3.7 Energy and Natural Resources

This Programmatic Environmental Impact Statement (EIS) considers the adverse environmental impacts on energy and natural resources that would result from the types of facilities described in Chapter 2, Overview of Transmission Facilities, Development Considerations, and Regulations. This section addresses the following topics related to the new construction, operation and maintenance, upgrade, and modification of high-voltage electric transmission facilities (transmission facilities) in Washington:

- Section 3.7.1 identifies regulatory, siting, and design considerations.
- Section 3.7.2 describes the affected environment.
- Section 3.7.3 describes the adverse environmental impacts.
- Section 3.7.4 describes Mitigation Measures.
- Section 3.7.5 identifies probable significant adverse environmental impacts on energy and natural resources.

3.7.1 Regulatory, Siting, and Design Considerations

This Programmatic EIS establishes a broad framework for compliance, outlining general laws, regulations, best management practices (BMPs), and design considerations. It is assumed that project-specific applications would be developed within this pre-established regulatory context and comply with existing laws and regulations. Any projects not complying with applicable laws and regulations or failing to adhere to design considerations or BMPs would require additional project-specific environmental analysis and mitigation. The federal and state laws and regulations that apply to energy and natural resources are summarized in **Table 3.7-1**.

Table 3.7-1: Laws and Regulations for Energy and Natural Resources

Applicable Legislation	Agency	Summary Information
16 USC § 791a et seq. – Federal Power Act	Federal Energy Regulatory Commission	Originally enacted in 1920 and amended in 1935, the FPA grants FERC jurisdiction over wholesale electric power transactions[1] and interstate transmission of electric power.
42 USC Chapter 134 – Energy Policy Act	U.S. Department of Energy Multiple federal agencies	This act, originally enacted in 1992, is a comprehensive piece of legislation aimed at addressing various energy-related issues in the United States, including energy efficiency and conservation, alternative fuels,[2] electricity market reforms, renewable energy, and nuclear and fossil fuels. An amendment in 2005 introduced major changes, including: Loan Guarantees, Biofuel Mandates, Electricity Grid Reliability, Market Manipulation Prevention, and Public Utility Holding Company Act Repeal. This amendment also includes provisions to improve the reliability of the electric grid and streamline the permitting process for transmission projects. It expands FERC's authority, including backstop siting[3] authority for transmission facilities in designated National Interest Electric Transmission Corridors.[4]
42 USC Chapter 152 – Energy Independence and Security Act	Multiple federal agencies	This act aims to enhance U.S. energy security[5] and promote clean energy. The EISA set ambitious targets for biofuels[6] to reduce dependence on oil.

[1] The buying and selling of large quantities of electricity between electricity producers (such as power plants) and electricity suppliers (such as utility companies). These transactions typically occur in wholesale electricity markets, which were established during the deregulation of the electricity markets in the 1990s.

[2] Energy sources that can be used to generate electricity as a substitute for traditional fossil fuels like coal, oil, and natural gas. These alternative fuels are often more sustainable and often considered more environmentally friendly.

[3] FERC's limited authority to approve the siting of certain electric transmission lines when state authorities fail to do so. This authority is granted under specific conditions outlined in the Energy Policy Act of 2005 and further clarified by the Infrastructure Investment and Jobs Act of 2021.

[4] Geographic areas designated by the DOE where electricity transmission limitations are significantly affecting consumers. These corridors are identified based on findings from the National Transmission Needs Study and other relevant data.

[5] Reliable and affordable access to sufficient energy resources to meet a nation's needs. It encompasses the ability to produce or obtain enough energy to support economic stability, national security, and the daily activities of its citizens.

[6] A type of fuel derived from biological materials, such as plants, algae, or animal waste. Unlike fossil fuels, which take millions of years to form, biofuels are produced over a much shorter time span and are considered renewable.

Applicable Legislation	Agency	Summary Information
49 USC Chapter 53 – Bipartisan Infrastructure Law	Multiple federal agencies	This law includes investments in modernizing the electric grid, including funding for new transmission facilities and grid upgrades.
Washington State Environmental Policy Act	▪ Washington State Agencies ▪ Local governments	This act is a process that identifies and analyzes environmental impacts that can be related to issuing permits. SEPA helps permit applicants and decision-makers understand how a proposed project will impact the environment. Certain projects, as defined in the SEPA Rules (WAC 197-11-704) and that are not exempt, are required to go through the SEPA process.
RCW 19.285, Washington State Energy Independence Act	Washington State Department of Commerce[(a)]	This act requires electrical utilities serving at least 25,000 retail customers to use renewable energy and energy conservation over a 10-year period and set two-year targets.
RCW 19.405, Washington State Clean Energy Transformation Act	Washington State Department of Commerce[(a)]	This act mandates that Washington's electricity supply be 100% carbon-neutral[7] by 2030 and 100% renewable or non-emitting[8] by 2045. It also established the Transmission Corridors Work Group to identify and address the need for upgraded and new transmission facilities.
RCW 36.70A, Washington State Growth Management Act	Washington Department of Commerce[(a)]	This act requires cities and counties to plan for growth while conserving natural resources and protecting critical areas such as wetlands and forests.
RCW 70A.535, Clean Fuel Standard	Washington State Department of Ecology[(a)]	This program aims to reduce the carbon intensity of transportation fuels and promote the use of low-carbon and renewable alternatives.
RCW 70A.65, Climate Commitment Act	Washington State Department of Ecology[(a)]	This act establishes a comprehensive program to reduce carbon pollution and achieve the greenhouse gas limits set in state law.

[7] A balance between emitting carbon and absorbing carbon from the atmosphere in carbon sinks. Any CO_2 released into the atmosphere from activities such as burning fossil fuels is offset by an equivalent amount of CO_2 being removed, resulting in no net increase in atmospheric CO_2.

[8] Energy sources or technologies that do not release greenhouse gases during their operation.

Applicable Legislation	Agency	Summary Information
WAC Title 463, Energy Facility Site Evaluation Council	State of Washington Energy Facility Site Evaluation Council[(a)]	This regulation covers various aspects of energy facility siting, construction, and operation.

Notes:

[(a)] The agency responsible for administering most permits or authorizations for the identified regulation. However, if EFSEC is determined to be the agency responsible for approving a proposal, EFSEC can administer several types of permits at the state and local levels. EFSEC provides a streamlined process for siting and licensing major energy facilities, including transmission facilities in Washington State. EFSEC coordinates all evaluation and licensing steps, specifies the conditions for new construction and operation, and issues a Site Certification Agreement, which assumes the responsibility for issuing individual state or local permits. By consolidating these permits into a single Site Certification Agreement, EFSEC can simplify the regulatory process for energy facility developers. While EFSEC itself does not directly administer federal permits, it works closely with federal agencies to ensure that all necessary federal requirements are met during the evaluation and licensing of energy facilities.

EFSEC = Energy Facility Site Evaluation Council; **EISA** = Energy Independence and Security Act; **FERC** = Federal Energy Regulatory Commission; **FPA** = Federal Power Act; **RCW** = Revised Code of Washington; **SEPA** = State Environmental Policy Act; **USC** = United States Code; **WAC** = Washington Administrative Code.

The siting of transmission facilities is determined by engineering, technical, environmental, and socioeconomic factors. **Table 3.7-2** summarizes guidance documents and management plans that outline the design considerations and BMPs generally used to avoid or minimize adverse environmental impacts on energy and natural resources.

Table 3.7-2: Siting and Design Considerations for Energy and Natural Resources

Siting and Design Consideration	Description
Siting: Finding a Home for Renewable Energy and Transmission (Zichella and Hladik n.d.)	This document from the U.S. Department of Energy focuses on the challenges and strategies for siting renewable energy projects and transmission facilities. Strategies for effective siting include: ▪ Optimizing existing infrastructure ▪ Early stakeholder engagement ▪ Interagency coordination ▪ Innovative compensation ▪ "Smart from the start," a strategy aimed at using criteria to prioritize low-impact areas for development to avoid environmental and cultural conflicts
Recommended Siting Practices for Electric Transmission Developers	This document outlines best practices for siting electric transmission facilities. Recommended practices include: ▪ Early and transparent engagement ▪ Respect and fair dealing

Siting and Design Consideration	Description
(Americans for a Clean Energy Grid 2023)	▪ Environmental considerations ▪ Interagency coordination ▪ Use of existing infrastructure
North American Electric Reliability Corporation Standard Processes Manual VERSION 5 Effective November 28, 2023 (NERC 2023)	NERC Reliability Standards are developed using an industry-driven process that: ▪ Ensures the process is open to all persons who are directly and materially affected by the reliability of the North American bulk power system ▪ Ensures the process is transparent to the public ▪ Demonstrates the consensus for each standard ▪ Fairly balances the interests of all stakeholders ▪ Provides for reasonable notice and opportunity for comment ▪ Enables the development of standards in a timely manner
Transmission Corridors Work Group Final Report (EFSEC 2022)	The final TCWG report concludes the following: ▪ **Regional and interregional planning:** Washington has long relied on out-of-state sources for its energy needs. Reliance on those sources is likely to increase in the state's future. It will be critical to have a strong state presence at the table for enhanced regional and interregional transmission planning. Timely engagement in clean energy transmission planning will ensure that the renewable energy the state needs can reach the homes and businesses that require it. ▪ **Staff resources in state agencies:** The state's critical role in transmission planning would be enhanced by the designation (and funding) of a team dedicated to incorporating state input into regional planning processes. Sufficient staff are also needed to perform the transmission siting work that will be required in the coming years, particularly in the realm of archaeology and historic preservation. ▪ **Enhanced resources for Tribes:** The burden of paying for siting-related archaeological and cultural review should not fall on the Tribes. It is critical to identify mechanisms for funding Tribal governments to carry out this vital work. ▪ **Pre-application planning and coordination:** Key stakeholders believe the state currently lacks sufficient transmission infrastructure to meet CETA's 2030 targets for renewable energy. Given that it can take over 10 years to properly site a major transmission project, the needed planning work is already overdue and should begin as soon as possible.

CETA = Clean Energy Transformation Act; **NERC** = North American Electric Reliability Corporation; **TCWG** = Transmission Corridors Work Group.

3.7.1.1 Energy Programs

To ensure a robust and resilient electric grid, various federal initiatives and programs have been established to support transmission planning, cost allocation, and infrastructure development.

3.7.1.2 Federal Initiatives

- **Building a Better Grid Initiative:** Administered by the U.S. Department of Energy's (DOE's) Grid Deployment Office, this initiative focuses on developing long-distance, high-voltage transmission facilities and modernizing distribution facilities to ensure reliable and affordable electricity.
- **Order No. 1920:** The Federal Energy Regulatory Commission (FERC) issued Order No. 1920, which mandates long-term regional transmission planning. This involves scenario planning over a 20-year horizon to identify and address future transmission needs. Order No. 1920 identifies seven benefits that must be considered in the cost-benefit analysis of long-term transmission planning:
    - Avoided or deferred reliability transmission facilities and aging infrastructure replacement.
    - Either reduced loss of load probability or reduced planning reserve margin
    - Production cost savings.
    - Reduced transmission energy losses.
    - Reduced congestion due to transmission outages.
    - Mitigation of extreme weather events and unexpected system conditions.
    - Capacity cost benefits from reduced peak energy losses.

Federal Energy Programs

- **U.S. State Energy Program:** Administered by the DOE, the U.S. State Energy Program provides funding and technical assistance to states to promote energy efficiency and renewable energy projects.
- **The Transmission Facilitation Program:** Administered by the DOE, the Transmission Facilitation Program is administered by the DOE and supports the development of new transmission facilities and upgrades through financial tools like capacity contracts, loans, and public-private partnerships. The program aims to overcome financial barriers and accelerate the deployment of critical transmission infrastructure.

- **Grid Resilience and Innovation Partnership Programs:** These programs, managed by the DOE, offer $110.5 billion in funding to enhance grid resilience and support innovative transmission projects.
- **Coordinated Interagency Transmission Authorizations and Permits Program:** The Coordinated Interagency Transmission Authorizations and Permits Program, administered by the DOE, aims to streamline environmental reviews and permitting processes, reducing the time required for federal permits.
- **National Interest Electric Transmission Corridors:** Designations under this program unlock critical federal financing and permitting resources to spur transmission development, including direct loans and public-private partnerships.

Among the acts included in **Table 3.7-1**, Washington also has key programs and initiatives focused on transmission to support its clean energy goals, including those described below.

Transmission Corridors Work Group

The Clean Energy Transformation Act (CETA) included a directive for EFSEC to establish the Transmission Corridors Work Group (TCWG). The TCWG included members from several state agencies, industry stakeholders, and organizations, as follows:

- Washington State Department of Commerce
- Washington Utilities and Transportation Commission
- Washington State Department of Ecology
- Washington Department of Fish and Wildlife
- Washington State Department of Natural Resources
- Washington State Department of Transportation
- Washington State Department of Archaeology and Historic Preservation
- Washington State Military Department

Additionally, the TCWG included the following non-state participants:

> *two representatives designated by the association of Washington cities, one from central or eastern Washington and one from western Washington; two*

> *representatives designated by the Washington state association of counties, one from central or eastern Washington and one from western Washington; two members designated by sovereign tribal governments; one member representing affected utility industries; one member representing public utility districts; and two members representing statewide environmental organizations. The Bonneville Power Administration and the United States Department of Defense were also invited to participate as ex officio work group member* (Senate Bill 5116, 2019).

The TCWG final report presents a list of guiding principles that provide foundational, solution-oriented direction throughout transmission facility development. The principles were formulated to address the adverse environmental impacts of transmission facilities, the needs of overburdened communities, background findings, geographic considerations, and transmission-related challenges (EFSEC 2022). The TCWG's guiding principles are organized according to phases of transmission development, beginning with overarching principles that apply to all phases and ending with best practices that may apply to multiple phases. These principles are as follows:

Overarching Principles

1) *Interregional transmission capacity is key in enabling Washington, as well as other states, to build a diverse portfolio of clean and reliable electricity resources.*
2) *Allow sufficient lead time for planning and engagement.*
3) *Properly fund or provide authorization to receive funding to Tribes and federal, state, and local agencies providing essential project review (e.g., EFSEC, Department of Archaeology and Historic Preservation).*
4) *Overburdened communities should not bear higher costs and risks associated with the loss of health, environment, native foods, and cultural resources as Washington strives to meet its CETA goals through new or upgraded transmission infrastructure.*

Principles for Transmission System Planning

1) *Designate and fund a person or organization within state government responsible for coordinating participation in transmission development activities and long-term transmission planning.*

2) *Leverage opportunities to access federal funding for transmission development and grid enhancement.*

3) *Ensure that practicable alternatives to building additional transmission infrastructure are considered.*

4) *Optimize grid operations and enhance the capacity of existing infrastructure.*

5) *Efficiently utilize system capacity.*

6) *Upgrade existing infrastructure.*

7) *Establish transmission planning practices that include proactive, long-term, interregional assessments on a regular basis.*

8) *Continue to explore creation of a regional transmission organization (RTO) and expanded participation in regional markets that would allow efficient dispatch of least cost resources given transmission and other constraints.*

9) *Pursue practicable and cost-effective opportunities to site new electrical generation near electrical load and existing transmission.*

10) *Explore opportunities to use transportation rights-of-way for co-locating new transmission lines.* (EFSEC 2022)

Grid Modernization Grants

Washington's Grid Modernization Grants are part of the state's Clean Energy Fund, administered by the Washington State Department of Commerce. These grants aim to enhance the reliability, resilience, and efficiency of the electric grid. The grants support projects that modernize the electric grid, integrate renewable energy, and improve grid resilience against natural disasters like wildfires and extreme weather. Funded projects include microgrids,[9] smart buildings,[10] and renewable integration. The grants often involve partnerships between utilities, technology providers, and local communities. These projects aim to create a more efficient, flexible, and economical power grid, ultimately supporting Washington's goal of achieving 100 percent clean electricity by 2045.

[9] A small, controllable electrical system that can generate its own power and operate independently from the main power grid.
[10] Structures that use advanced technologies to enhance the efficiency, comfort, and safety of their operations.

3.7.2 Affected Environment

This section describes energy and natural resources within the Study Area (see Chapter 1, Introduction). The analysis of the affected environment incorporates the following:

- Energy Resources and Power Generation
- Energy Grid
- Resource Consumption

3.7.2.1 Energy Resources and Power Generation

The state's energy providers have the capacity to produce approximately 102,961 thousand megawatt-hours per year (EIA 2024a). The Northwest Power and Conservation Council (NWPCC) maintains an online map that illustrates the location of each electricity-generating facility in Washington (NWPCC 2024a). Washington leverages a diverse mix of energy sources to generate electricity, categorized into renewable and non-renewable (conventional). Non-renewable energy supplies are finite and extracted from the earth, while renewable energy comes from sources that naturally replenish.

Non-Renewable Energy Sources

Currently, there are 30 conventional energy facilities operating in Washington. These facilities have a combined nameplate generating capacity[11] of 6,032 megawatts (MW), which represents the maximum designed output of these generators when running at full capacity (NWPCC 2024a). Washington's non-renewable electricity-generating portfolio includes the following:

- **Natural Gas:** In 2023, Washington's 26 natural gas energy facilities represented the second-largest source of in-state net power generation and were responsible for producing 18 percent of the state's total electricity. Washington's utilities and energy producers import natural gas because the state maintains no petroleum or natural gas reserves. Washington consumes less natural gas by

[11] In terms of generating capacity, nameplate capacity (also known as rated capacity or nominal capacity) refers to the maximum amount of electrical power that a generator or power plant can produce under specific conditions, as determined by the manufacturer. This capacity is typically measured in MW or kilowatts and represents the full-load sustained output of the facility. For example, a power plant with a nameplate capacity of 100 MW can theoretically produce 100 megawatts of electricity when operating at full capacity under ideal conditions. However, actual output can vary due to factors like maintenance, fuel availability, and operational efficiency.

volume than more than half of the other states, and it uses less per capita than all but four other states and the District of Columbia (EIA 2024b; NWPCC 2024a).

- **Nuclear:** Nuclear power provides a stable and carbon-free electricity source to complement renewable energy resources. Nuclear power supplied about 8 percent of Washington's net electricity generation in 2023. The Columbia Generating Station nuclear power plant in south-central Washington is the state's fifth-largest power-producing facility by capacity. It has been in operation since 1984 and is currently the only operational nuclear power facility. By resource, nuclear power represents Washington's third-largest provider of electricity (EIA 2024b; NWPCC 2024a).
- **Coal:** Although being phased out, there are still two coal-fired power plants operating in Washington. Coal is Washington's fifth-largest source of energy, accounting for approximately 4 percent of Washington's energy generation in 2023. The TransAlta Centralia coal-fired power plant is one of the state's largest non-renewable electricity-producing facilities by capacity. In 2020, TransAlta Centralia retired one of its two coal-fired units, and the company plans to retire its last remaining operational unit in 2025. Although Washington has more than 700 million tons of recoverable coal reserves, the last coal mine in the state closed in 2006 (EIA 2024a; NWPCC 2024a).

Renewable Energy Sources

Washington has a substantial number of renewable power facilities. Other than hydroelectric power, renewable resources accounted for almost 10 percent of the state's electricity generation in 2023 (EIA 2024b). The status of renewable energy production in Washington is described below:

- **Hydropower:** Washington is the nation's largest producer of hydroelectric power. Approximately 93 hydroelectric projects, ranging from smaller hydroelectric projects to large-scale dams, are located in Washington. Hydroelectric power typically accounts for more than 60 percent of Washington's electricity generation, as shown in **Figure 3.7-1**. Nine of the 10 highest electricity-generating facilities in Washington are hydroelectric power facilities (EIA 2024a, 2024b; NWPCC 2024a).
- **Wind:** Washington has 25 operational wind energy projects that, at maximum generating capacity, form the second-largest energy source in the state. In 2023, wind accounted for approximately 8 percent of the state's power generation and

80 percent of the state's nonhydroelectric renewable electricity (EIA 2024b; NWPCC 2024a; EFSEC n.d.).

- **Solar:** Solar energy accounts for less than 1 percent of Washington's electricity production but is growing rapidly. Energy generation from solar facilities more than quadrupled between 2022 and 2023 and is anticipated to continue to grow in the near future, with a number of large solar facilities in active development (EIA 2024b; EFSEC n.d.).

  Biomass: Biomass power facilities in Washington primarily convert organic materials, such as wood waste from forestry operations, into electricity. In 2023, biomass accounted for about 1 percent of Washington's total electricity generation, with 28 biomass projects in operation (EIA 2024a; NWPCC 2024a).

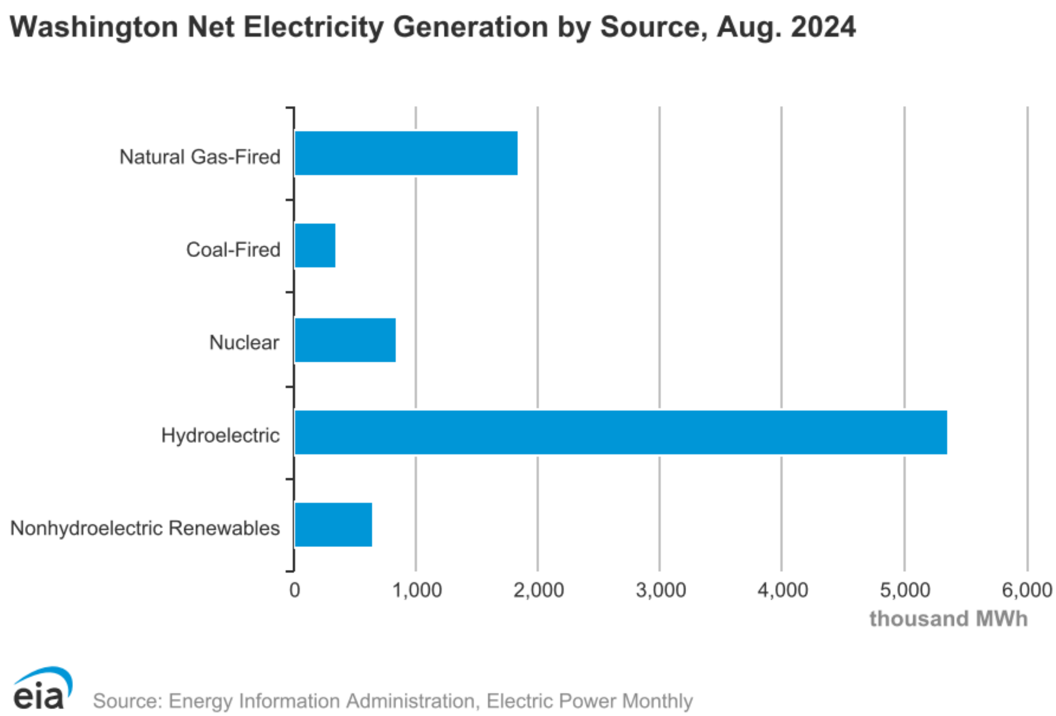

Figure 3.7-1: Washington Net Electricity Generation

Source: EIA 2024b

3.7.2.2 Energy Grid

Planning

National Interest Electric Transmission Corridors (NIETCs) are specific geographic areas identified by the DOE where transmission capacity constraints or congestion negatively impact consumers.[12] These designations aim to promote the development of new transmission infrastructure to enhance grid reliability, integrate renewable energy, and lower consumer costs.

NIETC designation unlocks access to key federal financing mechanisms, including public-private partnerships through the Transmission Facilitation Program under the Bipartisan Infrastructure Law, and loans via the Transmission Facility Financing Loan Program established by the Inflation Reduction Act. Within designated NIETCs, FERC is authorized to issue permits for transmission facility siting if state authorities fail to act on an application within one year or if they deny it, thus allowing FERC to expedite the approval process for critical transmission facilities.

In Washington, NIETCs are part of a broader national strategy to support the state's clean energy goals. NIETC designation facilitates the development of necessary transmission infrastructure and integrates renewable energy sources to enhance grid resilience.

NIETCs also help address transmission bottlenecks within major grid interconnections. Major grid interconnections are large, synchronized grids that transmit electricity over vast areas. The North American Electric Reliability Corporation (NERC) oversees these interconnections to maintain power system reliability and stability and balance electricity supply and demand. Washington is part of the Western Interconnection, which comprises about 156,000 miles of transmission lines that span 14 states, the Canadian provinces of British Columbia and Alberta, and northern Baja California in Mexico. The Western Interconnection serves 90 million people (WECC 2024).

The NWPCC is responsible for developing and maintaining a comprehensive power plan specifically for Washington, Oregon, Idaho, and Montana, known as the Northwest Power Plan (NWPCC 2022). This plan ensures an adequate, efficient, economical, and reliable power supply for the region and aligns with the goals of NIETCs. The NWPCC's regional plans help identify areas where NIETC designations

[12] The DOE designates NIETCs based on findings from the National Transmission Needs Study, public input, and recommendations on transmission capacity constraints and congestion. The process involves collaboration with states, Tribes, local communities, industry, and other stakeholders.

might be beneficial. The NWPCC updates the Northwest Power Plan every five years, addressing the following key areas:

- **Energy Efficiency:** Emphasizes energy efficiency as the most cost-effective and environmentally friendly resource, setting targets for energy savings and outlining strategies to achieve these goals.
- **Resource Adequacy:** Assesses the region's ability to meet future electricity demand with existing resources and identifies the need for new resources to ensure reliability.
- **Renewable Energy Integration:** Supports the integration of renewable energy sources, such as wind and solar, into the grid, evaluating the potential for renewable energy development and the necessary transmission infrastructure.
- **Climate Change Mitigation:** Includes strategies to reduce greenhouse gas (GHG) emissions and adapt to climate change impacts, involving the transition to cleaner energy sources and enhancing grid resilience.
- **Fish and Wildlife Mitigation:** Addresses the adverse environmental impacts of energy production and transmission, particularly on fish and wildlife, including measures to mitigate these adverse environmental impacts and promote ecosystem health.

The Pacific Northwest transmission grid, supported by the NWPCC's comprehensive planning and the strategic designation of NIETCs, helps ensure that the region's energy needs are met efficiently and sustainably. Key features of the Pacific Northwest transmission grid include the following:

- **Hydropower Integration:** The grid is designed to connect remote renewable energy resources, such as hydropower dams, to major load centers.[13] This design supports the transfer of seasonal energy influences by rainfall and snowmelt.[14] Washington generates more electricity from hydropower than any other state, accounting for about 25 percent of the nation's total utility-scale hydroelectric generation (EIA 2024b). The Grand Coulee Dam, located on the Columbia River, is the largest power facility in the United States by capacity (EIA 2024b).

[13] Areas with high concentrations of electricity demand.

[14] During periods of heavy rainfall or snowmelt, the increased water flow can be harnessed to generate electricity, ensuring a reliable and consistent energy supply throughout the year. This approach maximizes the use of natural water cycles, enhancing the overall efficiency and sustainability of hydroelectric power generation.

- **Authorities:** The region does not have a single regional transmission operator or independent system operator. Instead, multiple balancing authorities ensure that electricity generation meets demand within their designated areas.
- **Transmission Planning:** Organizations facilitate regional transmission planning across the Pacific Northwest and Intermountain West, ensuring coordinated efforts to maintain and expand the grid.
- **Transmission Facilities:** Washington maintains over 4,527 miles of high-voltage transmission lines (greater than 230 kilovolts [kV]) and more than 3,321 miles of low-voltage transmission lines (less than 230 kV) (DOE 2021).
- **Modernization Efforts:** Efforts are ongoing to modernize the grid, incorporating smart grid technologies and enhancing resilience against natural disasters.

Source and Availability

As the transmission network expands to meet demand, the surplus capacity of transmission facilities is gradually consumed. If not managed properly, this cycle of expansion and increased usage can lead to transmission congestion. Transmission congestion—i.e., when a specific transmission path cannot handle increased power flow—can occur due to inadequate infrastructure, high demand peaks, or unexpected outages. Without careful coordination of capacity, grid expansion, and generation, the system may face reliability risks, making it essential to plan and manage these elements together.

Washington benefits from access to abundant, low-cost energy from renewable resources. The state’s net generation often exceeds its electricity demand, allowing energy producers to send excess power to the Western Interconnection (EIA 2024b).

Management

FERC and NERC oversee the reliability of the interstate bulk power system, which includes large generators and the transmission network. These organizations issue and enforce mandatory reliability standards. Additionally, professional organizations like the Institute of Electrical and Electronics Engineers, the International Electrotechnical Commission, and the International Council on Large Electric Systems provide guidelines and technical standards.

In Washington, the electricity grid is managed using a comprehensive approach to ensure its reliability, resilience, and efficiency. The Washington State Department of

Commerce administers programs to strengthen and modernize the grid against threats like wildfires, extreme weather, and other natural disasters. Their programs include the Grid Resilience State and Tribal Formula Grants program, a program that funds projects aimed at enhancing the grid's reliability and reducing the frequency and duration of power outages.

The state also focuses on energy assurance planning to prepare for potential energy disruptions. This involves assessing vulnerabilities at critical facilities and implementing mitigation activities to ensure a continuous energy supply during emergencies. Washington is actively investing in grid modernization through initiatives like the Grid Modernization Grants, a grant program that supports projects to improve grid reliability, resilience, and efficiency.

Demand

Electricity demand in Washington is on the rise due to several key factors, including the following:

- **Electrification of Transportation:** More charging infrastructure is being developed, and more vehicles are powered by electricity.
- **Artificial Intelligence and Data Centers:** Artificial intelligence (AI) applications and data centers require substantial electricity for operations and cooling. Data centers are projected to consume up to 9 percent of total U.S. electricity demand by 2030, with the largest growth dedicated to developing AI capabilities and scaling AI applications to millions of consumers (DOE n.d.).
- **Residential and Commercial Electrification:** The shift toward electric appliances and heating systems in homes and businesses increases electricity use.
- **Population Growth:** Washington's population continues to grow, and so does the overall demand for electricity to support residential, commercial, and industrial activities.

Projections suggest that electricity demand in the Pacific Northwest, including Washington, could increase by 30 percent over the next decade (PNUCC 2024). This increase underscores the need for modernizing the grid and expanding transmission facilities to meet future electricity needs.

Risks

The DOE's State Energy Risk Profile examines the relative magnitude of the risks that Washington's energy infrastructure routinely encounters in comparison with the probable impacts of the events. The top three causes for transmission facility outages in the United States, according to the DOE, are:

- **Weather (excluding lightning):** Severe weather events such as hurricanes, ice storms, and high winds can cause damage to transmission facilities.
- **Fire:** Wildfires and other fires can damage transmission facilities and related equipment, resulting in power disruptions.
- **Failed Protection System Equipment:** Malfunctions or failures in protection of system equipment, which are designed to safeguard the grid, can lead to outages when they do not operate correctly.

The DOE's analysis of Washington concluded that, for electric transmission outages related to severe weather, high winds were identified as the cause of the most widespread power disruptions (DOE 2021).

Climate Change

The energy sector is the largest emitter of GHG emissions, primarily from burning fossil fuels for electricity, heat, and transportation. These emissions contribute to climate change, which in turn affects transmission in several ways:

- **Impact on Energy Infrastructure:** Climate change affects energy infrastructure through extreme weather events, rising temperatures, and sea level rise. For example, sea level rise threatens coastal energy facilities, such as substations, with flooding and erosion, necessitating costly adaptations or relocations to ensure continued operation and safety.
- **Energy Demand:** Climate change influences energy demand patterns. Historically, electricity demand in Washington increases in the winter. However, warmer summers have increased the use of air conditioning, while more and increasingly severe winter events have also created higher demand for heating in the winter (NWPCC 2024b).

Transitioning to renewable energy sources like wind, solar, and hydropower is crucial for reducing GHG emissions. However, climate change can also impact the availability and efficiency of these resources. For instance, changes in precipitation patterns can affect hydropower generation.

3.7.2.3 Resource Consumption

Resource consumption refers to human use of natural resources to meet needs and wants. These resources include water, minerals, fossil fuels, forests, and land. Resource consumption is defined by the quantity of a resource needed for a particular process or project; the rate of use, or how quickly a resource is consumed over time; and the efficiency, or how effectively a resource is used to achieve a desired outcome. Generally, once consumed, renewable resources can be replenished naturally over time, whereas non-renewable resources are finite and cannot be replaced. The following factors influence resource consumption:

- **Population Growth:** As the global population increases, so does the demand for resources.
- **Economic Development:** Industrialization and economic growth often lead to higher resource consumption.
- **Technological Advancements:** New technologies can either increase efficiency and reduce resource use or lead to higher consumption through new applications.
- **Lifestyle Choices:** Individual and societal choices, such as diet, transportation, and energy use, impact resource consumption.

Resource consumption can have the following adverse environmental impacts:

- **Resource Depletion:** Overuse of non-renewable resources can lead to shortages and increased costs.
- **Pollution:** Resource extraction and use can result in air, water, and soil pollution.
- **Climate Change:** Burning of fossil fuels for energy is a major contributor to GHG emissions and global warming.

Understanding the resource consumption required for a project is essential for minimizing adverse environmental impacts and ensuring resource availability. Transmission facilities consist of various components and materials designed for efficient, reliable, and safe transmission of electrical power over long distances. Key materials used in new construction, operation and maintenance, upgrade, and modification are described below.

Non-renewable Resources

Materials used for the new construction, operation and maintenance, upgrade, and modification of transmission facilities are selected based on their specific properties, which meet the demands of transmission facilities while balancing performance with environmental and economic considerations.

Steel

Steel is a crucial material in the new construction, operation and maintenance, upgrade, and modification of transmission facilities because of its strength, durability, and versatility. Steel is used for transmission facilities in the following ways:

- **Transmission Towers:** Steel provides the strength and durability needed for transmission towers, while minimizing weight. The production of steel involves energy consumption and GHG emissions. An average high-voltage transmission tower includes about 40,000 to 60,000 pounds of steel (AISI 2024).
- **Reinforcement in Transmission Cables:** For a 1455-sized aluminum conductor steel-reinforced (ACSR) cable, 270 pounds of steel is needed to manufacture 1,000 feet of line (AISI 2024).
- **Substation Construction:** Steel is used extensively for constructing substation frameworks, support structures, and enclosures due to its strength and durability.
- **Underground Utilities**: Small amounts of steel (e.g., rebar) may be embedded within the concrete of underground vaults to enhance tensile strength and structural integrity.

In 2023, approximately 80 million tons of raw steel were produced in the United States, and about 1,900 million tons were produced globally. Domestic production is augmented by an abundant global supply chain, with the United States importing 25 million tons of steel in 2023, primarily from Canada and Mexico (USGS 2024a).

Aluminum

Aluminum is widely used in transmission facilities due to its favorable properties, as described below:

- **Transmission Cables:** Aluminum is used in transmission cables due to its greater strength-to-weight ratio and lower density, giving it twice the conductivity-to-weight ratio of copper. This makes aluminum a good option for high-voltage overhead transmission lines.
- **ACSR Cables:** Featuring a central core of steel strands surrounded by aluminum strands, ACSR cables are the most commonly used type of cable for overhead transmission. The steel core provides mechanical strength, while the aluminum strands offer good electrical conductivity.
- **Innovative Conductors:** Newer conductors may incorporate ceramic fibers in a matrix of aluminum for added strength with lighter weight.
- **Busbars and Conductors:** Aluminum is often used for busbars and other conductors because of its high conductivity-to-weight ratio.

In 2023, the United States produced 750,000 tons of primary aluminum and 3.3 million tons of secondary aluminum recovered from scrap. Domestic production is augmented by an abundant global supply chain, with the United States importing 5.6 million tons of aluminum in 2023, primarily from Canada. Global resources of bauxite[15] are estimated to be between 55 billion and 75 billion tons and are sufficient to meet world demand for metal well into the future (USGS 2024b).

Copper

Copper is a crucial material in transmission facilities due to its electrical conductivity and durability. Copper is used in transmission facilities primarily in the following ways:

- **Transmission Cables:** Copper is used in transmission cables, especially for submarine and underground cables, due to its higher conductivity compared to aluminum (PSCW 2011).

[15] Rocks composed of aluminum oxides, along with other minerals. Bauxites are the world's primary source of aluminum. After mining, bauxite is refined into alumina, which is then converted into aluminum.

- **Transformer Windings:** Copper is often used for windings in transformers due to its excellent conductivity (TTES 2024).

In 2023, the recoverable copper content of U.S. mine production was estimated at 1.1 million tons. Old (post-consumer) scrap, converted to refined metal, alloys, and other forms, provided an estimated 150,000 tons of copper in 2023, and an estimated 700,000 tons of copper was recovered from new (manufacturing) scrap derived from fabricating operations. The most recent U.S. Geological Survey assessment of global copper resources indicated that, as of 2015, identified resources contained 2.1 billion tons of copper, and undiscovered resources contained an estimated 3.5 billion tons. Domestic production is augmented by an abundant global supply chain, with the United States importing 894,000 tons of copper in 2023 (USGS 2024c).

Cast Iron and Composite Materials

Cast iron plays a small role in the materials used in the construction of transmission components. Current uses of cast iron include the following:

- **Underground Facilities:** Cast iron is commonly used for maintenance hatch covers, ladders, and steps in underground transmission facilities. Its durability and strength make it ideal for these applications, ensuring long-lasting performance and safety.
- **Substation Components:** Cast iron is also used in some substation components, providing robust support and protection for electrical equipment. Cast iron is used in the construction of transformer housings and other electrical equipment due to its thermal conductivity and ability to withstand high temperatures.

Ongoing research and development are leading to new uses for composite materials in transmission facilities, such as advanced insulators and support structures that benefit from the unique properties of composites. Composite materials are used in transmission facilities in the following ways:

- **Cable Reinforcement:** Composite materials, such as those incorporating ceramic fibers in a matrix of aluminum, are used to reinforce transmission cables. These materials offer high strength with reduced weight, improving the overall efficiency and performance of the cables.
- **Structural Components**: In some cases, composite materials are used for structural components in transmission facilities. Their high strength-to-weight

ratio and resistance to environmental factors make them suitable for various applications.

Concrete

Concrete is essential for the foundations of transmission towers, ensuring their stability and support. Its production involves large quantities of aggregate (sand, gravel, or crushed stone), cement, and water. The amount of aggregate needed for concrete footings varies based on a tower's size and design, with a single foundation typically requiring several cubic feet of concrete. The extraction and transportation of aggregate can disrupt habitats, increase dust and noise pollution, and increase carbon emissions.

Concrete is also used for foundations and other structural components of substations, providing necessary stability and support.

For underground transmission facilities, concrete vaults are buried at regular intervals along the new construction route. These vaults are crucial for splicing cables during construction and for providing permanent access, maintenance, and repair (PSCW 2011). Concrete offers the strength and durability needed to withstand environmental stresses and support the weight of the soil above.

Concrete is a non-renewable resource that is usually a mixture of aggregates and cement paste. The aggregates are sand and gravel or crushed stone, and the paste consists of water and cement. Typically, concrete is a mixture of about 10 to 15 percent cement, 60 to 75 percent aggregate, and 15 to 20 percent water (Portland Cement Association 2024). There are several active aggregate mining operations throughout Washington.

Aggregates

Aggregates are necessary for making ready-mixed concrete, asphalt, and many other building materials. Sand, gravel deposits, and bedrock may be mined or quarried to produce raw materials known as aggregates. In 2023, 920 million tons of construction sand and gravel were produced from 6,500 pits across the United States, with Washington listed among the top 10 producing states (USGS 2024d).

Fuel

Fuel is essential at various stages of new transmission facility construction, operation and maintenance, upgrade, and modification, including the following:

- **Vegetation Clearing and Ground Leveling:** Heavy machinery, powered by fuel, is used to clear vegetation and level the ground.
- **Access Road Construction:** Fuel-powered equipment is used for grading and constructing access roads to a site.
- **Foundation Excavation:** Diesel-powered excavators and backhoes dig foundations for transmission towers.
- **Concrete Mixing and Pouring:** Diesel engines power concrete mixers and pumps to mix and pour concrete for tower foundations.
- **Tower Erection:** Cranes and other lifting equipment, typically running on diesel, are used to erect the steel or aluminum towers.
- **Material Transportation:** Trucks and trailers, powered by diesel or gasoline, transport tower components and other materials to construction sites.
- **Helicopter Use:** In difficult terrain, helicopters may be used to transport tower components or erect towers, consuming aviation fuel.
- **Stringing Conductors:** Specialized equipment like winches and pullers, powered by diesel engines, are used to string conductors between towers. Helicopters may also be used in difficult terrain, consuming aviation fuel.
- **Portable Generators:** Diesel-powered generators provide electricity for tools and lighting at remote construction sites.
- **Transportation:** Construction crews use fuel-powered vehicles for transportation to and from the site.
- **Line Inspections and Vegetation Management:** Specialized tools and equipment may use fuel.
- **Access and Repair:** Maintenance crews often use specialized vehicles such as bucket trucks and all-terrain vehicles to access and repair transmission facilities, especially in remote or difficult-to-reach areas.

Petroleum products, including gasoline and diesel fuels used for vehicles, equipment, and machinery lubricants, are available at numerous commercial outlets. Fuel for large projects is sourced through a combination of local production and imports. Washington has a robust infrastructure for fuel production and distribution, supported by several refineries within the state.

Land

Land is a finite, non-renewable resource. The size of the footing required for high-voltage transmission facilities depends on the voltage of the transmission line, soil conditions, and the design of the tower. The right-of-way (ROW) for a transmission facility includes land where the facility is sited, as well as land needed to perform maintenance and land that is cleared to avoid risk of fires and other accidents. It provides a safety margin between high-voltage lines and surrounding structures and vegetation. In some cases, access roads constitute a portion of the ROW and provide more convenient access for repair and inspection vehicles. The width of a transmission facility ROW varies depending on the type and voltage of the transmission facility. The width of a transmission facility ROW is typically around 100 to 200 feet (FERC 2024). Typically, access roads do not require a substantial input of raw materials.

The amount of land needed for a high-voltage substation can vary based on the size and complexity of the substation. A simple distribution substation may require less than 1 acre of land. More complex substations that handle higher and/or multiple voltages and interconnections have more equipment and can require up to 6 acres or more. The exact land requirement depends on factors such as the number of lines, the size of the transformers, and the type of switchgear used. For example, an air-insulated switchgear substation typically requires more land than a gas-insulated switchgear substation to maintain safe distances between live components. The land on and adjacent to the substation may also have gravel or other aggregate surrounding the components.

Vaults required for underground transmission can vary in size, typically ranging from shallow installations about 8 feet deep with a volume of 340 cubic feet to deeper setups of around 30 feet deep with a volume of 3,000 cubic feet (Grajek 2016). Adequate space around the vault is necessary for safe access and maintenance activities. When vaults are located near roadways, additional land may be required to implement traffic control measures and protect workers from vehicular hazards.

Synthetics

Synthetic materials used in new transmission facility construction, operation and maintenance, upgrades, and modifications include insulation materials and insulating oil or gas. Transmission cables use various insulation materials to ensure safety, reliability, and efficiency. Polyethylene is commonly used for its good insulation properties and ease of processing. Cross-linked polyethylene offers enhanced thermal and mechanical properties. Polyvinyl chloride (PVC) is widely used due to its flexibility, durability, and resistance to environmental factors. Natural rubber provides excellent flexibility and insulation but is less resistant than vulcanized rubber to environmental degradation. Vulcanized rubber is an enhanced version of natural rubber with improved durability and resistance to heat and chemicals. Ethylene propylene rubber is a synthetic rubber with excellent insulation properties, flexibility, and resistance to heat and chemicals. Ceramic fibers have been incorporated into some newer conductors to add strength while reducing weight. Production of insulation materials often involves chemical processes that can release pollutants and GHG emissions. The production of these materials can be energy-intensive, adding to the overall carbon footprint.

Oil or gas in transformers and switchgear provides electrical insulation and cooling. Mineral oil is the most commonly used insulating oil in transformers. It serves multiple purposes, including acting as a dielectric material, providing electrical insulation, and cooling the transformer by dissipating heat. It also protects the internal components from moisture and oxidation. Silicone oil is used in some applications for its stability at high temperatures and excellent insulating properties. Sulfur hexafluoride (SF_6) is widely used in gas-insulated switchgear due to its excellent insulating and arc-quenching[16] properties. SF_6 is a very potent GHG, with a global warming potential 23,500 times greater than that of carbon dioxide. For this reason, there are active collaborative agency and industry efforts underway to find suitable alternatives to SF_6-insulated switchgear.

[16] The process of extinguishing an electrical arc that forms when current-carrying contacts in a circuit breaker or switchgear separate. This arc is a highly ionized, conductive path that can cause significant damage if not properly managed. Effective arc-quenching is crucial for ensuring the safe and efficient interruption of electrical currents.

Renewable Resources

The new construction, operation and maintenance, upgrade, and modification of transmission facilities involve the use of various renewable resources, including the following:

- **Timber:** Timber is used frequently during new construction of transmission facilities for support structures, scaffolding and formwork, and road construction, and as construction materials. The annual harvest of trees is about 2.7 billion board feet in Washington, making it the second-largest state producer of lumber in the United States. Approximately 85 percent of that is harvested from forests in western Washington (DOC n.d.). Timber is considered a renewable resource if sustainably managed.
- **Water:** Water is a key component in the production of concrete, which is used for the foundations of transmission towers and underground transmission vaults. During new construction activities, water is often sprayed to suppress dust or moisten soil during compaction processes. Water is also used to clean equipment and tools.

  During the operation and maintenance of a transmission facility, water may be used in cooling systems to manage the heat generated by electrical equipment. Water is a critical resource for fire suppression systems, protecting the facility and surrounding areas from potential fire hazards.

  Due to Washington's varied land uses, terrain, and precipitation levels, water availability varies dramatically across the state. Increasing demands for water over time, from ongoing population growth, agriculture, and other consumptive uses, as well as associated land use practices, have resulted in lower stream flows and declining groundwater levels in some areas of Washington. These decreases have the potential to impact important resources for fisheries and general stream health. Water resources are discussed in Section 3.4 of this Programmatic EIS.
- **Energy:** Energy can be categorized as renewable or non-renewable. The transmission of electrical energy from generating facilities to consumers involves some energy loss, primarily due to resistance in the transmission lines. On average, 5 percent of energy generated between 2018 and 2022 was lost during transmission and distribution. This loss can vary with factors like the distance the electricity travels, the efficiency of the transmission facilities, and

the voltage levels used. Transmission at higher voltages loses less energy than lower voltages (EIA 2023; Energy Basics n.d.).

3.7.3 Impacts

For this Programmatic EIS, adverse environmental impacts were assessed for the new construction, operation and maintenance, upgrade, and modification of transmission facilities within the Study Area.

3.7.3.1 Method of Analysis

The study area for a project-specific application would typically encompass several key regions and features, such as the following:

- **Project Site and Immediate Vicinity:** This includes the specific location of the project and the surrounding area that might be directly affected by construction, operation and maintenance, upgrade, and modification activities. The project site would include the transmission facility ROWs, substation locations, transmission towers, access roads, and construction yards and associated laydown areas.
- **Affected Geography:** The consumption of energy and natural resources during a project's construction would be measurable and could impact resource availability within and outside the borders of Washington. The demand for these resources can lead to increased extraction and production activities, affecting local ecosystems and communities.

This Programmatic EIS analyzes the affected environment and adverse environmental impacts on energy and natural resources within the Study Area (see Chapter 1, Introduction). Four project stages for each transmission facility type (overhead or underground) were considered: new construction, operation and maintenance, upgrade, and modification.

This evaluation considers both overhead and underground transmission facilities for each stage. Overhead transmission facilities consist of transmission lines, substations, and ancillary infrastructure. Overhead and underground transmission facilities may involve similar aboveground infrastructure that may be associated with underground transmission facilities. Underground transmission facilities consist of underground transmission lines, underground access vaults, and other infrastructure located below the ground surface. The new construction of underground transmission facilities could include both open-trench and trenchless construction methods.

Impact Determination

This discussion of adverse environmental impacts is qualitative, given the high-level nature of a Programmatic EIS; quantification would require specific project details to analyze. **Table 3.7-3** describes the criteria used to evaluate adverse environmental impacts from the Action Alternative and No Action Alternative. Information reviewed to identify environmental impacts on energy and natural resources in the Study Area was obtained from federal agencies, state agencies, local planning documents, and public scoping.

Table 3.7-3: Criteria for Assessing the Impact Determination on Energy and Natural Resources

Impact Determination	Description
Nil	No foreseeable adverse environmental impacts are expected. A project would not adversely affect energy and natural resources.
Negligible	A project would have minimal adverse environmental impacts on energy and natural resources. Changes would either be non-detectable or, if detected, would have only slight effects. A project would consume minimal energy or natural resources. Negligible impacts would be short-term in duration. BMPs and design considerations are expected to be effective.
Low	A project would result in noticeable adverse environmental impacts on energy and natural resources, even with the implementation of BMPs and design considerations. These adverse environmental impacts may include energy consumption such that it would surpass minimal levels, but these would be limited and controlled. Adverse environmental impacts may include periodic increases in energy demand or utility usage, minor inefficiencies in energy distribution, and occasional strain on existing infrastructure. A project may also intermittently interact with or require modifications to existing energy or natural resource systems, such as fuel supply networks. Adverse impacts on local energy and natural resource supply chains would be localized. Adverse environmental impacts may be short or long-term.
Medium	A project would result in adverse environmental impacts on energy and natural resources, even with the implementation of BMPs and design considerations. A project would result in the consumption of energy and natural resources such that it would be measurable, leading to noticeable effects on resource availability and the environment. Changes to resource levels could disrupt supply chains or existing natural resource management plans. Medium impacts may be short or long-term in duration.

Impact Determination	Description
High	A project would result in adverse and potentially severe environmental impacts on energy and natural resources, even after the implementation of BMPs and design considerations. A project would cause measurable and major effects on the availability of energy and natural resources as well as the environment. The consumption of renewable and non-renewable resources would lead to the depletion of local supplies. Adverse environmental impacts on energy consumption may extend beyond the construction site, increasing demand on local energy grids. Additionally, substantial changes to natural resource levels and ecosystems would occur. High impacts may be short or long-term.

BMP = best management practice

To clearly understand the potential severity of adverse environmental impacts without any interventions, the following impact determinations exclude the use of Avoidance Criteria and Mitigation Measures. The ratings assume compliance with all federal, state, and local laws and regulations, as well as standardized BMPs and design considerations. Assessing adverse environmental impacts without Avoidance Criteria or Mitigation Measures offers a baseline understanding of potential environmental effects, helping to identify the true extent of these impacts. Environmental laws often require that initial impact assessments be conducted without considering mitigation to maintain the integrity of the environmental review process.

When impact determinations are identified as medium or high, then either the applicant would adopt applicable Mitigation Measures from this Programmatic EIS, or the State Environmental Policy Act (SEPA) Lead Agency may require applicable mitigation to be implemented to reduce project-specific adverse environmental impacts. When impact determinations are low, applicable Mitigation Measures should still be considered by the applicant and the SEPA Lead Agency, as these Mitigation Measures would help to further reduce adverse environmental impacts, including the project's contribution to cumulative impacts. These Mitigation Measures would be implemented in addition to compliance with laws, regulations, environmental permits, plans, and design considerations required for transmission facilities.

3.7.3.2 Action Alternative

New Construction

Overhead Transmission Facilities

Activities for the new construction of overhead transmission facilities would vary and depend on the scale of the facility and site characteristics. New construction could include a relatively short site preparation period (e.g., a few months), followed by a longer construction and start-up period. It is assumed that new construction of overhead transmission facilities, per mile, would have a shorter duration than underground construction. Overhead transmission facilities could have the following adverse environmental impacts related to energy and natural resources during new construction:

- Consumption of Non-Renewable Resources
- Consumption of Renewable Resources
- Consumption of Energy

Consumption of Non-Renewable Resources

The new construction of overhead transmission facilities would involve the consumption of non-renewable resources, including the following:

- **Metal:** Metal is essential for the structural integrity and functionality of transmission facilities. Mineral resources such as copper, steel, and aluminum would be mined and refined regionally, nationally, and globally, and components that require those materials would be manufactured regionally, nationally, and globally. The manufactured parts used in the new construction of transmission facilities would be shipped to project sites and installed by construction workers and electricians. The manufacturing of equipment like poles, conductor cables, and switchgear components like transformers, insulators, and circuit breakers also consumes substantial resources. These components ensure the safe and efficient operation of the transmission facility.
- **Aggregate:** In addition to soils, bulk materials such as aggregate gravel and sand would be required for laydown areas, substations, roads, and concrete mixtures. Bulk materials such as aggregate, gravel, and sand, in addition to soils, would likely be supplied locally from existing quarries.

- **Concrete:** Concrete is used primarily for the foundations of transmission towers and poles for overhead transmission facilities.
- **Fuel:** Transporting workers, materials, and equipment to construction sites involves fuel consumption, as does the construction process, including site preparation, assembly, and installation. Machinery lubricants would be purchased from commercial outlets in the vicinity of specific projects. Electricity for construction equipment would be provided by portable generators that require fuel to operate.

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of non-renewable resources during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Consumption of Renewable Resources

New construction activities often require the consumption of renewable resources, including the following:

- **Land:** The new construction process can have adverse environmental impacts both directly and indirectly, such as land disturbance and habitat disruption, which need to be managed through careful planning and Mitigation Measures (see Section 3.2, Earth Resources; Section 3.6, Habitat, Wildlife, and Fish; and Section 3.9, Land and Shoreline Use).
- **Water:** Water from local utilities would be used to mix concrete for structural foundations and to suppress fugitive dust during grubbing, clearing, grading, trenching, and soil compaction (see Section 3.4, Water Resources).

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of renewable resources during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to medium.

Consumption of Energy

During new construction, electricity would be required to operate equipment and machinery, as well as to power construction lighting. Electricity may be provided on site through generators powered by non-renewable resources, including diesel fuel.

Electricity may also be sourced from a local utility, in which case a utility provider would establish or expand the electrical distribution network to the project site.

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of energy during the new construction of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to negligible.

Underground Transmission Facilities

Activities for the new construction of underground transmission facilities would vary and depend on the scale of the facility and site characteristics. New construction could include a site preparation period of relatively short duration (e.g., a few months), followed by a longer construction and start-up period. It is assumed that the new construction of overhead transmission, per mile, would have a shorter duration than underground construction. Underground transmission facilities could have the following adverse environmental impacts related to energy resources during new construction:

- Consumption of Non-Renewable Resources
- Consumption of Renewable Resources
- Consumption of Energy

The consumption of energy and natural resources during the new construction of underground transmission facilities would be measurable and could impact resource availability within the vicinity of the project location and in the State of Washington more broadly.

Consumption of Non-Renewable Resources

The new construction of underground transmission facilities would require measurable consumption of non-renewable resources, including the following:

- **Metal:** Metals like copper, steel, and aluminum are required for cables, conduits, and other components. These materials are mined and refined at various scales and locations, then manufactured into parts that are shipped to project sites for installation by construction workers and electricians. The production of equipment such as transformers, insulators, and circuit breakers also demands substantial metal resources.

- **Aggregate:** Bulk materials like gravel, sand, and soil are necessary for creating stable foundations, backfilling trenches, and constructing access roads. Gravel and sand are typically sourced from local quarries.
- **Concrete:** Concrete is crucial for the new construction of underground transmission facilities, particularly for encasing cables and building vaults and maintenance hatches. It ensures structural integrity and protection against environmental factors.
- **Fuel:** Fuel is consumed in transporting workers, materials, and equipment to construction sites. Site preparation, trenching, and installation require fuel for machinery and generators. Lubricants for machinery are required, and electricity for construction equipment is often provided by portable generators that consume fuel.

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of non-renewable resources during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Consumption of Renewable Resources

Underground construction activities would require considerable consumption of renewable resources, including the following:

- **Land:** The new construction of underground transmission facilities can impact the environment through land disturbance and habitat disruption (see Section 3.2, Earth Resources; Section 3.6, Habitat, Wildlife, and Fish; and Section 3.9, Land and Shoreline Use).
- **Water:** Water from local utilities is used for mixing concrete, suppressing dust during new construction activities, and soil compaction (see Section 3.4, Water Resources).

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of renewable resources during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from low to medium.

Consumption of Energy

During new construction, electricity would be required to operate equipment and machinery, as well as to power construction lighting. Electricity may be provided on site through generators powered by non-renewable resources, including diesel fuel. Electricity may also be sourced from a local utility, in which case a utility provider would establish or expand the electrical distribution network to the project site.

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of energy during the new construction of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to negligible.

Operation and Maintenance

Overhead Transmission Facilities

Activities for the operation and maintenance stage of overhead transmission facilities would vary based on the type of facility, scale, and site characteristics. Facilities are not expected to have staff on site daily, but maintenance crews are anticipated to be regularly deployed. Transmission facilities require ongoing maintenance for equipment and ROWs. Overhead transmission facilities could have the following adverse environmental impacts during the operation and maintenance stage:

- Consumption of Non-Renewable Resources
- Consumption of Renewable Resources
- Consumption of Energy

Typical consumption of energy and natural resources occurs during transmission facility operation and maintenance. Operation and maintenance would require both renewable and non-renewable resources.

Consumption of Non-Renewable Resources

The operation and maintenance of overhead transmission facilities would require the consumption of non-renewable resources, including the following:

- **Metal:** Replacement parts such as conductors, joints, and insulation materials are regularly required.

- **Fuel:** Fuel is required for maintenance vehicles and portable generators used at the sites. Operation and maintenance vehicles would need a continuous supply of fuel.
- **Oil:** Maintenance activities may require replacement parts, lubricants, and fluids.

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of non-renewable resources during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to negligible.

Consumption of Renewable Resources

Maintenance activities often require consumption of renewable resources, such as the following:

- **Water:** Water may be needed for certain maintenance activities, such as cooling equipment or suppressing dust during earthwork. Water for operation and maintenance activities would be purchased from local vendors or through water rights agreements managed in accordance with state and local laws and regulations (see Section 3.4, Water Resources).

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of renewable resources during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from nil to low.

Consumption of Energy

During operation and maintenance, overhead transmission facilities would have the following adverse environmental impacts related to energy consumption:

- **Energy:** The transmission of electrical energy from power plants to consumers involves some energy loss. The operation of monitoring systems and other equipment would require a continuous supply of electrical energy.

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of energy during the operation and maintenance of overhead transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Underground Transmission Facilities

Similar to overhead transmission facilities, activities for the operation and maintenance of underground transmission facilities would vary based on type of facility, scale, and site characteristics. Facilities are not expected to have staff on site daily, but maintenance crews are anticipated to be regularly deployed. Transmission facilities require ongoing maintenance for equipment and ROWs, similar to any other linear industrial facility. Underground transmission facilities could have the following adverse environmental impacts during the operation and maintenance stage:

- Consumption of Non-Renewable Resources
- Consumption of Renewable Resources
- Consumption of Energy

Consumption of Non-Renewable Resources

Operation and maintenance would require consumption of non-renewable resources, including:

- **Metal:** Replacement parts such as cables, joints, and insulation materials are regularly required.
- **Fuel:** Fuel is required for the operation and maintenance of vehicles and portable generators used at the sites. Operation and maintenance vehicles would need a continuous supply of fuel. Maintenance crews use specialized vehicles to transport equipment and materials to various sites. These vehicles are equipped to handle the specific needs of underground maintenance.
- **Oil:** Maintenance activities may require replacement parts, lubricants, and fluids.

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of non-renewable resources during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Consumption of Renewable Resources

During operation and maintenance, underground facilities would require consumption of renewable resources, including the following:

- **Water:** Water may be needed for certain maintenance activities, such as cooling equipment or suppressing dust during excavation. Water for operation and maintenance activities would be purchased from local vendors or through water rights agreements managed in accordance with state and local laws and regulations (see Section 3.4, Water Resources).

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of renewable resources during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to low.

Consumption of Energy

The transmission of electrical energy from power plants to consumers involves some energy loss. The operation of monitoring systems and other equipment requires a continuous supply of electrical energy.

Impact Determination: Adverse environmental impacts on energy and natural resources resulting from the consumption of energy during the operation and maintenance of underground transmission facilities are expected to vary depending on the scale of the project and site-specific conditions. In the absence of mitigation, these adverse environmental impacts could range from negligible to medium.

Upgrade

Overhead Transmission Facilities

Upgrades to overhead transmission facilities would occur within existing ROWs without expanding the existing facility footprint or causing new ground disturbance. However, these upgrades may result in adverse environmental impacts on energy and natural resources, including:

- Consumption of Non-Renewable Resources
- Consumption of Renewable Resources
- Consumption of Energy

The adverse environmental impacts from upgrading overhead transmission facilities are often comparable to those of maintaining overhead transmission facilities. These adverse environmental impacts are generally anticipated to be lower than those for modifying or constructing a new transmission facility due to several factors. Table 2.3-1 highlights how upgrading existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

Underground Transmission Facilities

Upgrades to underground transmission facilities would occur within existing ROWs, without expanding the facility footprint or causing new ground disturbance. However, these upgrades may result in adverse environmental impacts on energy and natural resources, including:

- Consumption of Non-Renewable Resources
- Consumption of Renewable Resources
- Consumption of Energy

The adverse environmental impacts from upgrading underground transmission facilities are often comparable to those of maintaining underground transmission facilities. These adverse environmental impacts are generally anticipated to be lower than those for modifying or constructing a new transmission facility due to several factors.

Table 2.3-1 highlights how upgrading existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

Modification

Overhead Transmission Facilities

Modifying existing overhead transmission facilities typically involves several key steps, each with specific requirements, timelines, and settings, as outlined in Chapter 2, Overview of Transmission Facilities, Development Considerations, and Regulations. The adverse environmental impacts of modifying existing transmission facilities would vary depending on the scale of the project-specific application. Overhead transmission facilities could have the following adverse environmental impacts on energy and natural resources during the modification stage:

- Consumption of Non-Renewable Resources

- Consumption of Renewable Resources
- Consumption of Energy

Adverse environmental impacts of modifying overhead transmission facilities could be similar to those of new construction but are anticipated to be lower. Table 2.3-2 highlights how modifying existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

Underground Transmission Facilities

Modifying existing underground transmission facilities typically involves several key steps, each with specific requirements, timelines, and settings, as outlined in Chapter 2, Overview of Transmission Facilities, Development Considerations, and Regulations. The adverse environmental impacts of modifying existing transmission facilities would vary depending on the scale of the project-specific application. Underground transmission facilities could have the following adverse environmental impacts on energy and natural resources during the modification stage:

- Consumption of Non-Renewable Resources
- Consumption of Renewable Resources
- Consumption of Energy

Adverse environmental impacts of modifying underground transmission facilities could be similar to those of new construction but are anticipated to be lower. Table 2.3-2 highlights how modifying existing transmission facilities would generally result in fewer or less impactful adverse environmental impacts.

3.7.3.3 No Action Alternative

Under the No Action Alternative, the Programmatic EIS would not be adopted as a planning or analytical framework. Instead, transmission facility siting and development would continue under existing state and local regulatory processes, with each project evaluated independently for environmental compliance without the benefit of the environmental review provided in this document. This approach would lack the advanced notice of potential serious environmental concerns for those planning transmission facilities, as well as the Mitigation Strategies developed under the Programmatic EIS. As a result, environmental outcomes could be less predictable and consistent, and adverse environmental impacts could be greater.

3.7.4 Mitigation Measures

Under SEPA, there are six recognized forms of mitigation that agencies can apply to reduce or address adverse environmental impacts:

- **Avoiding the adverse environmental impact** altogether by not taking a certain action or parts of an action.
- **Minimizing adverse environmental impacts** by limiting the degree or magnitude of the action and its implementation.
- **Rectifying the adverse environmental impact** by repairing, rehabilitating, or restoring the affected environment.
- **Reducing or eliminating the adverse environmental impact** over time by preservation and maintenance operations during the life of the action.
- **Compensating for the adverse environmental impact** by replacing or providing substitute resources or environments.
- **Monitoring the adverse environmental impact** and taking appropriate corrective measures.

This section describes the Mitigation Measures that could apply to adverse environmental impacts from new construction, operation and maintenance, upgrade, and modification of transmission facilities.

All General Measures adopted for this Programmatic EIS (see Section 3.1 of Chapter 3, Affected Environment, Significant Impacts, and Mitigation) are relevant to this resource section. Applicants would be responsible for providing information within their application materials documenting their implementation of the General Measures.

Mitigation Measures have been identified to minimize adverse environmental impacts from transmission facility projects. These measures are intended to be broad so that they can be applied to most projects that would be covered under this Programmatic EIS. However, project-specific plans would be needed to adapt the measures for project-specific applications. The inclusion of a Mitigation Measure in this Programmatic EIS does not imply that a given adverse environmental impact is presumed to occur. Rather, the measures are provided to support early planning and the avoidance of adverse environmental impacts, streamlining project-specific environmental reviews when impacts are identified. Mitigation Measures are intended to serve as a set of potential strategies that the SEPA Lead Agency and applicants can draw from, depending on the specific environmental context and project footprint. Applicants and the SEPA Lead Agency retain discretion to:

- Propose alternative mitigation strategies that achieve equivalent or better outcomes.
- Demonstrate that certain Mitigation Measures are not applicable due to the absence of relevant adverse environmental impacts.

When impact determinations are identified as medium or high, then either the applicant would adopt applicable Mitigation Measures from this Programmatic EIS or the SEPA Lead Agency may require applicable mitigation to be implemented to reduce project-specific adverse environmental impacts. When impact determinations are low, applicable Mitigation Measures should still be considered by the applicant and the SEPA Lead Agency, as these Mitigation Measures would help to further reduce adverse environmental impacts, including the project's contribution to cumulative impacts. These Mitigation Measures would be implemented in addition to compliance with laws, regulations, environmental permits, plans, and design considerations required for transmission facilities.

The following Mitigation Measures could be adopted to mitigate adverse environmental impacts:

ENR-1 – Recycle Components: Recycle components that have the potential to be used as raw materials in commercial or industrial applications to the extent practicable.

Rationale: Recycling components can reduce the environmental footprint of projects, reducing the demand on natural resources.

ENR-2 – Source Recycled Materials: Source recycled or alternative materials to the extent practicable.

Rationale: Using recycled materials and alternative, lower-impact materials can reduce the environmental footprint of projects, reducing the demand on natural resources.

ENR-3 – High-Efficiency Lighting: Install high-efficiency lighting to reduce energy needs for the project's operation and maintenance.

Rationale: High-efficiency lighting, such as LED lights, consumes less energy than traditional lighting options. High-efficiency lights typically have a longer operational life, reducing the frequency of replacements and maintenance. By reducing energy consumption, high-efficiency lighting helps decrease greenhouse gas emissions associated with electricity generation. Longer-lasting lights mean fewer replacements, leading to less waste and lower adverse environmental impacts from manufacturing and disposal.

ENR-4 – Energy Supply: Power monitoring systems and maintenance equipment with renewable energy sources, and use electric or hybrid vehicles for operation and maintenance, when feasible.

Rationale: Integrating renewable resources into the lifecycle of transmission facilities enhances environmental sustainability and reduces reliance on non-renewable resources. The use of electric or hybrid vehicles for the operation and maintenance of transmission facilities, when feasible, can also serve several advantages, including reduced emissions, energy efficiency, noise reduction, and sustainability.

ENR-5 – Source Locally: Locally source raw materials, components, and fuel to the extent practicable.

Rationale: Local sourcing minimizes the distance materials need to travel, which reduces fuel consumption and lowers greenhouse gas emissions associated with transportation. Shorter transportation distances mean less energy is required to move materials from the source to the site, promoting overall energy efficiency.

ENR-6 – Cost-Benefit Analysis: Project-specific applications are encouraged to include a cost-benefit analysis.

Rationale: Providing a cost-benefit analysis enhances long-term transmission planning efforts and decision-making by providing transparent selection criteria. It also helps decision-makers compare alternatives by assessing the net welfare change (i.e., the difference in societal well-being between a "build" and "no build" scenario).

In addition to the above Mitigation Measures, the following Mitigation Measures[17] developed for other resources may be applicable:

W-1 – Minimize Water Use: Minimize water use, to the greatest extent practicable.

3.7.5 Probable Significant Adverse Environmental Impacts

Determining the significance of an adverse environmental impact involves consideration of context and intensity, which, in turn, depends on the magnitude and duration of the impact. “Significant” in SEPA means a reasonable likelihood of more than a moderate adverse environmental impact on environmental quality. An adverse environmental impact may also be significant if its chance of occurrence is not great, but the resulting impact would be severe if it occurred (WAC 197-11-794).

Identification of adverse environmental impacts and assignment of discipline-specific ratings are based on a structured evaluation consistent with the criteria outlined in WAC 197-11-330. Significance determinations consider the context and intensity of potential adverse environmental impacts, using both quantitative and qualitative information where appropriate. Professional expertise does not substitute for regulatory compliance. Regulatory requirements establish the baseline for environmental analysis and mitigation. Professional experience is used to supplement this baseline, providing additional insight to identify whether mitigation beyond what is required by regulation may be warranted. In cases where data are incomplete or unavailable, a conservative approach has been applied to ensure that potential adverse environmental impacts are not underestimated.

This Programmatic EIS weighs the adverse environmental impacts on energy and natural resources that could result from transmission facilities after considering the application of laws and regulations; siting and design considerations, including agency guidance and BMPs; and Mitigation Strategies, and makes a resulting determination for significance for each impact. **Table 3.7-4** summarizes the adverse environmental impacts anticipated for the new construction, operation and maintenance, upgrade, and modification of transmission facilities.

[17] The rationales for the identified Mitigation Measures are provided in their respective resource sections.

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Table 3.7-4: Summary of Adverse Environmental Impacts, Mitigation Strategies, and Significance Rating for Energy and Natural Resources

<table>
<tr><th>Adverse Environmental Impact</th><th>Project Stage</th><th>Description of Impact</th><th>Impact Determination Before Applying Mitigation</th><th>Mitigation Strategy Applied[(a)]</th><th>Significance After Applying Mitigation Strategy</th><th>Rationale for Significance Rating</th></tr>
<tr><td rowspan="3">Energy and Natural Resources – Consumption of Non-Renewable Resources</td><td>New Construction</td><td>The construction of overhead transmission facilities would require the manufacturing of steel transmission towers, aluminum and steel conductors, substations, and substation components. As a result of the raw materials being globally abundant and available, the changes are not anticipated to hinder supply chains or the management and distribution of natural resources.
The new construction of underground transmission facilities generally requires more raw materials than overhead transmission. Underground cables need extensive insulation and protective sheathing. The installation of underground cables involves trenching, which typically requires additional materials for backfilling and protective layers. Specialized equipment and labor are also needed, increasing the overall material usage.</td><td>Overhead: negligible to low
Underground: negligible to low</td><td rowspan="3">▪ ENR-1: Recycle Components
▪ ENR-2: Source Recycled Materials
▪ ENR-4: Energy Supply
▪ ENR-5: Source Locally
▪ ENR-6: Cost-Benefit Analysis</td><td rowspan="3">Less than Significant</td><td rowspan="3">The implementation of BMPs and Mitigation Measures collectively contributes to the lower impact of non-renewable resource consumption for new construction of overhead transmission facilities and upgrades or modifications.

The amount of non-renewable resources used during the operation and maintenance stage is relatively small compared to other industrial activities. Implementation of Mitigation Measures further reduces the reliance on non-renewable resources.</td></tr>
<tr><td>Operation and Maintenance</td><td>The use of fuel could be required during operation and maintenance for transmission facility inspections, vegetation management, and facility repairs. The use of non-renewable resources, such as fossil fuels, for powering maintenance vehicles and equipment would be intermittent; however, it would occur throughout the operation and maintenance stage.
Maintenance of underground transmission facilities could involve:
▪ Excavation and trenching, which require more fuel and equipment
▪ Spoil management, including removal and disposal of soil or rock
▪ Dewatering or groundwater management, depending on site conditions
These activities involved increased fuel consumption.</td><td>Overhead: nil to negligible
Underground: negligible to low</td></tr>
<tr><td>Upgrade</td><td>Upgrades to existing transmission facilities—whether overhead or underground—are confined to ROW and are designed to enhance system performance without introducing new or increased adverse environmental impacts. Because these activities do not involve new land disturbance or major construction, the consumption of non-renewable resources is generally limited.
Materials such as steel, aluminum, copper, and concrete may still be required for replacing or reinforcing components like conductors, insulators, or support structures. However, since the upgrades reuse existing corridors and infrastructure where possible, the demand for raw materials, fuel, and energy is lower than for new builds or more extensive modifications. Additionally, the reduced need for heavy machinery, transportation, and site preparation further minimizes fossil fuel use and associated emissions.</td><td>Overhead: nil to negligible
Underground: negligible to low</td></tr>
</table>

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[(a)]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
		Unlike overhead transmission facilities, where components like towers or conductors can often be reused or upgraded in place, underground transmission facilities may require complete replacement of cables and ducts, even for minor upgrades.				
	Modification	The modification of an overhead transmission facility often involves processes and considerations similar to those identified in new construction. Generally, most resources are used during the production of the materials used for construction. Although modification might involve reinforcing or replacing existing towers, poles, and conductor cables with resources similar to those used in new construction, this analysis assumes that existing structures could be used in many cases, and therefore, fewer resources would be consumed. The modification of an underground transmission facility involves processes and considerations like those used for new construction. A large amount of excavation and site preparation is required for modification projects. This includes re-digging trenches, removing existing infrastructure, and preparing the site for new installations. Modification often involves installing new, more efficient cables and components, which could be as complex as installing them for the first time.	**Overhead:** negligible to low **Underground:** negligible to low			
Energy and Natural Resources – Consumption of Renewable Resources	New Construction	Materials like sustainably sourced wood or bio-based products might be used in new construction or maintenance. Water is essential for mixing concrete used in the new construction of foundations and other structural components. Water is used for dust suppression during new construction, operation and maintenance, upgrade, and modification.	**Overhead:** negligible to medium **Underground:** low to medium	▪ **ENR-2**: Source Recycled Materials ▪ **ENR-5:** Source Locally ▪ **ENR-6:** Cost-Benefit Analysis ▪ **W-1:** Minimize Water Use	Less than Significant	Underground cables are designed to be durable and require less frequent maintenance, which would offset some of the initial impacts. However, the upfront resource consumption remains. Implementation of Mitigation Measures helps reduce impacts on less than significant. Sourcing recycled materials like wood or bio-based materials would reduce a project's overall demand for natural resources. The amount of water required for construction activities is relatively small compared to other industrial processes. Water use during construction is typically short term and
	Operation and Maintenance	Materials like sustainably sourced wood or bio-based products might be used in new construction or maintenance. Water is essential for mixing concrete used in the new construction of foundations and other structural components. Water is used for dust suppression during new construction, operation and maintenance, upgrade, and modification. During operation and maintenance, water is used for cooling systems, cleaning, and vegetation management.	**Overhead:** nil to low **Underground:** negligible to low			
	Upgrade	Since these projects are confined to existing ROWs and avoid new or increased environmental disturbance, they do not typically require significant use of renewable materials such as sustainably harvested wood, bio-based composites, or plant-derived fuels. However, some renewable resources may be indirectly consumed during the upgrade process. For example:	**Overhead:** nil to low **Underground:** negligible to low			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
		▪ Electricity from renewable sources (e.g., solar or wind) may power tools, machinery, or support facilities during construction of upgrades. ▪ Biofuels might be used in transportation or equipment if part of a sustainability initiative. ▪ Recycled or sustainably sourced materials may be incorporated into components like insulators, poles, or cable sheathing, depending on procurement policies. Despite these possibilities, the overall demand for renewable resources associated with upgrading existing transmission facilities is typically incidental, especially compared to new construction or major modification projects. In many cases, upgrades may even support broader renewable energy goals by improving grid efficiency and enabling greater integration of renewable generation sources. Unlike overhead transmission facilities, where components like towers or conductors can often be reused or upgraded in place, underground transmission facilities may require complete replacement of cables and ducts, even for minor upgrades.				localized. The ongoing water needs for operation and maintenance are minimal.
	Modification	Water is used for mixing concrete and dust suppression during the modification of existing transmission facilities.	**Overhead:** negligible to medium **Underground:** low to medium			
Energy and Natural Resources – Consumption of Energy	New Construction	New construction activities, equipment, and lighting would require electricity from diesel generators or from a utility provider.	**Overhead:** nil to negligible **Underground:** nil to negligible	▪ **ENR-3:** High-Efficiency Safety Lighting ▪ **ENR-4:** Energy Supply ▪ **ENR-6:** Cost-Benefit Analysis	Less than Significant	Mitigation Measures help mitigate the impacts of electricity consumption and promote more sustainable practices in the new construction, operation and maintenance, upgrade, and modification of transmission facilities.
	Operation and Maintenance	The operation of monitoring systems and other electrical transmission equipment would require a continuous supply of electrical energy. Similarly, the transmission of electrical energy from energy facilities to consumers involves some energy loss. If thermal management systems (e.g., forced cooling) are part of the underground transmission facility, they may require temporary or permanent electrical power.	**Overhead:** negligible to low **Underground:** negligible to medium			
	Upgrade	Even though upgrades are confined to existing ROW and avoid new adverse environmental impacts, they still involve temporary consumption of electrical energy during construction and commissioning. The extent of this consumption varies between overhead and underground systems: ▪ Overhead transmission facility upgrades involve mechanical operations (e.g., lifting, replacing conductors), which rely more on fuel-powered equipment than electricity. ▪ Small amounts of electricity may be used for lighting, tools, or safety systems at staging areas. Electrical testing of upgraded	**Overhead:** negligible to low **Underground:** negligible to medium			

Adverse Environmental Impact	Project Stage	Description of Impact	Impact Determination Before Applying Mitigation	Mitigation Strategy Applied[a]	Significance After Applying Mitigation Strategy	Rationale for Significance Rating
		lines (e.g., impedance, insulation resistance) consumes some energy but is brief and localized. ▪ Underground transmission facility upgrades include activities like cable splicing, insulation testing, and powering dewatering pumps or ventilation systems (in duct banks or tunnels), which require more electricity. Underground systems often undergo more rigorous and prolonged electrical testing (e.g., high-voltage withstand tests, partial discharge testing). If thermal management systems (e.g., forced cooling) are part of the upgrade, they may require temporary or permanent electrical power.				
	Modification	Electricity would be necessary to power equipment and lighting during modification activities.	**Overhead:** nil to negligible **Underground:** nil to negligible			

Notes:

[a] Appendix 3.1-1 provides a detailed listing of each Mitigation Strategy. This appendix serves as a reference section that can be consulted independently of the main text. This is particularly useful for detailed guidance and technical specifications that may be referred to multiple times. Additionally, including this information in an appendix allows for easier updates and revisions. If Mitigation Strategies or guidance changes, the appendix can be updated without altering the main content.

BMP = best management practice; **ROW** = right-of-way

3.7.6 Environmental Sensitivity Map

No criteria specific to energy and natural resources were identified that would impact project siting decisions at a broad, programmatic level. Consequently, no environmental sensitivity map was developed for this resource. The consumption of energy and natural resources can vary significantly over time and across individual projects. Therefore, a more detailed, site-specific analysis is required to determine the suitability of a project in any area. This variability can make it difficult to create a static environmental sensitivity map that accurately reflects current conditions and accounts for the adverse environmental impacts of transmission facilities on energy and natural resources.

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