development. Taiwan identified an energy structure goal to use coal-fired power plants, with flexible adjustments, and to promote techniques to introduce clean coal and carbon reduction techniques, which will diminish carbon emission due to a reduction in coal use.[28]

Mitigation Plans

Taiwan plans to reduce its economy-wide GHG emissions by 50% by 2030 (relative to business as usual).[29] This target is approximately 20% below 2005 levels, and also includes a long-term target of 50% below 2005 levels by 2050.[30] Taiwan expects to reduce its emission through reduced energy and electricity consumption, the addition of more advanced electricity generation technology (like CCS), accelerated renewable energy additions, and increasing use of natural gas.[31]

Summary

To meet its 2030 emission reduction commitments, Taiwan would likely not be able to increase its generation from coal by any significant amount, unless such coal-fired generation also included CCS. The central planning role of the Taiwanese government would also limit the ability to add new coal builds without CCS, thereby limiting any significant increases in coal demand and the resulting GHG emissions from coal-fired generation that does not have CCS.

<u>China</u>

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26 *Id*, p 1.

27 *Id*, p 1.

28 *Id*, p 4.

29 Submission by Republic of China (Taiwan) Intended Nationally Determined Contribution (核定本), Available at: http://enews.epa.gov.tw/enews/enews_ftp/104/1117/174044/Submission%20by%20Republic%20of%20China%20(Taiwan)Intended%20Nationally%20Determined%20Contribution.pdf.

30 "Taiwan sets INDC goal for greenhouse gas," Taiwan Today, Sept. 17, 2015. Available at: http://taiwantoday.tw/news.php?unit=15,23&post=23982.

31 Submission by Republic of China (Taiwan) Intended Nationally Determined Contribution (核定本), and "Taiwan sets INDC goal for greenhouse gas."

Planning Processes

The Chinese government is heavily involved in the energy industry planning process, including the decision-making regarding the types of power plants that will be built.

China's energy market is highly regulated and largely directed through government policy. The Chinese power market is heavily reliant on coal-fired power plants to generate electricity. For example, coal-fired generation comprised 69% of consumed energy in 2011.[32] While China's 2015 5-Year Plan laid out plans to address carbon emissions issues, coal is still likely to remain the primary source of generation for the near and middle term.[33]

The Chinese government's most recent Five-Year Plan included 58 gigawatts of nuclear generating capacity in operation by 2020. China will start building more nuclear power plants by 2020, with the goal of 150 gigawatts of nuclear power by 2030.[34] In addition, the Chinese government has prioritized the expansion of LNG and alternative energy sources to address carbon emissions issues. However, given China's rapid and continued growth, demand for energy will likely outpace current technological advancements.[35]

The Chinese central government is integral to the decision-making process regarding opening new facilities. While private investors apply to build new facilities, the final approval is given by the central planners.[36]

China's central government sets broad economic development goals, which are implemented by government officials in local governments (e.g., provincial, municipal, county, and township governments). Central government strategies are issued in the form of five-year plans, which outline economic development priorities for the next five years. The 13th Five-Year Plan was announced in 2015 and outlines policy for the period from 2016 to 2020.[37] In practice, five-year plans lack detailed implementation guidelines and instead set broad goals for the national economy. In the last two five-year plans, innovation was prioritized as a central element of China's development goals.

Mitigation Plans

In September 2016, China ratified the Paris Agreement, which defined its NDC commitment to have CO_2 emissions peak around 2030, to lower CO_2 intensity by 60 to 65% from 2005 levels,

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32 China Profile. U.S. Energy Information Administration, February 4, 2014, p 3.

33 *Id*.

34 Follett A. China Will Literally Double the Amount of Nuclear Power. The Daily Caller. March 24, 2016. Accessed May 25, 2016. http://dailycaller.com/2016/03/24/china-literally-doubles-down-on-nuclear-power/#ixzz49fLxESGF

35 US Energy Information Administration, China Profile, February 4, 2014, Page 33.

36 China's Energy Markets: Anhui, Chongqing, Henan, Inner Mongolia, and Guizhou Provinces. US EPA Coalbed Methane Outreach Program, p 68.

37 China's 13th Five-Year Plan (2016-2020). *China's Policy Think Piece Series Issue No. 3*. Fung Business Intelligence Centre. November 2015.

and to increase non-fossil fuels energy consumption to about 20%. China's National Action Plan on Climate Change also sets a goal to increase natural gas' share of energy consumption to 10% by 2020. Further, the Energy Development Strategy Action Plan set a target limit of coal consumption of 4.2 billion metric tons by 2020. China added additional limits in 2015 and 2016 that are aimed at reducing coal use and coal production, while also shutting down coal-fired generators in an effort to improve air quality. The result of these recent actions has been declines in coal consumption each year since 2014.[38]

Summary

While China's NDC commitment is not as well defined as some other countries, the actions taken by the central government in recent years have demonstrated a commitment to reducing coal consumption. Even if the central government were to slow the pace of coal abatement from recent years, this would still likely not represent an opportunity to significantly increase coal demand within China.

Conclusion

The details provided in this appendix confirm that the likely Asian end-markets for the coal passing through the Project have in place established commitments for GHG emissions. These countries, including Japan, South Korea, Taiwan and China have a substantial central government's planning role within the electricity sector. In addition, these countries have established commitments for GHG emissions reductions and mitigations at a national level. These GHG emission reductions focus on direct, Scope 1 GHG emissions within the countries, and include mitigation of end-uses that would use the coal transported through the MBT-Longview facility such as electricity generation.

[38] See http://climateactiontracker.org/countries/china.html.