Chapter 7 Energy and Natural Resources

7.1 Introduction

This chapter evaluates the potential impacts of the proposed project's Technology and Marine Terminal Alternatives and a No-Action Alternative, as well as the related actions, on energy and natural resources. The construction and operation of the proposed project and alternatives would create new demands for energy in the forms of electricity and natural gas, and would consume building materials, fuel, and other natural resources. This assessment describes the existing energy demand of the project site, identifies the current energy providers, estimates the projected energy demand of the proposed project and alternatives, and assesses whether the current service providers could accommodate the projected energy demand.

As discussed below, Cowlitz County Public Utility District No. 1 (Cowlitz PUD) can meet the electricity demand of either of the proposed project's Technology Alternatives with limited improvements to the existing PUD infrastructure. With construction of the Kalama Lateral Project (the proposed pipeline), assessed below as a related action, the existing supply and transmission capacity of the natural gas infrastructure is adequate to serve the proposed project with either Technology Alternative without affecting supply to other gas users. Thus, this analysis concludes that neither the proposed project nor the No-Action Alternative would result in significant adverse impacts to energy and natural resources.

7.2 Methodology

This assessment of energy and natural resources begins by characterizing existing energy supply and demand on the project site and then projects future conditions for the proposed project and each alternative. The estimated energy demand for the proposed project and alternatives is based on information provided by the project proponent. The assessment of whether the electric system would be able to accommodate the proposed project's demand is based on correspondence with Cowlitz PUD, the electric service provider for the project site. The assessment of potential impacts to the natural gas system is based on information provided in submittals to the Federal Energy Regulatory Commission (FERC) by Northwest Pipeline LLC (Northwest 2014) for the natural gas pipeline, the related action.

7.3 Affected Environment

The following section describes the affected environment for energy and natural resources. Electricity and natural gas are the primary forms of energy that would be consumed by the proposed project and alternatives, and this section focuses on those energy resources.

7.3.1 Electric Power Service

Within Cowlitz County, electric service is provided by the Cowlitz PUD, a municipal corporation incorporated in 1936 to serve the citizens of Cowlitz County, Washington. Today, the Cowlitz PUD manages and operates two systems—an electric transmission system and a distribution system.

The Cowlitz PUD electric system provides electric service – in year 2013, the PUD served approximately 48,500 residential, commercial, industrial, and street lighting customers countywide (Washington State Auditor's Office 2014). Electrical energy is drawn primarily

from wholesale power purchased from the Bonneville Power Administration (BPA), which comes primarily from Columbia River system hydroelectric sources, as well as a nuclear source (i.e., the Columbia Generating Station) and miscellaneous others. A small portion of the Cowlitz PUD's energy supply comes from the Swift No. 2 hydroelectric project on the Lewis River, which is operated by the Cowlitz PUD distribution system.

In year 2013, the Cowlitz PUD electric system had retail energy sales of approximately 5,195,417 megawatt-hours (Washington State Auditor's Office 2014). The project site, which is currently undeveloped and used as a dredged material disposal site, does not generate significant demand for electric power in existing conditions.

7.3.2 Natural Gas Service

The project site is not currently connected to the natural gas system and thus does not currently generate demand for natural gas.

In general, Cascade Natural Gas (Cascade) provides residential and commercial natural gas service in Kalama. However, the use of the Cascade system to serve the proposed project would require construction of substantial new pipeline and appurtenant facilities to meet the delivery requirements of the proposed project while still meeting Cascade's existing customer demand. At this time, NWIW has not entered into contracts for the supply of natural gas to the proposed project.

7.4 Environmental Impacts

7.4.1 Proposed Project

7.4.1.1 Construction Impacts

The construction of the proposed project would result in the same types of overall construction activities with the same overall duration with either Technology Alternative and either Marine Terminal Alternative. Construction activities with either Technology Alternative and either Marine Terminal Alternative would have the same potential to impact energy and natural resources. Therefore, this assessment accounts for the potential construction impacts that could occur under either of the Technology Alternatives or either of the Marine Terminal Alternatives.

Construction of the proposed project would require fuel to power off-road construction vehicles and equipment, trucks, personal vehicles for construction workers, temporary construction lighting, dredging vessels, and vessels and barges delivering construction modules to the project site. However, the demand for diesel and gasoline needed to fuel construction equipment is anticipated to be met by existing supplies. Furthermore, the construction of the proposed project would consume traditional building materials and would use a maximum of approximately 5.4 megawatts per day of temporary grid electric power. The volume and use of these resources would be typical of other construction projects of this size and scope, and these resources are not expected to be in short supply. Overall, construction of the proposed project would not result in significant adverse impacts to energy and natural resources.

7.4.1.2 Operational Impacts

As described in Chapter 2, Proposed Project and Alternatives, the proposed project would develop the currently vacant industrial project site with a methanol manufacturing facility,

marine terminal, and other supporting facilities. The proposed project would include a new substation on the project site to facilitate the provision of electric service to the project.

In order to provide electric service to the proposed project with the Ultra-Low Emissions (ULE) Alternative, it is expected that Cowlitz PUD would upgrade an existing transmission line from its existing Kalama Industrial Substation to the project site by installing new lines on existing towers within the existing transmission line corridor. New equipment (e.g., 115-kilovolt [kV] breakers and switches) would be installed at the Kalama Industrial Substation within the existing footprint of that facility. Cowlitz PUD also has indicated that it may construct a short transmission line (approximately 750 feet) between the Kalama Industrial Substation and an existing 115-kV transmission line on the east side of Interstate 5 (I-5) to provide redundant supply to the substation. This short line would cross I-5, N. Hendrickson Drive, and the railroad and would require installation of new poles. As discussed in Chapter 2, Proposed Project and Alternatives, the new lines and improvements to the Kalama Industrial Substation would constitute a related action on the part of the Cowlitz PUD.

Technology Alternatives

The Technology Alternatives would result in different demand for electricity and natural gas.[1] As discussed in Chapter 2, Proposed Project and Alternatives, the primary differences between the Combined Reformer (CR) and ULE Alternatives are energy consumption and the energy sources used for the natural gas reforming step in the methanol production process. With the CR Alternative, the waste heat from the reforming process is used to generate steam, and the steam is sent to turbines to drive rotating process equipment (such as pumps and compressors). ULE technology is designed to use process heat directly to provide energy for the reforming reaction. With the ULE reforming technology, rotating process equipment is driven by electricity instead of steam turbines. To power the processes, the CR Alternative would require electrical power of approximately 36 megawatts and natural gas with a power content of 60,000 dekatherms[2] per day; the ULE Alternative would require electrical power of approximately 101 megawatts and natural gas with a power content of 30,000 dekatherms per day.[3] Both alternatives also would consume a substantial amount of natural gas used as raw material to manufacture methanol.

Both the CR and ULE Alternatives would require substantial amounts of electricity and natural gas to power their processes and to produce methanol. The CR Alternative requires more energy input and relies more heavily on natural gas for that energy. The ULE Alternative uses natural gas to power boilers, but the reforming process is powered by process heat from the autothermal reformer. The ULE Alternative requires substantially more electricity because electricity is used to power compressors and pumps.

Overall, the ULE Alternative would have greater demand for electric power from the Cowlitz PUD than the CR Alternative (approximately 101 megawatts compared to approximately 36 megawatts with both methanol production lines in operation), while the CR Alternative would have greater demand for natural gas than the ULE Alternative (approximately 290,000 dekatherms per day compared to approximately 270,000 dekatherms per day with both

[1] All estimates of natural gas and electricity demand are based on preliminary engineering design calculations provided by Northwest Innovation Works, LLC – Kalama.
[2] A dekatherm is a unit of energy equal to 10 therms and one million British thermal units (MMBtu).
[3] This power consumption for the ULE Alternative includes natural gas consumption to fuel the onsite electric power generator. These values are for average power consumption over the life of the reforming catalyst.

methanol production lines in operation).[4] These estimates of natural gas usage includes natural gas that would be used as fuel for the production process, as well as natural gas used as raw material for methanol. The ULE Alternative, therefore, was assessed as the worst-case Technology Alternative for electricity demand and the CR Alternative was assessed as the worst-case Technology Alternative for natural gas demand.

Electricity Demand

Based on estimates provided by the project proponent, the electricity demand for the ULE Alternative would be approximately 201 megawatts with both methanol production lines in operation. [5] The ULE Alternative would include an on-site natural gas-fired power generator to produce approximately 101 megawatts, and the remaining 100 megawatts of electricity demand would be provided by the Cowlitz PUD. The project proponent has discussed the provision of electrical service with the Cowlitz PUD. In a letter dated 12 June 2015, the Cowlitz PUD stated that it can support a connected load of 100 megawatts for the proposed project, although improvements to its system would be necessary (see **Appendix F**). These improvements would consist of upgrading an existing transmission line, improvements to the Kalama Industrial Substation, and the possible construction of a short transmission line across I-5, as described above. If in the future, Cowlitz PUD constructs transmission capacity adequate to supply all of the power needs for the ULE Alternative, the on-site power generation facility could be made obsolete. Cowlitz PUD currently has no plans to construct additional transmission capacity to the project site.

The CR Alternative would require approximately 36 megawatts of electricity. This demand could be met entirely by the Cowlitz PUD, and it would not require an on-site power generation facility.

The electrical load delivered by Cowlitz PUD must be considered by the PUD as a "new large single" load. This legal designation requires that the customer needing the service, in this case NWIW, to pay for the costs for the electrical service, including all power generation costs, transmission costs, and any system upgrades that are specifically required to deliver the electrical service. In addition, power purchased for this "new large single load" cannot be provided from the "preference power" generated by the federal Columbia River Hydropower System. "Preference power" is federally obligated to be made available to public utility districts and preference customers and not to industrial customers. Cowlitz PUD anticipates that there will be no impacts to rates paid by existing customers as a result of the project (Cowlitz PUD 2016).

Neither Technology Alternative would result in a significant adverse impact related to electricity demand.

[4] The estimated natural gas demand of the ULE Alternative includes gas that would be used to produce approximately 100 megawatts of electricity in the on-site power generation facility. At full operation, the ULE Alternative would use approximately 201 megawatts of electricity - 100 megawatts produced by the on-site power generation facility and 101 megawatts from the Cowlitz PUD. Inclusion of the power generation facility reduces the demand for electricity from the Cowlitz PUD and increases the natural gas consumption of the ULE Alternative.

[5] As discussed in Chapter 2, NWIW is conducting a more in-depth analysis of the feasibility of incorporating a zero liquid discharge (ZLD) system into the methanol plant design. A ZLD system would increase the facility's average electricity demand, but would not affect its peak power requirements.

Natural Gas Demand

The proposed project would manufacture methanol from natural gas transported on the Kalama Lateral Project (the proposed pipeline) to be constructed by Northwest (**Figure 2-19**). The methanol manufacturing process under the CR Alternative would generate demand for approximately 290,000[6] dekatherms[7] of natural gas per day (including natural gas used for raw material and natural gas used for fuel). Under the ULE Alternative, the total natural gas demand would be approximately 270,000[8] dekatherm per day. The proposed pipeline has been designed to meet the higher demand of the CR Alternative. There are two primary factors to consider in assessing the potential for the proposed project to affect the availability of natural gas for other Northwest consumers. These factors are the availability of natural gas itself and the availability of pipeline transmission capacity to deliver the natural gas to consumers. With respect to the supply of natural gas, the proposed pipeline would interconnect with Northwest's bi-directional mainline, which provides access to British Columbia, Alberta, Rocky Mountain, and San Juan Basin gas supplies.

Overall, annual natural gas production in the United States has increased substantially in recent years as a result of the identification and development of shale gas supplies (American Petroleum Institute 2014). North America has natural gas resources that have been developed through technological advances in exploration and production techniques, which have changed the energy supply in the United States. As a result of the development of these significant natural gas resources, production is forecasted to exceed what can be used domestically. The reference case from the U.S. Energy Information Administration (EIA) predicts natural gas consumption in the United States to increase from 26.2 trillion cubic feet (Tcf) in 2013 to 29.7 Tcf in 2040 and natural gas production to increase from 24.4 Tcf in 2013 to 35.5 Tcf in 2040 (EIA 2015). Further, the United States has a large inventory of wells that have been drilled but not completed. This allows producers to avoid selling into the market at lower prices, while taking advantage of lower drilling and service costs available because of reduced activity. These wells can be completed later when prices rise, which could rapidly increase supply, stifling large price increases (National Energy Board 2016).

Historically, the United States consumed more natural gas than it produced and made up for the difference with imported natural gas, primarily from Canada. However, with the recent increase in domestic natural gas production, it has been forecast that the United States may become a net exporter of natural gas by 2020 (American Petroleum Institute 2014). Furthermore, the United States used approximately 26.2~~13~~ trillion cubic feet (or 26.13 billion dekatherms) of natural gas in 2013 (~~U.S. Energy Information Administration~~EIA 2014). The proposed project would use between approximately 270,000 and 290,000 dekatherms of natural gas per day (or between 0.098 and 0.105 billion dekatherms per year) depending on the technology selected. Existing natural gas production capacity in North America is available to supply gas to the project. This with ~~Given~~ the increasing production of natural gas in the United States, the ability to import additional natural gas supplies when needed, and the small amount of natural gas used by the proposed project relative to the overall United States consumption, the proposed project would not adversely affect the supply of natural gas for other consumers.

[6] This is an estimate of the average natural gas consumption over the life of the reforming catalyst. This estimate is based on actual performance of combined reforming processes of similar design.
[7] 1 dekatherm equals 1,000 cubic feet of gas. 290,000 dekatherms equal 290,000,000 cubic feet of gas or 2.9 Tcf.
[8] This is also an estimated average over the life of the reforming catalyst. This is an estimate only; the actual natural gas usage may be lower or higher depending on the final engineering design and catalyst used and the heating value of the natural gas delivered to the project.

With respect to the availability of pipeline transmission capacity for natural gas, Northwest's Section 7(c) application to FERC,[9] states that on a typical day more than 500,000 dekatherms of operationally available capacity on the mainline has been historically available for natural gas deliveries to the Kalama area, which is more than the proposed project demand. This figure represents available upstream transportation capacity and already accounts for capacity that has been subscribed to deliver gas to other Northwest consumers. Residential customers are served by local distribution companies that hold sufficient firm gas supply resources to serve their customers. The proposed project's demand is within this available upstream transmission capacity. FERC has granted Northwest its requested Section 7(c) certificate[10] finding that the proposed natural gas transportation service to NWIW's methanol facility would not have adverse effects on existing natural gas customers or other pipelines and their customers. As a result, the proposed project with either Technology Alternative would not adversely affect the availability of natural gas for other Northwest consumers.

The Northwest Gas Association's (NWGA) 2016 Gas Outlook explains that natural gas demand is growing in the Pacific Northwest due to increased consumer and industrial demand and increased demand for gas-fired power generation. In its key conclusions, the report states that additional pipeline transmission capacity is likely to be required within the forecast horizon to serve growing demand for natural gas under the "expected case," which does not take into account the addition of new major sources like replacement of coal power generation, LNG facilities, fertilizer plants, methanol plants, or use of natural gas as a transportation fuel. Regardless of whether or not the proposed project or other major sources are built, the report concludes that "it is only a matter of time before new capacity within the region will be required."[11]

The report also considers the effect on demand that would be created by new major industrial loads that are not reflected in its expected case. These include industrial users like new gas-fired power plants to replace coal power generation, LNG facilities, fertilizer plants, and methanol plants, including the proposed project. Regarding such new industrial users, the report concludes: "Additional generation demand and industrial loads materially above the expected case will amplify and accelerate the need for incremental capacity required to serve the region."[12] Because such industrial users would add to the already growing demand, they necessarily would accelerate to some degree the eventual need for expanded regional pipeline capacity. In this context, NWGA concludes "Quicker deployment of new capacity will be required to serve the region if these scenarios [coal replacement or new major industrial loads] are realized."[13] The NWGA report does not suggest that the construction of the proposed project alone will require increased pipeline capacity, as a cumulative impact of the project, but that "an inflection point could happen if some combination of LNG export, methanol and new gas-fired power generation loads emerge."

The proposed project is not dependent on expansion of regional pipeline capacity. While expansion of pipeline capacity could improve the reliability of gas supply to the methanol plant, such expansion is not necessary for the plant to operate effectively. As noted above, due to limitations in the existing regional pipeline capacity and projected regional growth in demand for natural gas, there may come a time when pipeline capacity is no longer adequate to meet

[9] This application is FERC Docket CP15-8 and is available online at http://www.ferc.gov/docs-filing/elibrary.asp
[10] Federal Energy Regulatory Commission, Order Issuing Certificate, Docket No. CP-15-8-000, April 11, 2016.
[11] 2016 NWGA at 20.
[12] 2016 NWGA at 17.
[13] 2016 NWGA at 19.

peak demand from other gas users during extreme cold weather days and also provide NWIW the entire amount of gas for it to operate at full production levels. During those rare extreme cold weather days, NWIW may have to cut back its production due to limitations on gas delivery. NWIW has discussed with gas suppliers, such as Northwest Natural, the possibility of entering into gas supply contracts where a portion of the natural gas to be supplied is firm and not interruptible, but a portion of the supply may be interrupted when demand surges from other users, such a consumer needs. In this manner, NWIW has the flexibility to operate even if pipeline capacity eventually becomes constrained during periods of peak demand.

NWIW has not entered into contracts for the supply of natural gas to the project, and it has the option to purchase natural gas from several different regions in western United States and Canada. Natural gas is a commodity product and may be sourced from a wide market of producers. As discussed above, North American well fields from which natural gas can be transported to Kalama have adequate production capacity to satisfy the immediate daily demands of the proposed methanol plant and new wells are continually being developed (Canadian National Energy Board 2016) (EIA 2016). Natural gas producers develop additional wells based on many factors, including the age, efficiency and future capacity of their existing wells; their projections of demand; where that demand will be; the capacity of existing and proposed pipelines for transporting the gas; and their strategy for competing with other natural gas producers and energy sources in the North American markets. How the proposed project and other unrelated future developments will affect natural gas markets and competitive positions is too speculative to assess. For these reasons, the proposed project would not necessarily result in the development of new wells.

Overall, the proposed project with either Technology Alternative would not result in significant adverse impacts to energy and natural resources.

Energy Conservation Measures

The proposed project would incorporate measures to conserve energy during construction and operation. Most notably, the methanol production process with either Technology Alternative would be designed to reuse and recycle waste products to reduce the overall energy required to operate the manufacturing process. With the CR Alternative, the waste heat from the reforming process is recovered and used to generate steam, and the steam is sent to turbines to drive rotating process equipment (such as pumps and compressors). With the ULE Alternative, process waste heat is used directly to provide energy for the reforming reaction. Another energy efficiency measure would be the reuse of hydrocarbon byproducts from the distillation process as fuel for the boilers to generate steam used in the process.

The proposed project would also use light-emitting diode (LED) light fixtures. LED light fixtures use substantially less energy than traditional high-intensity discharge lighting fixtures and have a much longer useful life.

Marine Terminal Alternatives

The Marine Terminal Alternatives would both result in the same potential impacts to energy and natural resources and are assessed together.

Both Marine Terminal Alternatives would generate demand for electricity for lighting, loading equipment, and the operations shack and dockworker shelter. They would also generate demand for electricity from the use of shore power (also known as “cold-ironing”). Both Marine Terminal Alternative would generate a peak electrical demand of approximately 3

megawatts (accounting for both methanol loading activities and the use of shore power by vessels serving the methanol manufacturing facility and lay berth vessels), and an estimated annual electricity use of approximately 11,000 megawatt-hours based on preliminary engineering estimates. This electricity demand would be negligible compared to the approximately 5 million megawatt-hours of energy sales by the Cowlitz PUD in 2013. Therefore, the operation of the Marine Terminal Alternatives would not result in significant adverse impacts to energy and natural resources.

7.4.2 Related Actions

7.4.2.1 Kalama Lateral Project

The proposed pipeline would be made up of 3.1 miles of 24-inch-diameter pipeline, associated facilities and equipment extending from Northwest's mainline to the proposed project. During construction of the proposed pipeline, building materials and fuel would be consumed. Construction activities would be temporary, lasting approximately five months, and energy use during construction, which would primarily be diesel and gasoline fuel use, is expected to be negligible compared to the approximately 87 million barrels (with 42 gallons per barrel) of distillate fuel and motor gasoline consumed in 2012 in Washington (~~U.S. Energy Information Administration~~ EIA 2012). During operation, the proposed pipeline and associated aboveground facilities would require very little energy. Therefore, the proposed pipeline related action would not result in significant adverse impacts to regional energy or local natural resources.

7.4.2.2 Electrical Service

It is expected that electrical service improvements to the Kalama Industrial Substation and new transmission lines, primarily on existing towers within the existing power line corridor, may be run to the project site under the ULE Alternative. The new transmission lines and substation improvement would constitute a related action on the part of the Cowlitz PUD. They would provide electric service to the proposed project with the ULE Alternative but would not generate demand for energy or natural resources by themselves. Therefore, this related action would not result in significant adverse impacts to regional energy or local natural resources.

7.4.3 No-Action Alternative

Under the No-Action Alternative, the proposed project would not be constructed on the project site, but instead the Port of Kalama would pursue other future industrial or marine terminal development of the site. During construction, development under the No-Action Alternative would be expected to create demand for building materials and fuel. During operation, the No-Action Alternative would likely generate demand for electricity, natural gas, and other energy resources depending on the type of development that is ultimately pursued. The electrical demand for an alternative use of the site could be more or less than the project, depending on the use.

7.5 Mitigation Measures

There are no significant adverse impacts to energy and natural resources; therefore, no mitigation measures are identified.

7.6 Unavoidable Significant Adverse Impacts

Because the amount of energy resource consumption associated with the proposed project falls within the range of existing available capacity of the electricity and natural gas providers, neither the proposed project nor the No-Action Alternative would result in unavoidable significant adverse impacts to energy and natural resources.

7.7 References

American Petroleum Institute. 2014. Understanding Natural Gas Markets. Prepared by the Brattle Group. Prepared for the American Petroleum Institute. Available at http://www.api.org/~/media/files/oil-and-natural-gas/natural-gas-primer/understanding-natural-gas-markets-primer-low.pdf.

Canadian National Energy Board. 2016. Energy Market Assessment, Short-term Canadian Natural Gas Deliverability 2016-2018. June 2016.

Cowlitz County Public Utility District No. 1 (Cowlitz County PUD). 2016. Letter RE: Draft Environmental Impact Statement (EIS) for the Kalama Manufacturing and Marine Export Facility by Northwest Innovation Works, LLC – Kalama (NWIW). April 18, 2016.

National Energy Board. 2016. Energy Market Assessment, Short-term Canadian Natural Gas Deliverability 2016-2018. June 2016.

Northwest Pipeline LLC. 2014. Application for Certificate of Public Convenience and Necessity for the Kalama Lateral Project, submitted to Federal Energy Regulatory Commission on October 27, 2014. Docket No. CP15-8-000.

Washington State Auditor's Office (SAO). 2014. Financial Statements Audit Report Public Utility District No. 1 of Cowlitz County. Audit Period January 1, 2013 through December 31, 2013. Report No. 1011741. Washington State Auditor. Olympia, Washington. May 1, 2014. Available at: http://www.cowlitzpud.org/pdf/Cowlitz%20PUD%202013%20Financial%20Audit.pdf. Accessed March 5, 2015.

U.S. Energy Information Administration (EIA). 2016. Annual Energy Outlook 2016, Table: Natural Gas Supply, Disposition and Prices. Available at: http://www.eia.gov/forecasts/aeo/data/browser/#/?id=13-AEO2016&cases=ref2016~ref_no_cpp&sourcekey=0. Accessed July 17, 2016.

U.S. Energy Information Administration (EIA). 2015. Annual Energy Outlook 2015 with projections to 2040. DOE/EIA-0383(2015). April 2015.

U.S. Energy Information Administration (EIA). 2014. Natural Gas Explained Use of Natural Gas. Updated December 10, 2014. Accessed April 10, 2015. http://www.eia.gov/energyexplained/index.cfm?page=natural_gas_prices.

U.S. Energy Information Administration (EIA). 2012. State Energy Data 2012: Consumption. Table C2 Energy Consumption Estimates for Major Energy Sources in Physical Units, 2012. Washington, DC. Available at http://www.eia.gov/state/seds/sep_sum/html/pdf/sum_use_tot.pdf Accessed March 5, 2015.