EXH. DRK-16
DOCKETS UE-22___/UG-22___
2022 PSE GENERAL RATE CASE
WITNESS: DAN'L R. KOCH

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, Complainant, v. PUGET SOUND ENERGY, Respondent.	Docket UE-22____ Docket UG-22____

FIFTEENTH EXHIBIT (NONCONFIDENTIAL) TO THE PREFILED DIRECT TESTIMONY OF

DAN'L R. KOCH

ON BEHALF OF PUGET SOUND ENERGY

JANUARY 31, 2022

CHAPTER 2. PROJECT ALTERNATIVES

This chapter describes the project alternatives evaluated in the Phase 2 Draft EIS. The alternatives were developed based on discussions among the Partner Cities, the EIS Consultant Team, and PSE, and public comments on the Phase 1 Draft EIS and Phase 2 scoping periods. The alternatives were designed to identify, analyze, and feasibly attain PSE's objectives for the project (as defined in Chapter 1; see Section 1.7). This chapter also identifies alternatives considered but not evaluated in the Phase 2 Draft EIS because they did not meet PSE's project objectives (see Section 2.2). As required by SEPA (Washington Administrative Code [WAC] 197-11-440), benefits and disadvantages of delaying PSE's project are described at the end of this chapter (presented in Section 2.3).

The Phase 1 Draft EIS was published on January 28, 2016. It evaluated, at a more general level, the environmental impacts of alternative methods to address the electrical transmission capacity deficiency identified by PSE. The Phase 1 Draft EIS was programmatic in nature and addressed a broad range of potential alternatives. While not required under SEPA, the Partner Cities opted to provide the Phase 1 evaluation to ensure that the alternatives considered in the Phase 2 Draft EIS reflect the full range of feasible alternatives to meet PSE's project objectives. The Phase 1 Draft EIS broadly evaluates the general impacts and implications associated with feasible and reasonable alternatives available to address PSE's identified objectives for the project. The evaluation conducted during Phase 1 was used in part to narrow the range of alternatives for consideration in the Phase 2 Draft EIS. Informed by the Phase 1 analysis, the Phase 2 Draft EIS is project-specific and focuses on PSE's preferred alignment and alternative alignment routes also called options. The Phase 1 Draft EIS includes important information on project background and the regulatory context, which is not repeated in the project-specific Phase 2 Draft EIS; the reader is referred to the Phase 1 Draft EIS for additional information on those topics, and cross references are included in the Phase 2 Draft EIS for convenience of readers.

The Phase 2 Draft EIS is focused on the information needed to evaluate PSE's proposed project, at a level of detail sufficient for decision makers to comply with SEPA during permitting. Information on context is included as needed to provide a complete analysis for the project-level Phase 2 Draft EIS, with more detailed supporting information incorporated by reference to the Phase 1 Draft EIS and appendices.

To keep the information in Chapter 2 focused and understandable, project details that relate to a specific element of the environment are presented in Chapter 3, *Long-term (Operation) Impacts and Potential Mitigation*, and Chapter 4, *Short-term (Construction) Impacts and Mitigation*. For example, while Chapter 2 includes general information on vegetation clearing zones associated with the project, further details about vegetation clearing (such as the number, location, and type of trees removed) are described and analyzed as appropriate in Sections 3.4 and 4.4, *Plants and Animals*. Similarly, information on pipeline safety, both during construction and operation, is presented in Sections 3.9 and 4.9, *Environmental Health – Pipeline Safety*. Chapter 2 focuses on the key components of the segments and options at an appropriate level of detail to support the analysis presented in Chapters 3 and 4.

2.1 PHASE 2 PROJECT ALTERNATIVES

This Phase 2 Draft EIS evaluates PSE's proposed Energize Eastside project, and a No Action Alternative (as required by SEPA, WAC 197-11-440). The No Action Alternative provides a benchmark against which the impacts of the project and other alternatives can be compared.

PSE's proposed project includes two main components:

1. **A new substation, called the Richards Creek substation,** adjacent to the existing Lakeside substation in Bellevue; and
2. **New 230 kV overhead transmission lines,** connecting the Richards Creek substation to both the Sammamish substation in Redmond and the Talbot Hill substation in Renton, through the cities of Redmond, Bellevue, Newcastle, and Renton.

The new Richards Creek substation and transmission lines would increase electrical capacity and improve electrical grid reliability for Eastside communities. PSE has proposed a preferred alignment for the transmission lines, along with route and pole options within some segments of the alignment, described in Section 2.1.2. The Partner Cities, in cooperation with PSE, have determined that these route and pole options are reasonable alternatives that could attain or approximate PSE's objectives for the proposed project. In some segments of the corridor, no alternative route options are proposed because no reasonable alternatives would attain or approximate PSE's objectives for the proposed project and have lower environmental cost.

2.1.1 No Action Alternative

SEPA requires the analysis of the No Action Alternative in an EIS, against which an action alternative (e.g., Alternative 1) can be evaluated and compared. For the Phase 2 Draft EIS, the No Action Alternative is defined as those actions

Project Terminology

The Phase 2 Draft EIS uses the following terms:

Alternative 1 – Refers to PSE's entire proposed project, including the new Richards Creek substation and the transmission line.

Segment – Segments are components of Alternative 1 and include identified portions of the transmission line route, generally divided by city boundaries, except there are three segments for Bellevue. The Phase 2 Draft EIS evaluates six distinct segments.

Option – Options are alternative routes identified by PSE for specific segments, designed to address public comments or jurisdictional considerations. For the Phase 2 analysis, four options have been identified for the Bellevue South Segment, and three options have been identified for the Bellevue Central Segment.

Corridor, Route, Alignment – These are all general terms for the path travelled by the transmission line, and are essentially synonyms. Corridor generally refers to the entire length of the line, whereas route and alignment refer to a given portion of a segment or option.

PSE's Preferred Alignment – PSE's Preferred Alignment is Alternative 1, comprised of the six segments; within the Central Bellevue Segment, the Preferred Alignment is the Existing Corridor Option; within the Bellevue South Segment, the Preferred Alignment is the Willow 2 Option.

PSE's Right-of-Way – Refers to the land over which PSE has a right to build and operate its transmission lines. PSE's right-of-way includes parcels owned outright by PSE, and parcels owned by others over which PSE owns an easement allowing the transmission lines. Portions of the transmission lines within public right-of-way are typically allowed through franchise agreements with the public entity that owns the right-of-way.

Easement – Refers to a formal legal agreement giving PSE the right to use the real property of another for a specific purpose, such as overhead transmission lines. An easement specifies the width and other dimensions over a given parcel. The easement is a real property interest, but legal title to the underlying land is retained by the original owner for all other purposes. Where possible, PSE prefers to place 230 kV lines in easements, rather than on public right-of-way, because within public right-of-way, PSE can be required to move the lines if needed to accommodate road expansion or other infrastructure improvements.

PSE would undertake to serve the project objectives without requiring the issuance of state or local permits (something PSE could build or undertake if the proposed project is not approved). The No Action Alternative represents the most likely outcome if the project is not implemented, and it is considered the baseline condition.

Under the No Action Alternative, PSE would continue to manage its system in largely the same manner as at present. This includes maintenance programs to reduce the likelihood of equipment failure, and stockpiling additional equipment so that in the event of a failure, repairs could be made as quickly as possible.

Implementation of the No Action Alternative would not meet PSE's objectives for the proposed project, which are to maintain a reliable electrical system and to address a deficiency in transmission capacity on the Eastside. Implementation of the No Action Alternative would increase the risk to the Eastside of power outages or system damage during peak power events.

Project Area and Study Area

This Phase 2 Draft EIS uses two related terms: "study area" and "project area." In general, "project area" refers to the lands crossed by the proposed transmission line corridor (both existing and new) and the substations, any properties with easements for the project, as well as the adjacent properties. In contrast, the term "study area" is used to describe the area associated with a specific resource element that could be affected by the project. The study area differs from element to element, depending on the spatial nature of the potential impacts. The study area for each resource element is defined in the introduction or methodology discussion in each Chapter 3 subsection, and often shown on a map for clarity.

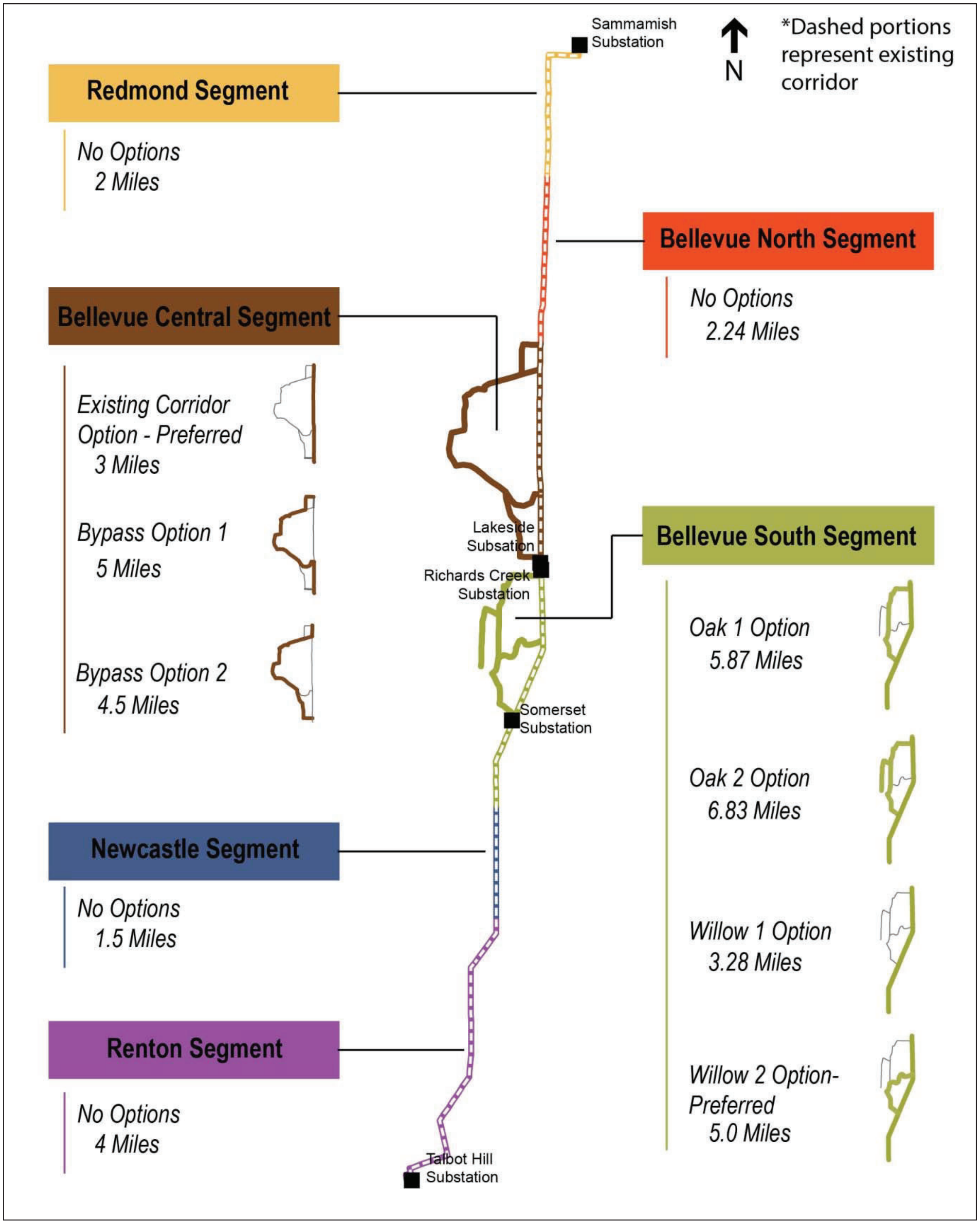
2.1.2 Alternative 1: New Substation and 230 kV Transmission Lines

Alternative 1 includes a new substation (Richards Creek) and approximately 18 miles of new 230 kV electrical transmission lines to connect two existing bulk energy systems (the Sammamish substation in Redmond, and the Talbot Hill substation in Renton). This alternative is a variant of Option A under Alternative 1 in the Phase 1 Draft EIS. For the Phase 2 Draft EIS, the proposed 230 kV transmission line corridor is divided into six main segments (some of which include additional route options) to aid in the analysis and organize material for the decision-makers. To assist Bellevue and the other Partner Cities in evaluating the preferred alignment during the decision-making process, the segments are organized primarily by city jurisdiction, from north to south: Redmond, Bellevue, Newcastle, and Renton. Because of the distance and various route options, the route within Bellevue is separated into three segments (Bellevue North, Bellevue Central, and Bellevue South). In the Bellevue Central and Bellevue South Segments, there are options for routing the transmission lines along various corridors other than PSE's existing 115 kV corridor.

Table 2.1-1 lists the segments and route options that comprise Alternative 1 as presented in the Phase 2 Draft EIS, resulting in 12 possible project scenario combinations. To be viable, Alternative 1 requires continuous transmission lines across all six segments. Where there are route options, only one option is needed per segment. Figure 2.1-1 shows a diagram of the route segments and options. The segments and options are color-coded throughout this Phase 2 Draft EIS.

Table 2.1-1. Alternative 1 Components, Segments, and Options

Alternative	Name Used in the Phase 2 Draft EIS
1A-S	Richards Creek Substation and Improvements to Other Substations
1A-1	Redmond Segment
1A-2	Bellevue North Segment
1A-3a	Bellevue Central Segment, Existing Corridor Option [PSE's Preferred Alignment]
1A-3b	Bellevue Central Segment, Bypass Option 1
1A-3c	Bellevue Central Segment, Bypass Option 2
1A-4a	Bellevue South Segment, Oak 1 Option
1A-4b	Bellevue South Segment, Oak 2 Option
1A-4c	Bellevue South Segment, Willow 1 Option
1A-4d	Bellevue South Segment, Willow 2 Option [PSE's Preferred Alignment]
1A-5	Newcastle Segment
1A-6	Renton Segment



Source: King County, 2015; Ecology, 2014; Open Street Map 2016.

Figure 2.1-1. Alternative 1 230 kV Transmission Line Corridor Summary, by Segment (Conceptual)

The Richards Creek substation is described first below, followed by information on the proposed 230 kV transmission lines. For the transmission lines, general information is first presented on shared components of the alternative, followed by information for each of the individual segments and options. Details on the construction of the line are presented separately, in Section 2.1.3, *Construction.* This section describes the major components (substation equipment, pole design, vegetation management, etc.) of the identified alternatives. Potential significant environmental impacts and mitigation are identified in Chapter 3 (*Long-term (Operation) Impacts and Potential Mitigation*) and Chapter 4 (*Short-term (Construction) Impacts and Potential Mitigation*).

(Note to the reader: the names of the alternatives, segments, and options presented in the Phase 2 Draft EIS differ from the names used during earlier parts of the project, such as in the Phase 1 Draft EIS and during the Phase 2 scoping comment period. In particular, definition and design of the segments has evolved during preparation of the Phase 2 Draft EIS, partially in response to discussion among PSE, the EIS Consultant Team, and the City of Bellevue, which has refined the alternatives identified for full analysis.)

2.1.2.1 New Richards Creek Substation and Improvements to Other Substations

PSE proposes to construct a new substation under Alternative 1, regardless of route option. The new Richards Creek substation would be immediately south of the existing Lakeside substation (see Figure 2.1-2) on parcels 102405-9083 and 102405-9130 in the City of Bellevue (see Figure 2.1-3). The total lot area for the substation site is 7.82 acres in size, and the fenced substation yard would cover approximately 2 acres within a fenced lot. The substation would include a new 230 kV transformer (see Figure 2.1-2) and associated electrical equipment such as circuit breakers, electrical bus, and connections to the new transmission lines. The main function of the substation would be to house the transformer and related equipment needed to step down the 230 kV voltage (bulk power) from the new transmission lines to 115 kV needed for use by the local distribution system.

Lakeside Substation (looking east)

230 kV Transformer

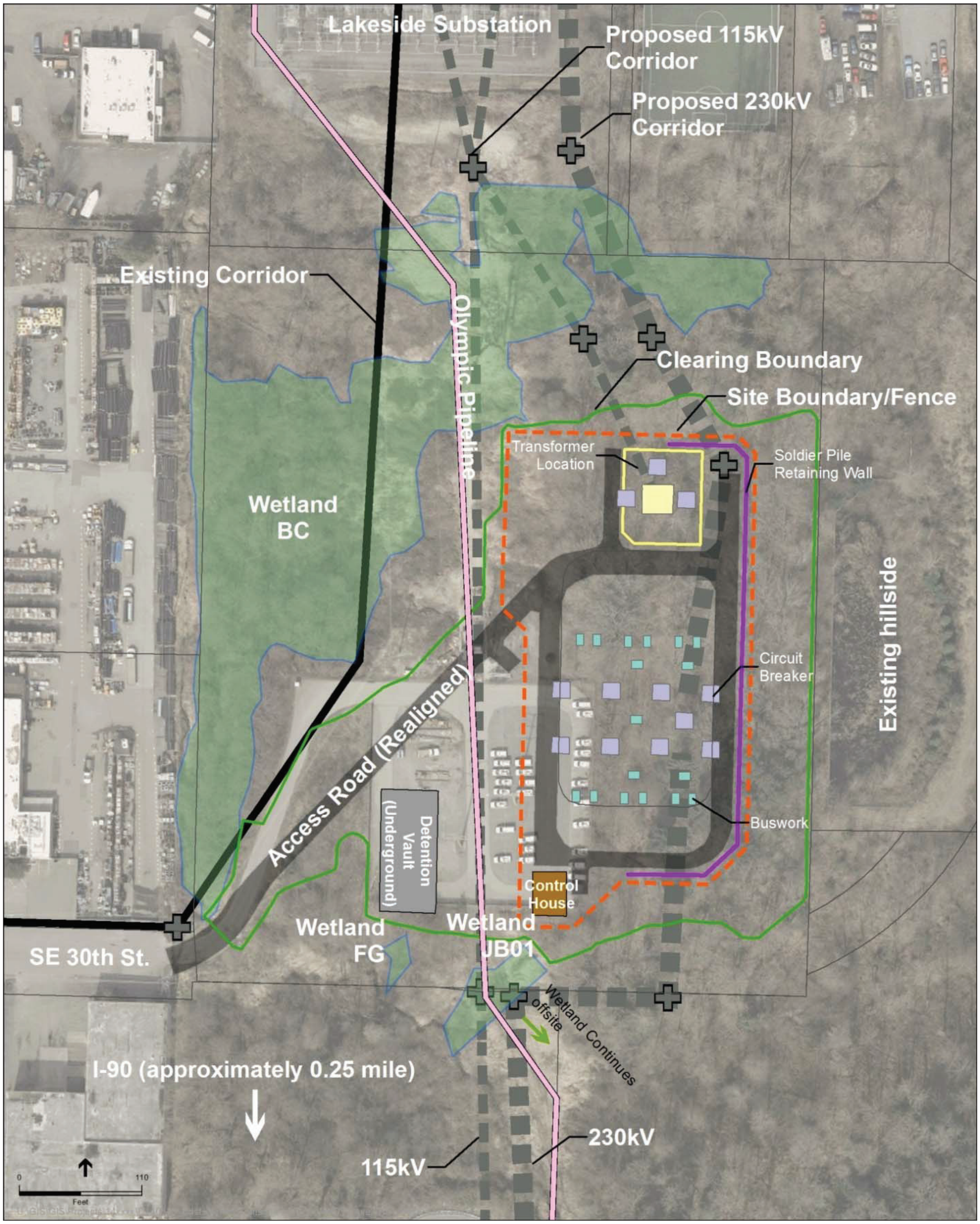


Figure 2.1-2. Conceptual Site Plan for the New Richards Creek Substation

(Note: configuration shown for Willow 1 and Willow 2 Options; for Oak 1 and Oak 2 Options, the 115 kV transmission line would run west to SE 30th Street just south of the control house)

Gravel surface

Looking north to the Lakeside substation

View to SE 30th Street access

Vegetated hillslope of the east boundary

Figure 2.1-3. Existing Conditions at the New Richards Creek Substation

The substation would include the necessary foundations, access ways, stormwater drainage, a control house, and security fencing. The *dead-end towers* with ground wire mast, located within the fenced lot, would be approximately 70 feet tall. The new substation would be in approximately the same location as PSE's current pole storage yard (see Figure 2.1-3).

The access road from SE 30th Street to the substation entrance gate would be paved with asphalt, and the route would be reconfigured relative to the current alignment to allow the delivery of large equipment, such as the transformer (see Figure 2.1-2). The existing access roadway to the Richards Creek site (SE 30th Street) is paved; however, it would be reconfigured to improve access. The reconfigured driveway would be 24 feet wide at the corners and 20 feet wide at the straight sections. The driveway would include 2-foot shoulders on each side of the pavement. Appropriate drainage for the driveway would be included in the site design. There is an existing unimproved, degraded road between the Richards Creek substation site and existing Lakeside substation. This road would not be improved as part of the Energize Eastside project. The yard surfacing inside the substation fence and for a perimeter 5 feet outside the fence will consist of insulating yard rock (3/4-inch crushed quarry rock), with interior driveways in the substation consisting of gravel surfacing (crushed surfacing top course).

The retaining wall on the east side of the substation would be an approximately 25-foot-tall soldier-pile wall. The preliminary grading quantities based on the 60 percent design are 26,500 cubic yards of excavation and 8,000 cubic yards of fill. The fence will be a 7-foot chain link fence with three strands of barbed wire on top.

Under the Bellevue Land Use Code, Electrical Utility Facilities require 15 feet of Type 1 Landscaping on all sides (LUC 20.20.520(F)(2)(a). Landscaping is expected to be installed along the western substation boundary, with natural screening used along the north, east, and south boundaries.

Natural resources on the site, including streams, wetlands, vegetation, and slopes, are described in Section 3.3, *Water Resources*, and Section 3.4, *Plants and Animals*.

Improvements to Existing Substations

In addition to the new Richards Creek substation, the proposed project requires upgrades to several existing substations in the study area, including the Lakeside, Talbot Hill, and Sammamish substations, as well as the Somerset substation (only associated with the Oak 2 and Willow 2 Options of the Bellevue South Segment). Substation locations are shown on Figures 1-1 and 2.1-1. In general, all upgrades to the existing substations would occur within the existing footprint of these facilities, and no yard expansion is proposed at any of these substations. No significant impacts are anticipated for these substation upgrades; therefore, no further analysis of impacts to resource topics at these substations is included in this Phase 2 Draft EIS.

- At the Lakeside substation, PSE would install new lines to interconnect with the existing 115 kV system that serves the Eastside. Additionally, a new 115 kV capacitor bank would be added to the station.
- At the Talbot Hill substation, PSE would add new circuit breakers and wires.
- At the Sammamish substation, PSE would add a new 230 kV line bay.
- For system operational reasons, at the Somerset substation (under the Oak 2 and Willow 2 Options only), PSE would upgrade the system from a radial to a loop system, allowing the substation to be fed from more than one transmission line. PSE would install 230 kV equipment to run at 115 kV for the near term; and install a new 115 kV transformer, three switches, and a control building. If the Somerset substation requires improvements, additional temporary work area in the immediate vicinity is anticipated as the substation yard is small. The footprint of the substation would not be expanded.

2.1.2.2 Overview of the New 230 kV Transmission Lines

Alternative 1 is to construct and operate two 230 kV transmission lines, one from the Sammamish substation in Redmond to the proposed Richards Creek substation in Bellevue, and one from Richards Creek substation to the Talbot Hill substation in Renton, a distance of approximately 18 miles. For analysis in the Phase 2 Draft EIS, the Alternative 1 corridor is divided into six segments, organized by city jurisdiction. The project includes six route options within some of the segments being considered as alternative routes to PSE's preferred alignment. Alternative 1 follows an existing 115 kV transmission line corridor for the majority (from 93 percent up to 100 percent, depending on route) of its length, using the existing PSE right-of-way and would not require new easements. PSE's existing 115 kV corridor is referred to in this Phase 2 Draft EIS as the "existing corridor." For the route options, which are in central and south Bellevue, the project would depart the existing corridor and follow adjacent roads and associated right-of-way, referred to in this Draft EIS as the "new corridor." The new corridor would require some new easements (the amount of which depends on the route options selected).

Transmission Line Terminology

Transmission Line – A system of structures, wires, insulators, and associated hardware that carry electric energy from one point to another in an electric power system.

Wire – The cable component of the transmission line through which electricity flows. Also referred to as the conductor.

Circuit – In general terms, the pathway for an electrical current. For use in this Draft EIS, circuit is used in the context of the number of circuits carried on a single pole or structure. A single-circuit line carries wires for only one circuit (either 115 kV or 230 kV), and each pole would support three wires. A double-circuit line carries wires for two circuits (one 115 kV and one 230 kV), and each pole would support six wires.

High-capacity 115 kV Line –A high-capacity 115 kV line would use a larger conductor (the same as the proposed 230 kV line) to allow for a greater amount of electrical current to be transmitted using a single line. This would be used to replace the two existing lower capacity 115 kV lines that are in service today. The high-capacity 115 kV line could be converted to 230 kV at some point in the future.

Dead-end Tower – Structure used where the line ends, or turns with a high angle, or at major crossings (such as highways or rivers). Dead-end towers must be stronger than other poles because they are under tension from just one side. Often they have additional guy wires, are larger in diameter, and/or have larger footings than other poles.

The project would replace two existing 115 kV transmission lines in the existing corridor (along most of the route) with a 230 kV line and a high-capacity 115 kV line (designed to be operable at 230 kV in the future) on new poles. The plan for the Energize Eastside project is to first operate one circuit at 115 kV while operating the other at 230 kV, then eventually operate both circuits at 230 kV. Generally, the project, as proposed by PSE, would upgrade an existing line and increase capacity with a new line largely within the existing corridor, rather than construct a new transmission line corridor. The majority (approximately 95 percent) of the existing 115 kV lines are strung on wooden H-frame structures; in a few locations (e.g., near substations or highway crossings), the existing lines are on other pole or structure types, such as single wood poles or steel monopoles.

The existing 115 kV transmission line corridor was originally established in the late 1920s and early 1930s. The original power lines were upgraded to 115 kV in the 1960s. Maintenance has occurred over time, and in 2007, PSE replaced or reframed approximately 200 H-frame structures on the existing corridor. As part of the proposed Energize Eastside project, the existing, older H-frame structures would be replaced primarily with a combination of steel monopoles and steel H-frame structures. The new poles would be taller in most cases than the existing H-frame structures. The typical height of the existing H-frame structures is 60 feet (ranging from 39 to 115 feet); the typical height of the proposed poles is approximately 90 feet (ranging from 80 to 125 feet) in the existing corridor. In most locations, the existing 115 kV transmission lines are strung on two adjacent H-frame structures (i.e., typically four poles total) at a single location; the project would consolidate these lines onto one or two pole structures. In most cases, the new poles would be installed in approximately the same locations along the existing corridor (i.e., within 25 feet up or down the line) as the existing poles; in several locations, the new poles could be moved farther along the line to avoid sensitive resources, such as wetlands or streams. In general, Alternative 1 would result in fewer poles along the existing corridor, but the poles would typically be 35 feet taller than the existing structures; with taller poles, the wire attaching points would also be higher than at present. More details on pole designs, including illustrations and photographs, are presented in Section 2.1.2.2.

The existing 115 kV transmission line corridor contains two of several transmission lines in this developed and growing region. In most portions of the Energize Eastside project area, the existing two 115 kV H-frame structures are the only lines within the corridor. In some portions, however, the line is collocated with other transmission line poles and structures, and the line also crosses and/or runs parallel to other transmission line corridors in several locations (including a 230 kV line typically on steel lattice towers owned and operated by Seattle City Light [SCL]).

Additional details are presented by segment and option in Section 2.1.2.3.

230 kV steel lattice tower in the study area, owned and operated by SCL

Pole Design

The majority of the existing 115 kV transmission lines are strung on wooden H-frame structures, typically about 60 feet tall. PSE's project would generally replace these structures and use a variety of replacement pole types (Table 2.1-2), including the following:

- One double-circuit steel monopole
- Two single-circuit steel monopoles
- Single-circuit steel H-frame

Along most of the Alternative 1 corridor, the new poles would be double-circuit steel monopoles with a typical height of 90 to 100 feet, although they could be as high as 125 feet in some locations (e.g., at road crossings or to accommodate major topographic changes). However, different pole types, pole heights, and span lengths can be used to respond to topographic conditions and other landscape features, as well as to mitigate potential visual impacts within specific areas. The single-circuit monopoles and single-circuit H-frame structures would be used in select locations, especially in the Bellevue Central, Bellevue South, and Newcastle Segments. Pole type and placement are also influenced by location within the landscape and other site-specific factors, such as where PSE shares their right-of-way with the Olympic Pipeline system (operated by BP Pipelines-North America [BP]).

What determines pole height?

Factors affecting pole height include the necessary ground clearance for the specific voltage of the lines, the total number of wires on the pole, and the separation required between wires. Ground clearance and separation between wires for 230 kV lines must be greater than for 115 kV. Poles that carry just one circuit have only three wires and can generally be lower than poles carrying two circuits, which typically requires six wires.

What determines pole type?

Pole types are chosen to be cost effective, but other factors are also considered, including the number of circuits needed, concerns about height, and the width of available right-of-way. H-frame structures have lower profiles than many monopoles because wires are separated horizontally rather than vertically as they are on a monopole. However, if two circuits are needed in one corridor, there may not be enough horizontal clearance to allow two H-frames. If height of the poles is not a major concern, or if there is insufficient room for H-frames, monopoles can be used. Monopoles carrying a double-circuit can be constructed with the smallest overall footprint and are preferred for cost purposes over using pairs of monopoles in parallel. In some circumstances, however, pairs of monopoles may be used to limit the overall height and thus reduce visual impacts.

To meet *National Electric Safety Code* (NESC) and Federal Energy Regulatory Commission (FERC) and North American Electric Reliability Corporation (NERC) requirements to prevent contact with the lines, adequate clearances must be maintained between each wire, the ground, adjacent buildings, and trees. Pole height therefore would vary depending on the number of circuits, the arrangement of the circuits on the poles, pole location, topography, and adjacent uses.

Specific pole locations would be determined based on site engineering but would be located within 25 feet of the existing H-frame structures in most locations along the existing corridor. Therefore, pole span (i.e., the spacing between poles) would be approximately the same as the existing line, typically 550 to 650 feet. Spacing can range from 125 to 1,650 feet, depending on site-specific constraints. Pole locations would generally be based on tensioning needs for the wire (including where turns are needed along the route), underground obstacles at pole foundation locations, and allowable structural heights, all while attempting to use as few poles as possible. PSE would also avoid placing poles in environmentally critical areas like wetlands and on unstable slopes to the greatest extent feasible.

For some of the route options, the line would run along existing roadways. Where possible, PSE prefers to place 230 kV lines in easements rather than on public right-of-way, because within public right-of-way, PSE can be required to move the lines if needed to accommodate road expansion or other infrastructure improvements. If it is not possible to obtain an easement for a pole, PSE generally places the pole along the outermost part of the road right-of-way and acquires an easement of up to 55 feet in width on the adjacent private property to ensure that the necessary electrical clearances are met. Typical easements widths for both the existing corridor and along road rights-of-way are illustrated in Figure 2.1-4.

The diameter of the poles depends on height, as well as loading, and would be greatest at the base. Typical (tangent) poles would be 2 to 4 feet in diameter at the base, while typical corner and termination poles may need to be 4 to 6 feet in diameter at the base depending on the angle and the terrain. Tangent poles are poles that are in a straight line with other poles. Termination poles and poles where the transmission line changes direction need to be larger than tangent poles to handle the asymmetrical weight and tension from the lines they are holding. An additional shield wire would be installed on top of the new poles for lightning protection. Any existing fiber-optic cable would need to be transferred to the new poles, or a single combination shield wire/fiber optic line could be used (i.e., optical ground wire [OPGW]).

In addition to the height and diameter of the poles, the diameter of the conductor (i.e., wire) will also increase. The wire on the existing corridor is currently 1.063 inches in diameter; the wire diameter of the proposed new wires will be 1.545 inches to accommodate the increased voltage.

The main characteristics of the various pole types are summarized and illustrated in Table 2.1-2.

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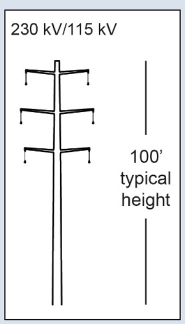
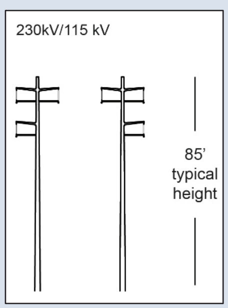
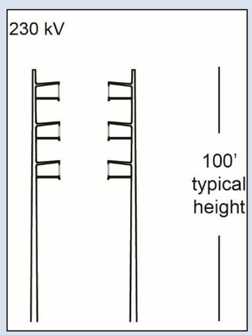
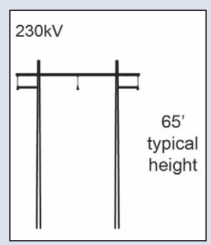
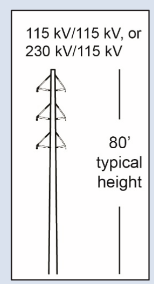
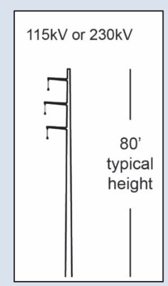
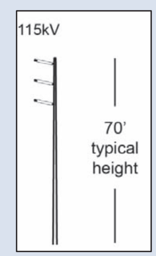
Table 2.1-2. Summary of Proposed Pole Types

	1 Double-Circuit Monopole	2 Single-Circuit Monopoles	2 Single-Circuit Monopoles	Single-Circuit H-Frame	1 Double-Circuit Monopole	1 Single-Circuit Monopole	1 Single-Circuit Monopole (Wood)
Line Configuration	6 wires total, 3 on each side of the pole	3 wires stacked vertically or in a delta configuration (shown below)	3 wires stacked vertically on each pole	3 wires horizontal on cross-arm	6 wires with 3 wires on each side of the pole	3 wires stacked vertically on the pole	3 wires stacked vertically on the pole
Typical Height	100 feet (tallest of the pole designs)	85 feet	100 feet	65 feet (shortest of the pole designs)	80 feet	80 feet	70 feet
Pole Replacement	Replaces 4 existing poles (2 H-frame structures) with 1 pole in most areas	Replaces 4 existing poles (2 H-frame structures) with 2 poles in some areas	Replaces 4 existing poles (2 H-frame structures) with 2 poles in some areas	Replaces 4 existing poles (2 H-frame structures, 2 single-circuit) with 2 poles (1 single-circuit H-frame structure)	New double-circuit (115 kV/115 kV, or 230 kV/115 kV, depending on option) pole to replace existing single-circuit 115 kV line along roadway	Replaces existing 115 kV line along Factoria Blvd/Coal Creek Pkwy in Oak 2 and Willow 2, or installed along Newport Way in Willow 2	Installed along 124th Ave SE to relocate existing 115 kV line from Factoria Blvd
Segments and options using this pole type	This is the main pole design and is used in all segments except Newcastle and parts of South Bellevue.	Proposed for use in the Willow 1 Option (in the Bellevue South Segment) and the north portion of the Renton Segment. Generally used on either side of the Olympic Pipeline when the pipeline is the center of the corridor.	Proposed for use in the Newcastle Segment. One monopole would be placed on the outer edge of the right-of-way on each side of the Olympic Pipeline, with the pipeline in the center of the corridor.	Proposed for use in the Oak 2 and Willow 2 Options (Bellevue South Segment). A single-circuit design can only be used where there is an option for re-routing the 115 kV line outside of the existing corridor. The H-frame design provides a shorter configuration for the 230 kV line than a monopole.	Proposed for use in the Oak 1, Oak 2, and Willow 2 Options (in the Bellevue South Segment).	Proposed for use in the Oak 2 and Willow 2 Options (in the Bellevue South Segment). Taller (typical height = 100 feet) versions of these poles are proposed in Bypass Options 1 and 2.	Proposed for use in the Oak 2 Option (in the Bellevue South Segment).
Diameter for typical poles (at base)	2.5–6 feet (largest of the pole designs)	Typically 2.5–5 feet (similar to the H-frame structures; smaller than double-circuit monopoles)	Typically 3–5.5 feet (similar to the double-circuit monopoles)	Typically 2.5–5 feet (similar to the single-circuit monopoles; smaller than double-circuit monopoles)	Typically 2.5–5 feet	Typically 2.5–5 feet	Typically 1.5–2.5 feet
							

Note: An additional shield wire would be installed on top of the new poles for lightning protection. For more information, see Section 2.1.2.2.

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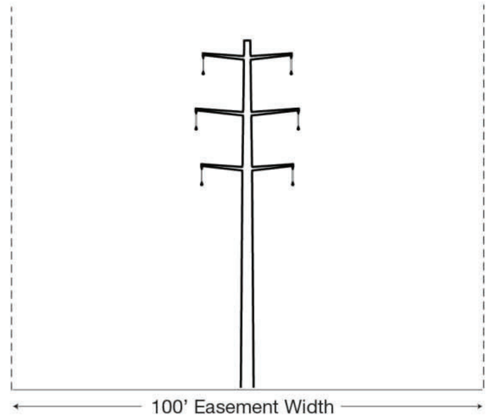

Typical Easement Widths - Existing Corridor:

- Existing 100-foot width

Typical Easement Widths - New Easements along Roadway:

35-foot width (range of 30 to 55 feet)
- Richards Road
- SE 30th Street
- Factoria Blvd SE (north of SE 38th Street)

20-foot width (range of 20 to 30 feet)
- Factoria Blvd SE (south of SE 38th Street)
- Coal Creek Parkway
- SE Newport Way

10-foot width (range of 5 to 25 feet)
- 124th Avenue SE
- SE 38th Street

Figure 2.1-4. Typical Easement Widths for the Existing Corridor and New Corridor along Roadways (Conceptual).

Olympic Pipeline System

Sign marking location of the Olympic Pipeline in existing corridor (foreground); telecom equipment mounted on existing poles (background)

The Olympic Pipeline system is an underground petroleum pipeline system that is co-located with the existing PSE 115 kV transmission line corridor in portions of the Energize Eastside project area. The Olympic Pipeline system is a 400-mile interstate pipeline system that runs from Blaine, Washington to Portland, Oregon. The system transports gasoline, diesel, and jet fuel through two pipelines – one 16-inch and one 20-inch in diameter. In the project area in general, the pipelines are co-located with PSE's transmission line within all of the segments, although in the Renton Segment it is not located near the southern terminus. The transmission line corridor predates the pipeline by approximately three decades. In most of the segments, the pipeline system is located along either the east or west side of the PSE right-of-way, crisscrossing the right-of-way from east or west in numerous locations. In parts of the corridor (especially the Newcastle Segment), however, the pipeline system is buried in the center of the right-of-way. BP is the operator of the Olympic Pipeline system, and partial owner of the Olympic Pipe Line Company, with Enbridge, Inc. (Olympic Pipe Line Company, 2017).

Due to the level of public concern expressed during scoping regarding the potential risk of a leak, fire, or explosion that could occur as a result of constructing or operating the transmission line in the same corridor as the Olympic Pipeline, the pipeline safety issue is addressed specifically as one of two environmental health issues. Information on pipeline safety, both during construction and operation, is presented in Sections 3.9 and 4.9, *Environmental Health – Pipeline Safety*.

Utility pole carrying transmission wires (top section), distribution wires (middle section), and telecom wires (lower section)

Telecommunications Equipment and Other Underbuild Components

Along portions of the transmission lines (both the existing and new corridors), telecommunications equipment, distribution lines, and cellular equipment is attached to PSE's existing poles, collectively referred to as "underbuild."

PSE hosts telecommunications (telecom) equipment, which is owned and operated by other providers. The telecom companies' use of transmission line infrastructure is regulated by state law (specifically, House Bill [HB] 2886 and Revised Code of Washington [RCW] Chapter 80.54); PSE and the Partner Cities have limited authority over the telecom underbuild equipment. Underbuild located on a 115 kV line may be undergrounded in certain situations, such as when a 115 kV line is converted to 230 kV. If PSE undergrounds a 115 kV pole, the telecom equipment would also be undergrounded or moved; in general, an existing pole cannot remain with just telecom equipment if the electrical equipment has been removed.

In the project area, cellular equipment is co-located along the existing corridor in seven locations. Upon completion of construction of the proposed project, PSE will work with telecom companies to reinstall the equipment onto the 230 kV poles, per local jurisdiction regulations.

In the project area, distribution lines are located along the following roadways: SE 26th Street, SE 30th Street, Coal Creek Parkway, Newport Way, and Factoria Boulevard SE. Distribution lines would be undergrounded along these roadways except on SE 30th Street.

Additional information on the co-located telecom equipment and distribution lines is included in Sections 3.2, *Scenic Views and the Aesthetic Environment*.

Vegetation Management and Maintenance

Alternative 1 includes both initial vegetation clearing to accommodate the new 230 kV transmission line, as well as ongoing vegetation maintenance along the corridor to keep tall vegetation (trees and shrubs) and noxious weeds from growing within the transmission line right-of-way. For vegetation clearing, it is assumed that all species within the managed right-of-way with a mature height of more than 15 feet will be removed and could be replaced with 230 kV-compatible vegetation. (In some circumstances, PSE can modify this requirement, in consultation with property owners.) Additional details on vegetation management are presented in Sections 3.4 and 4.4, *Plants and Animals*, including information on the number, species, and location of trees that could be removed for PSE's project. In the context of this EIS analysis, "vegetation management" refers to initial clearing or removal of trees and shrubs to construct the new transmission lines or substation, whereas "vegetation maintenance" refers to the long-term trimming or pruning of vegetation to maintain adequate line clearance and safety.

Access Roads

In some locations, additional access roads (either temporary or permanent) would be required to reach the transmission line corridor, under all segments and options. Preliminary access plans have been developed for each structure location. For additional information on access roads, see Section 2.1.3, *Construction,* and Appendix A.

2.1.2.3 Transmission Line Segments and Options

The following sections describe each of the segments and options of the Alternative 1 230 kV transmission line, from north (Redmond) to south (Renton). In two segments, options have been identified for analysis in the Phase 2 Draft EIS. All segments and options display sample simulations of the proposed transmission poles, except for the Oak 2 and Willow 2 Options in the Bellevue South Segment. Simulations for this segment can be found in Section 3.2, *Scenic Views and Aesthetic Environment*.

Route Options for the Bellevue Central Segment

In addition to the Existing Corridor Option of the Bellevue Central Segment, PSE has identified for environmental analysis two options that would bypass the East Bellevue Community Council (EBCC) boundaries, recognizing that the EBCC could deny a permit and thus delay or preclude PSE's preferred alternative. The two bypass options would not require approval by the EBCC. If EBCC denied approval, PSE would seek permit approval of one of the bypass options from the City of Bellevue. The bypass options are not PSE's preferred alignment, but have been included for analysis in the Phase 2 Draft EIS at PSE's request.

Route Options for the Bellevue South Segment

The existing 115 kV transmission line route through the Bellevue South Segment presented some challenges for accommodating the Energize Eastside project. Much of the existing right-of-way travels through residential areas, and some of these residents have expressed particular concern about potential adverse impacts, including aesthetic impacts, in this area.

What is EBCC's Role?

EBCC is empowered by state law with approval/disapproval authority over certain land use actions in a part of East Bellevue. The EBCC may also act in an advisory capacity on other land use issues that directly or indirectly affect its jurisdiction.

A portion of PSE's existing 115 kV transmission corridor passes within EBCC's jurisdiction along the western border. EBCC could therefore have approval/disapproval authority over that portion of the project. EBCC's approval is required in addition to approval by the City of Bellevue.

Community Involvement in Developing Options in Bellevue South Segment

PSE has conducted public outreach for the project since 2013. This outreach effort has included distributing regular project update letters; attending community events; holding meetings with individuals, neighborhoods, Cities, and other stakeholders; hosting public open houses; and responding to public comments. Input received during public outreach has been used to inform the project design and route options.

In 2014, PSE convened the Energize Eastside Community Advisory Group (often referred to as "the CAG") to inform the development of the proposed alignment alternative and associated route options. The group included 24 representatives from various interests across the Eastside. The process also involved targeted community outreach, including public events at key milestones. The goals of the Community Advisory Group were to identify and assess community values in the context of evaluating which route the new transmission lines should follow, and to develop route recommendations for PSE's consideration. Holding regular meetings throughout 2014, the group helped evaluate numerous potential route options for the Energize Eastside project. Part of the outcome was the recommendation of the initial Oak and Willow route options within the Bellevue South Segment. The initially identified Oak and Willow options were further refined by PSE in 2016, with the result being the four options for the Bellevue South Segment (i.e., Oak 1, Oak 2, Willow 1, and Willow 2) presented and analyzed in this Phase 2 Draft EIS. Additional information on the Community Advisory Group process is available on PSE's project website (www.EnergizeEastside.com; see the Library tab).

Options outside the existing corridor within this segment are more commercial in character (e.g., along Factoria Boulevard), and these commercial areas host existing utilities, including transmission and distribution lines. This presented an opportunity for PSE to consider alternative routes for parts of the Energize Eastside project within the nearby utility corridors, rather than using only the existing 115 kV corridor with the H-frame structures. Three of the four options developed (Oak 1, Oak 2, and Willow 2) explore areas outside the existing 115 kV corridor to address these community concerns.

Simulations for the Bellevue South Segment Options can be found in Section 3.2, *Scenic Views and Aesthetic Environment*.

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REDMOND SEGMENT

No Options

Part of PSE's Preferred Alignment

DESCRIPTION

Start: Sammamish Substation
End: Redmond-Bellevue Boundary

PROPOSED POLES & LOCATION

- Approximately 47 wooden H-frames replaced with approximately 35 double-circuit, 230 kV/115 kV steel monopoles.
- One circuit energized at 230 kV, the other circuit energized at 115 kV.
- Height:
  - 95' (typical)
  - 120' (maximum)
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.
- Two poles required at Sammamish substation for dead-end structures.

QUICK FACTS

Jurisdiction: Redmond

Segment Length: 2 miles

Easement / Property Acquisition

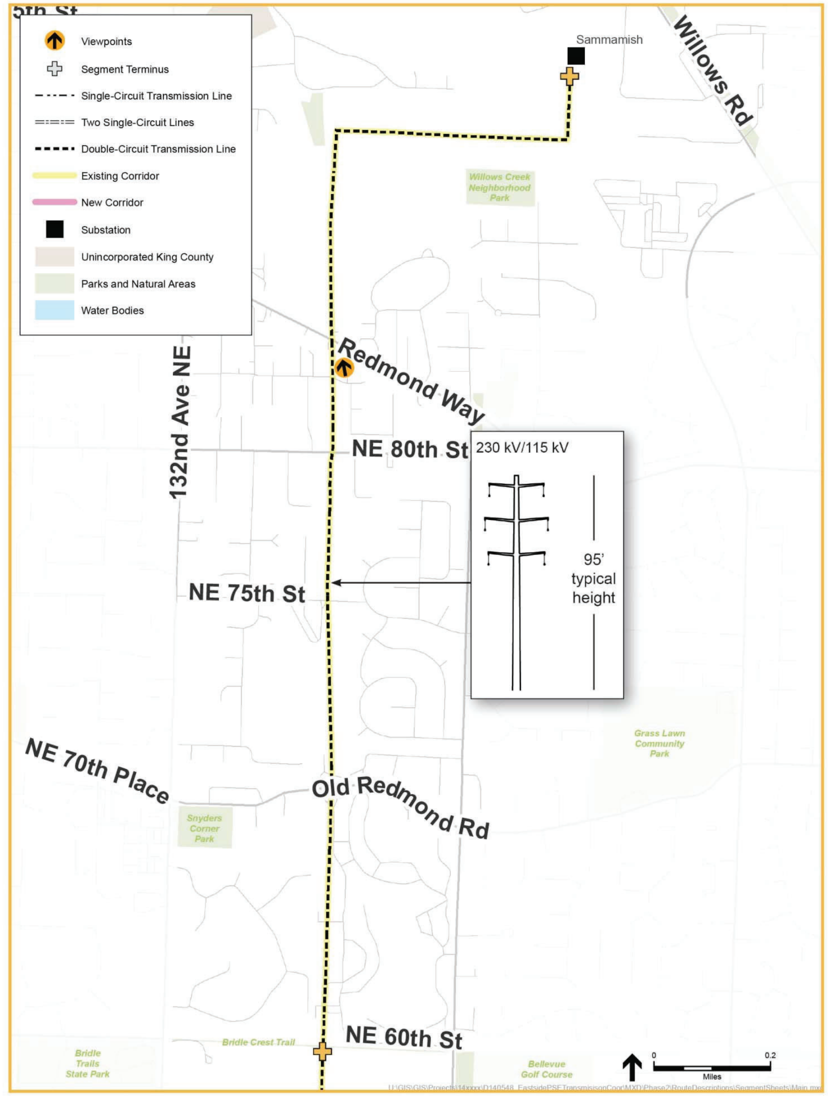
- Entirely in PSE's existing 100-foot, 115 kV corridor; no new easements or property acquisition needed.

Olympic Pipeline Info

- Co-located in existing corridor; pipeline buried on either side (east or west) of corridor.
- Poles would be placed in the center of the corridor.

From Redmond Way looking north (existing conditions)

Simulation of proposed project (Power Engineers, 2016)



BELLEVUE NORTH SEGMENT

No Options

Part of PSE's Preferred Alignment

DESCRIPTION

Start: Redmond-Bellevue Boundary
End: Northup Way/NE 20th St

PROPOSED POLES & LOCATION

- Approximately 38 wooden H-frames replaced with approximately 21 double-circuit, 230 kV/115 kV steel monopoles.
- One circuit energized at 230 kV, the other circuit energized at 115 kV.
- Height:
  - 95' (typical)
  - 100' (maximum)
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.
- Two poles required at SR 520 for dead-end structures.

QUICK FACTS

Jurisdiction: Bellevue

Segment Length: 2.2 miles

Easement / Property Acquisition

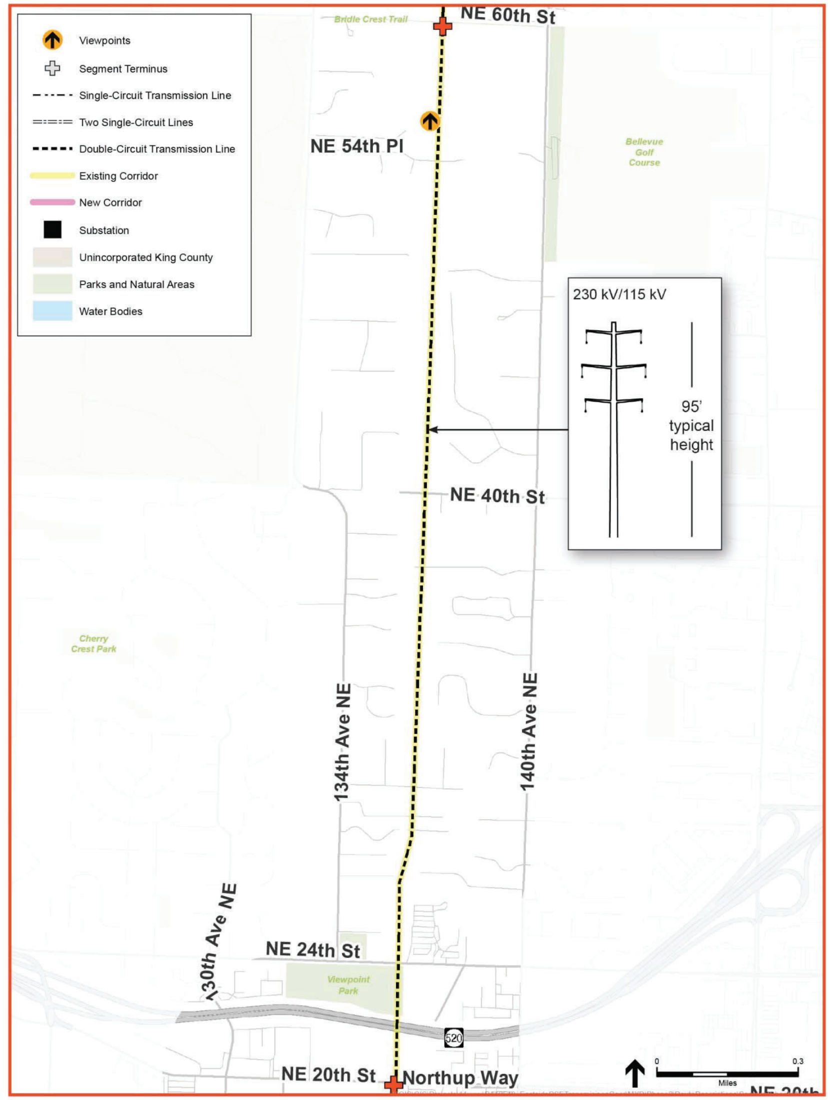
- Entirely in PSE's existing 100-foot, 115 kV corridor; no new easements or property acquisition needed.

Olympic Pipeline Info

- Co-located in existing corridor; pipeline buried on either side (east or west) of corridor.
- Poles would be placed in the center of the corridor.

From NE 54th Pl looking north (existing conditions)

Simulation of proposed project (Power Engineers, 2016)



BELLEVUE CENTRAL SEGMENT

Existing Corridor Option

Part of PSE's Preferred Alignment

DESCRIPTION

Start: Northup Way/NE 20th St
End: Richards Creek Substation (New)

PROPOSED POLES & LOCATION

- Approximately 59 wooden H-frames replaced with approximately 30 double-circuit, 230 kV/115 kV steel monopoles.
- One circuit energized at 230 kV, the other circuit energized at 115 kV.
- Height:
  - 95' (typical)
  - 115' (maximum)
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

QUICK FACTS

Jurisdiction: Bellevue; East Bellevue Community Council also has jurisdiction between NE 8th St and SE 12th St for some permitting decisions.

Segment Length: 2.8 miles

Easement / Property Acquisition

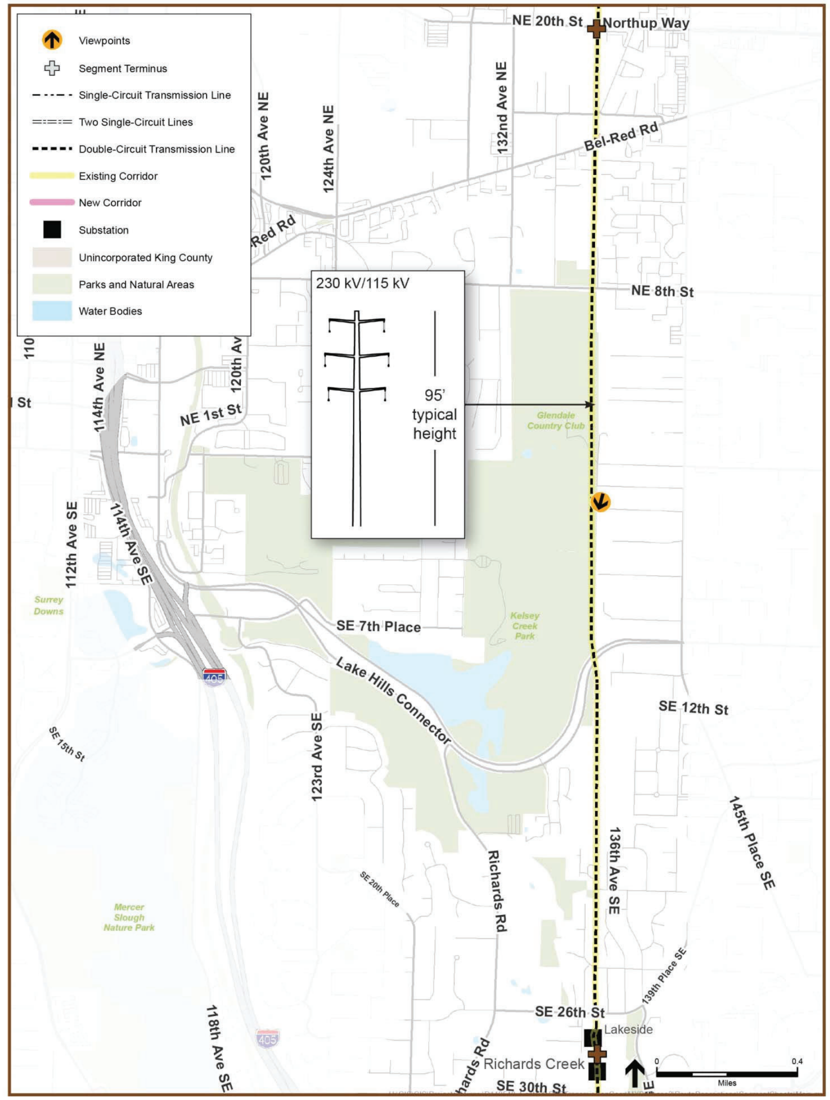
- Entirely in PSE's existing 100-foot, 115 kV corridor; no new easements or property acquisition needed.

Olympic Pipeline Info

- Co-located in existing corridor; pipeline buried on either side (east or west) of corridor.
- Poles would be placed in the center of the corridor.

From 136th Ave SE looking south (existing conditions)

Simulation of proposed project (Power Engineers, 2016)



BELLEVUE CENTRAL SEGMENT

Bypass Option 1

DESCRIPTION

Start: Northup Way/NE 20th St
End: Richards Creek Substation (New)

PROPOSED POLES & LOCATION

1 Single-Circuit Steel Monopole

- *Location:* NE 20th St/132nd Ave NE/Bel-Red Rd/120th Ave NE/NE 1st St/Lake Hills Connector.
- Approximately 50 new single-circuit 230 kV steel monopoles installed in the new corridor.
- Typical height = 100’ (max. = 125’).
- Typical easement width = 20’ (range = 20 to 30’).
- Clearing for vegetation over 15’ in height = 16’ from outside transmission wire, 6’ from pole on wire-free side.
- SCL lattice towers raised by 12’ and replaced with monopoles near intersection of Bel-Red Rd and 124th Ave NE.
- SCL towers may need to be raised and replaced with monopoles where SCL line crosses the Lake Hills Connector.

2 Double-Circuit Steel Monopole

- *Location:* Exiting corridor from intersection with Lake Hills Connector to Richards Creek Substation.
- Approximately 18 wooden H-frames replaced with approximately 10 double-circuit 230 kV/115 kV steel monopoles in the existing corridor.
- Typical height = 100’ (max. = 125’).
- Easement width = 100’.
- Clearing for vegetation over 15’ in height = 16’ from outside transmission wire.

QUICK FACTS

Jurisdiction: Bellevue

Segment Length: 3.8 miles

Easement / Property Acquisition

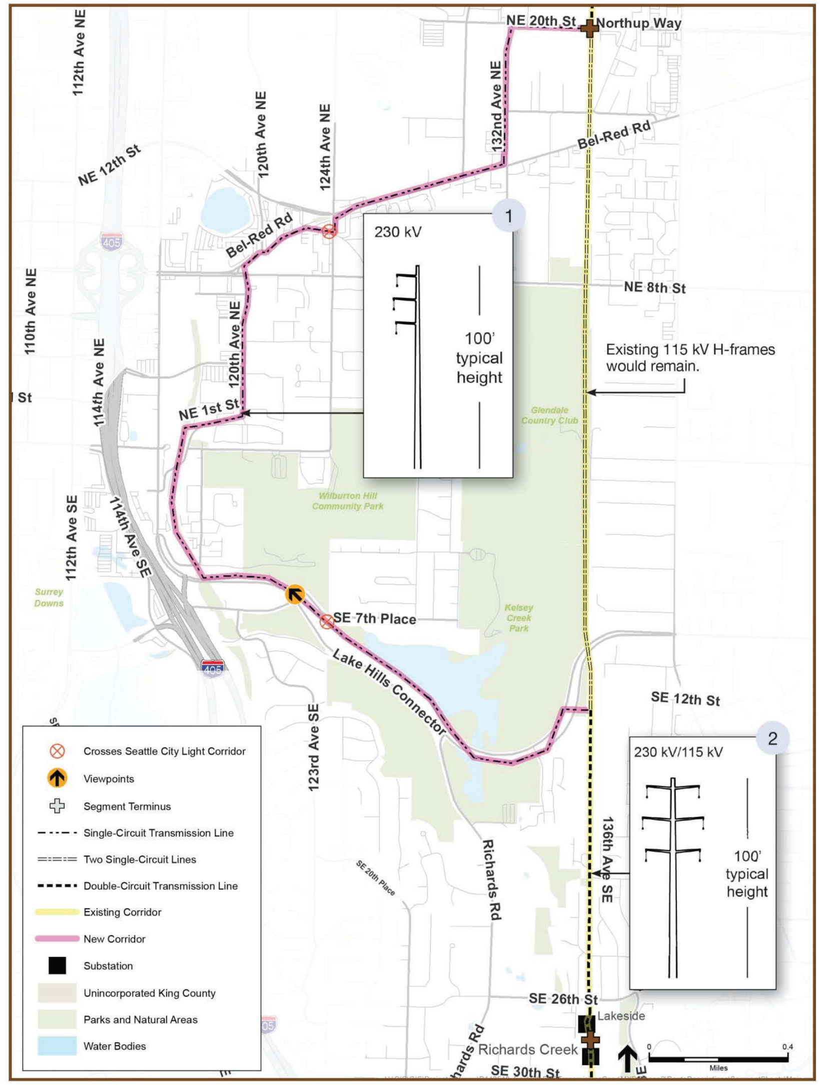
- New easements needed for about 50 properties (about 5 acres) in new corridor.
- No houses condemned or demolished; some accessory structures (e.g., garages and sheds) would need to be moved or demolished.

Olympic Pipeline Info

- Co-located in existing corridor; pipeline buried on either side (east or west). Poles placed in center of corridor.
- Where option departs the existing transmission line corridor, it would not be adjacent to the pipeline.

Lake Hills Connector looking northwest (existing conditions)

Simulation of proposed project (Power Engineers, 2016)



BELLEVUE CENTRAL SEGMENT

Bypass Option 2

DESCRIPTION

Start: Northup Way/NE 20th St
End: Richards Creek Substation (New)

PROPOSED POLES & LOCATION

1 Double-Circuit Steel Monopole

- *Location:* Existing corridor from Northup Way to Bel-Red Rd/SE 26th St.
- Approximately 7 new double-circuit 230 kV/115 kV steel monopoles installed in the new corridor.
- One circuit energized at 230 kV, the other at 115 kV.
- Typical height = 95-100' (max. = 125').
- Typical easement width = 35' (range = 30 to 55').
- Clearing for vegetation over 15' in height = 16' from outside transmission wire.
- Existing communication and distribution lines would be placed underground.

2 Single-Circuit Steel Monopole

- *Location:* Bel-Red Rd/120th Ave NE/NE 1st St/ Lake Hills Connector/Richards Rd.
- Approximately 47 new single-circuit 230 kV steel monopoles installed in the new corridor.
- Typical height = 100' (max. = 125').
- Typical easement width = 20' (range = 20 to 30').
- Clearing for vegetation over 15' in height = 16' from outside transmission wire, 6' from pole on wire-free side.
- SCL lattice towers raised by 12' and replaced with monopoles near intersection of Bel-Red Rd and 124th Ave NE.
- SCL towers may need to be raised and replaced with monopoles where SCL line crosses the Lake Hills Connector.

QUICK FACTS

Jurisdiction: Bellevue

Segment Length: 4.5 miles

Easement / Property Acquisition

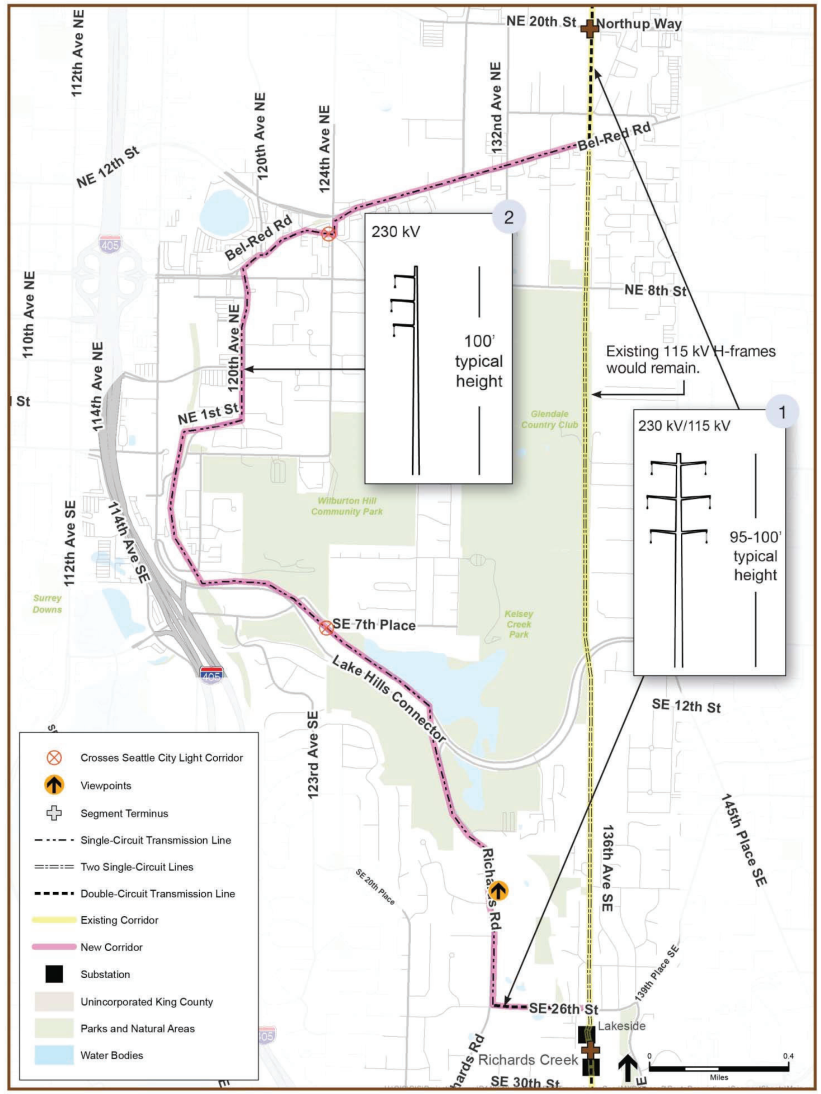
- New easements needed for about 60 properties (about 7 acres) in the new corridor.
- No houses condemned or demolished; some accessory structures (e.g., garages and sheds) would need to be moved or demolished.

Olympic Pipeline Info

- Where option departs the existing transmission line corridor it would not be adjacent to the pipeline.
- Co-located in existing corridor; pipeline buried on either side (east or west). Poles placed in center of corridor.


From Richards Road looking north (existing conditions)


Simulation of proposed project (Power Engineers, 2016)



BELLEVUE SOUTH SEGMENT

Oak 1 Option

DESCRIPTION

Start: Richards Creek Substation (New)
End: Bellevue-Newcastle Boundary

PROPOSED POLES & LOCATION

1 Double-Circuit Steel Monopole

- *Location:* SE 30th St/Richards Rd/Factoria Blvd/ Coal Creek Pkwy.
- Approximately 44 new double-circuit 230 kV/115 kV steel monopoles installed in the new corridor.
- On SE 30th St existing single-circuit 115 kV wood poles on the opposite side of the street would remain.
- Two circuits built to 230 kV standards; one energized at 115 kV, one energized at 230 kV.
- Typical height = 80' (max. = 125').
- Typical easement width = 35' (range = 30 to 55').
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

2 Double-Circuit Steel Monopole

- *Location:* Existing corridor from Somerset substation to SE 60th St.
- Approximately 8 wooden H-frames replaced with 4 steel monopoles.
- Two circuits built to 230 kV standards; one energized at 115 kV, one energized at 230 kV.
- Typical height = 100' (max. = 115').
- Same configuration used for all Oak and Willow options.
- Easement width = 100'.
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

3 Two Single-Circuit Steel Monopoles

- *Location:* Existing corridor from SE 60th St to Newcastle Way.
- Approximately 10 wooden H-frames replaced with 5 steel monopole pairs.
- The circuit on one monopole energized at 115 kV and the other at 230 kV.
- Typical height = 85' (max. = 90').
- Same configuration used for all Oak and Willow options.
- Easement width = 100'.
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.


From Factoria Blvd SE looking north (existing conditions)


Simulation of proposed project (Power Engineers, 2016)

QUICK FACTS

Jurisdiction: Bellevue
Segment Length: 3.6 Miles

Easement / Property Acquisition

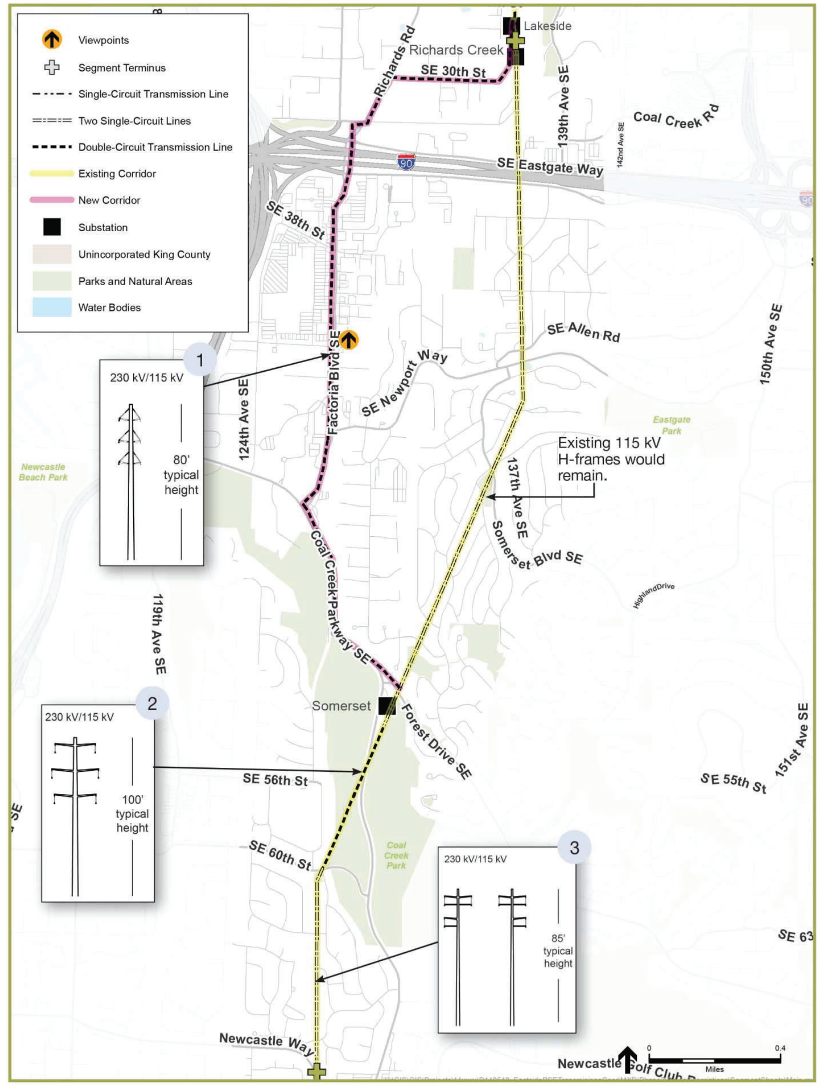
- New easements needed for about 60 properties (about 8 acres) in new corridor.
- No houses condemned or demolished.
- Some accessory structures (e.g., garages and sheds) would need to be moved or demolished.

Existing Distribution & Communication Lines

- Existing lines along Factoria Blvd SE and Coal Creek Pkwy would be placed underground.

Olympic Pipeline Info

- 16" pipeline uses existing corridor (often in the center).
- 20" pipeline uses SE 30th St, Richards Rd, Factoria Blvd SE, and Coal Creek Parkway SE between Richards Creek and Somerset substations. South of Somerset it uses the existing corridor.



BELLEVUE SOUTH SEGMENT

Oak 2 Option

DESCRIPTION

Start: Richards Creek Substation (New)
End: Bellevue-Newcastle Boundary

PROPOSED POLES & LOCATION

1 Double-Circuit Steel Monopole

- *Location:* SE 30th St/Richards Rd
- Approximately 11 new monopoles installed.
- On SE 30th St existing single-circuit 115 kV wood poles remain.
- Two circuits energized at 115 kV, one built to 230 kV standards.
- Typical height = 80' (max. = 125').
- Typical easement width = 35' (range = 30 to 55').
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

2 Single-Circuit Steel Monopole

- *Location:* Factoria Blvd SE, Coal Creek Parkway SE.
- Approximately 32 monopoles replaced with new monopoles.
- One circuit energized at 115 kV, built to 230 kV standards.
- Typical height = 80' (max. = 125').
- Typical easement width = 20' (range = 20 to 30').
- Clearing for vegetation over 15' in height = 16' from outside transmission wires, 6' from pole on wire-free side.

3 Single-Circuit Wood Monopole

- Existing line relocated from Factoria Blvd SE to 124th Ave SE and SE 38th St.
- No existing PSE poles; approximately 17 new monopoles.
- One circuit energized at 115 kV installed.
- Typical height = 70' (max. = 80').
- Typical easement width = 10' (range = 5 to 25').
- Clearing for vegetation over 15' in height = 16' from outside transmission wires, 6' from pole on wire-free side.

4 Single-Circuit Steel H-Frame

- *Location:* Existing corridor from Richards Creek substation to Somerset substation.
- Approximately 40 H-frames replaced with 23 H-frames energized at 230 kV.
- Typical height = 65' (max. = 90').
- Easement width = 100'.
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

5 Double-Circuit Steel Monopole

- *Location:* Existing corridor from Somerset substation to SE 60th St.
- Approximately 8 H-frames replaced with 4 monopoles.
- Two circuits built to 230 kV standards; one energized at 115 kV, one energized at 230 kV.
- Typical height = 100' (max. = 115').
- Same configuration used for all Oak and Willow options.
- Easement width = 100'.
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

6 Two Single-Circuit Steel Monopoles

- *Location:* Existing corridor from SE 60th St to Newcastle Way. Approximately 10 H-frames replaced with 5 monopole pairs.
- The circuit on one monopole energized at 115 kV and the other at 230 kV.
- Typical height = 85' (max. = 90').
- Same configuration used for all Oak and Willow options.
- Easement width = 100'.
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

QUICK FACTS

Jurisdiction: Bellevue

Segment Length: 6.7 Miles

Easement / Property Acquisition

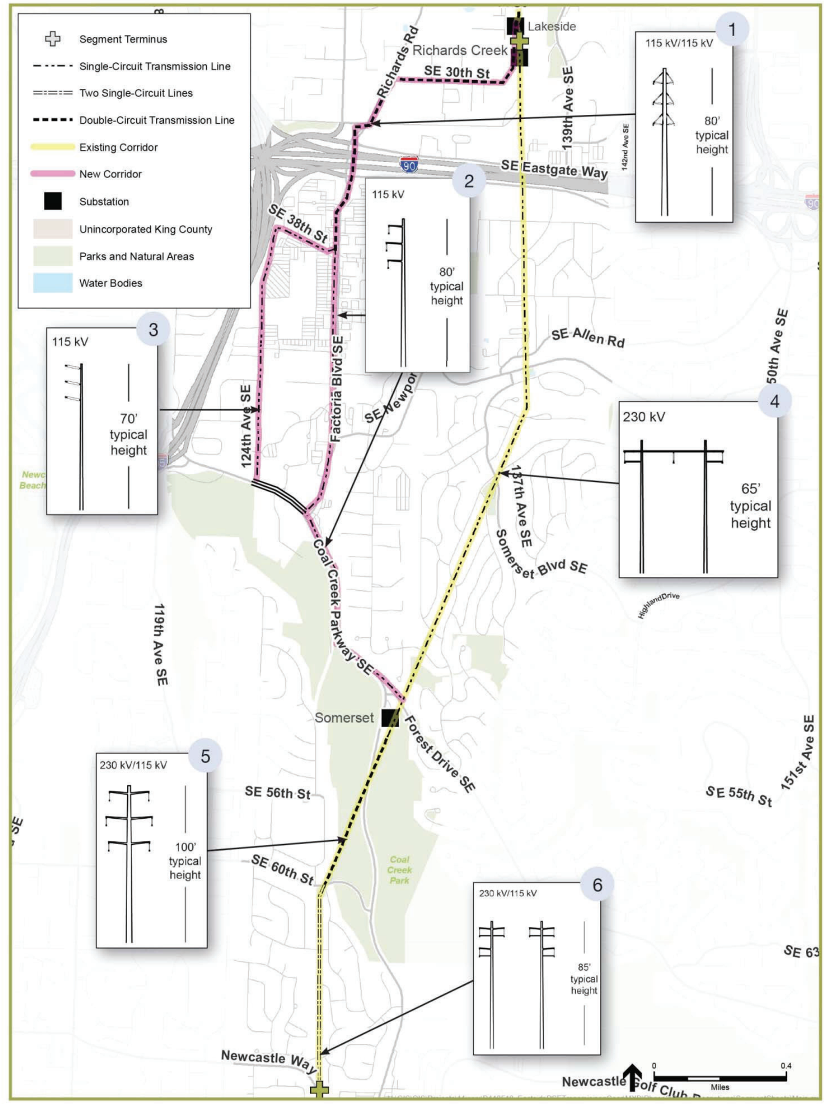
- New easements needed for about 70 properties (about 10 acres) in new corridor.
- No houses condemned or demolished.
- Some accessory structures (e.g., garages and sheds) would need to be moved or demolished.

Existing Distribution & Communication Lines

- Existing lines along Factoria Blvd SE and Coal Creek Pkwy would be placed underground.

Olympic Pipeline Info

- 16" pipeline uses existing corridor.
- 20" pipeline uses SE 30th St, Richards Rd, Factoria Blvd SE, and Coal Creek Parkway SE between Richards Creek and Somerset substations. South of Somerset it uses the existing corridor.



BELLEVUE SOUTH SEGMENT

Willow 1 Option

DESCRIPTION

Start: Richards Creek Substation (New)
End: Bellevue-Newcastle Boundary

PROPOSED POLES & LOCATION

1 Double-Circuit Steel Monopole

- *Location:* Existing corridor north of SE Newport Way and between Somerset Substation and SE 60th St.
- Approximately 26 wooden H-frames replaced with approximately 14 double-circuit 230 kV/115 kV steel monopoles.
- One circuit energized at 230 kV, one at 115 kV.
- Typical height = 100' (max. = 115').
- Clearing for vegetation over 15' in height = 16' from outside transmission wire.

2 Single-Circuit Steel Pairs

- *Location:* Existing corridor south of SE 60th St. and between SE Newport Way and Somerset substation.
- Approximately 30 wooden H-frames replaced with approximately 19 pairs of single-circuit 230 kV/115 kV steel monopoles.
- The circuit on one monopole energized at 230 kV, the other at 115 kV.
- Typical height = 85' (max. = 90').
- Clearing for vegetation over 15' in height = 16' from outside transmission wire.

QUICK FACTS

Jurisdiction: Bellevue

Segment Length: 3.3 miles

Easement / Property Acquisition

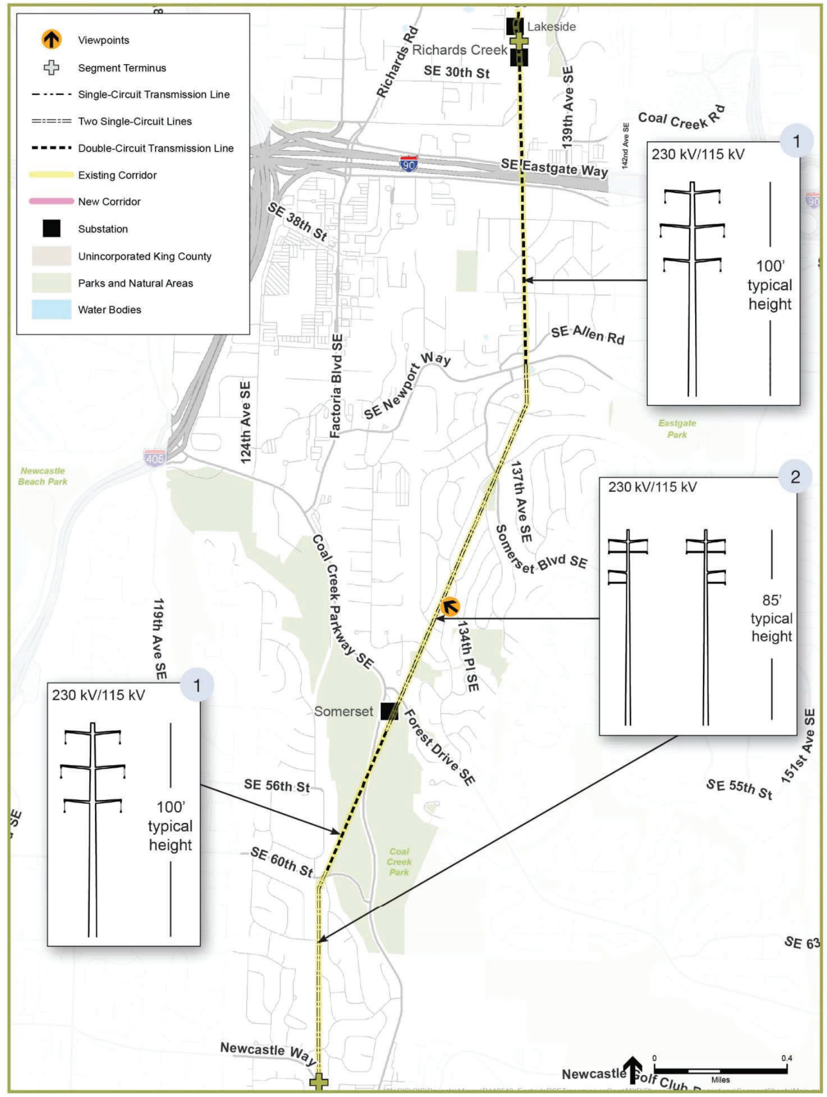
- Entirely in PSE's existing 100-foot, 115 kV corridor; no new easements or property acquisition needed.

Olympic Pipeline Info

- 16" pipeline uses existing corridor (often in the center); poles would be placed on either side.
- 20" pipeline uses existing corridor south of Somerset.


From 134th Pl SE looking west (existing conditions)


Simulation of proposed project (Power Engineers, 2016)



BELLEVUE SOUTH SEGMENT

Willow 2 Option

Part of PSE's Preferred Alignment

DESCRIPTION

Start: Richards Creek Substation (New)
End: Bellevue-Newcastle Boundary

PROPOSED POLES & LOCATION

1 Double-Circuit Steel Monopole

- *Location:* Existing corridor north of SE Newport Way.
- One circuit energized at 230 kV, the other circuit energized at 115 kV.
- Approximately 20 H-frames replaced with 10 monopoles.
- Typical height = 100' (max. = 125').
- Easement width = 100'.
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

2 Single-Circuit Steel H-Frame

- *Location:* Existing corridor south of SE Newport Way.
- Approximately 28 H-frames replaced with 14 H-frames.
- 115 kV H-frames replaced with 230 kV H-frames.
- Typical height = 65' (max. = 95').
- Easement width = 100'.
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

3 Single-Circuit Steel Monopole

- *Location:* SE Newport Way and Coal Creek Parkway SE.
- Approximately 65 poles replaced with 14 monopoles.
- Single-circuit 115 kV lines would be built to 230 kV standards.
- Typical height = 80' (max. = 80').
- Typical easement width = 20' (range = 20 to 30').
- Clearing for vegetation over 15' in height = 16' from outside transmission wires, 6' from pole on wire-free side.

4 Double-Circuit Steel Monopole

- *Location:* Factoria Blvd SE.
- Approximately six new 115 kV monopoles installed.
- 115 kV lines would be built to 230 kV standards.
- Typical height = 80' (max. = 90').
- Typical easement width = 35' (range = 30 to 55').
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

5 Double-Circuit Steel Monopole

- *Location:* Existing corridor from Somerset substation to SE 60th St.
- Approximately 8 H-frames replaced with 4 monopoles.
- Two circuits built to 230 kV standards; one energized at 115 kV, one energized at 230 kV.
- Typical height = 100' (max. = 115').
- Same configuration used for all Oak and Willow options.
- Easement width = 100'.
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

6 Two Single-Circuit Steel Monopoles

- *Location:* Existing corridor from SE 60th St to Newcastle Way.
- Approximately 10 H-frames replaced with 5 monopole pairs.
- The circuit on one monopole energized at 115 kV and the other at 230 kV.
- Typical height = 85' (max. = 90').
- Same configuration used for all Oak and Willow options.
- Easement width = 100'.
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

QUICK FACTS

Jurisdiction: Bellevue

Segment Length: 5.5 Miles

Easement / Property Acquisition

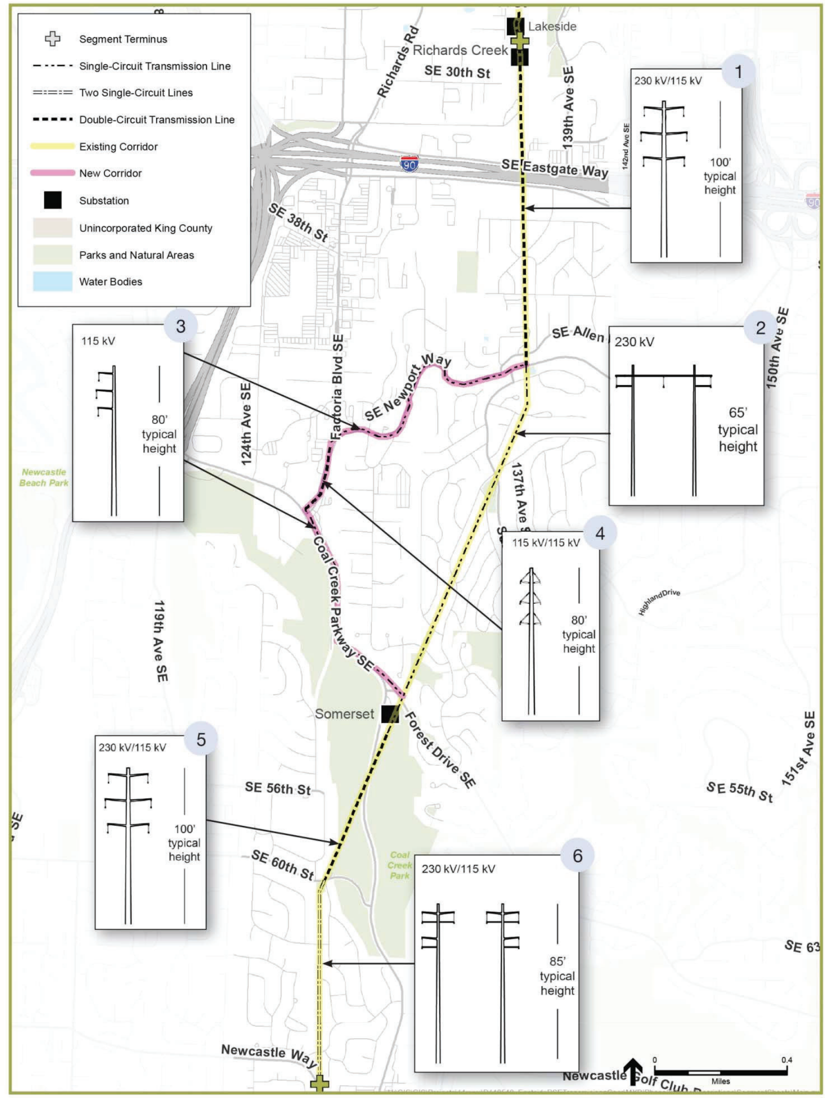
- New easements needed for about 50 properties (about 6 acres) in new corridor.
- No houses condemned or demolished.
- Some accessory structures (e.g., garages and sheds) would need to be moved or demolished.

Existing Distribution & Communication Lines

- Existing lines would be placed underground along Factoria Blvd SE, SE Newport Way, and Coal Creek Parkway.

Olympic Pipeline Info

- 16" pipeline uses existing corridor (generally in the center of the right-of-way).
- 20" pipeline uses Factoria Blvd SE and Coal Creek Parkway SE. South of Somerset uses the existing corridor.



NEWCASTLE SEGMENT

No Options

Part of PSE's Preferred Alignment

DESCRIPTION

Start: Bellevue-Newcastle Boundary
End: Newcastle-Renton Boundary

PROPOSED POLES & LOCATION

- Approximately 26 wooden H-frames (52 poles) replaced with approximately 26 pairs of single-circuit, 230 kV/115 kV steel monopoles that are located near the outer edges of the right-of-way.
- The circuit on one monopole energized at 230 kV, the other energized at 115 kV.
- Height:
  - 100' (typical)
  - 100' (maximum)
- Clearing for vegetation over 15' in height = 16' from outside transmission wires.

QUICK FACTS

Jurisdiction: Newcastle

Segment Length: 1.5 miles

Easement / Property Acquisition

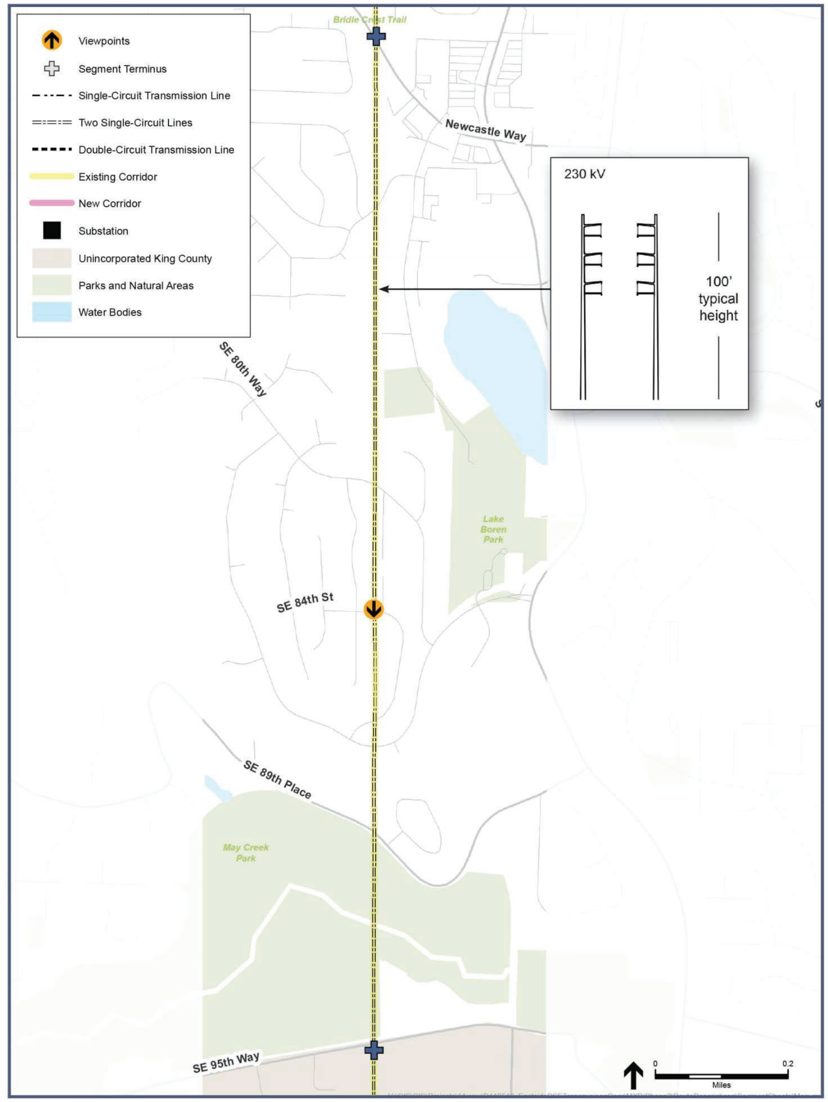
- Entirely in PSE's existing 100-foot, 115 kV corridor; no new easements or property acquisition needed.

Olympic Pipeline Info

- Co-located in existing corridor; pipeline buried in the center of corridor.
- Poles would be placed with one on either side of the pipeline.

From SE 84th St looking south (existing conditions)

Simulation of proposed project (Power Engineers, 2016)



RENTON SEGMENT

No Options

Part of PSE's Preferred Alignment

DESCRIPTION

Start: Newcastle-Renton Boundary
End: Talbot Hill Substation

PROPOSED POLES & LOCATION

1 Single-Circuit Steel Pairs

- *Location*: Existing corridor north of Honey Creek Open Space.
- Approximately 12 wooden H-frames replaced with approximately 6 pairs of single-circuit 230 kV/115 kV steel monopoles.
- The circuit on one monopole energized at 230 kV, the other at 115 kV.
- Typical height = 85' (max. = 125').
- Clearing for vegetation over 15' in height = 16' from outside transmission wire.
- SCL crossing may require wires and structures to be raised, and lattice towers replaced with monopoles.

2 Double-Circuit Steel Monopole

- *Location:* Existing corridor south of Honey Creek Open Space.
- Approximately 69 wooden H-frames replaced with approximately 46 double-circuit 230 kV/ 115 kV steel monopoles.
- One circuit energized at 230 kV, one at 115 kV.
- Typical height = 90' (max. = 125').
- Clearing for vegetation over 15' in height = 16' from outside transmission wire.
- Two poles required at Talbot Hill substation for dead-end structures.
- SCL crossing may require wires and structures to be raised, and lattice towers replaced with monopoles.

QUICK FACTS

Jurisdiction: Renton and a small portion of unincorporated King County.

Segment Length: 4.5 miles

Easement / Property Acquisition

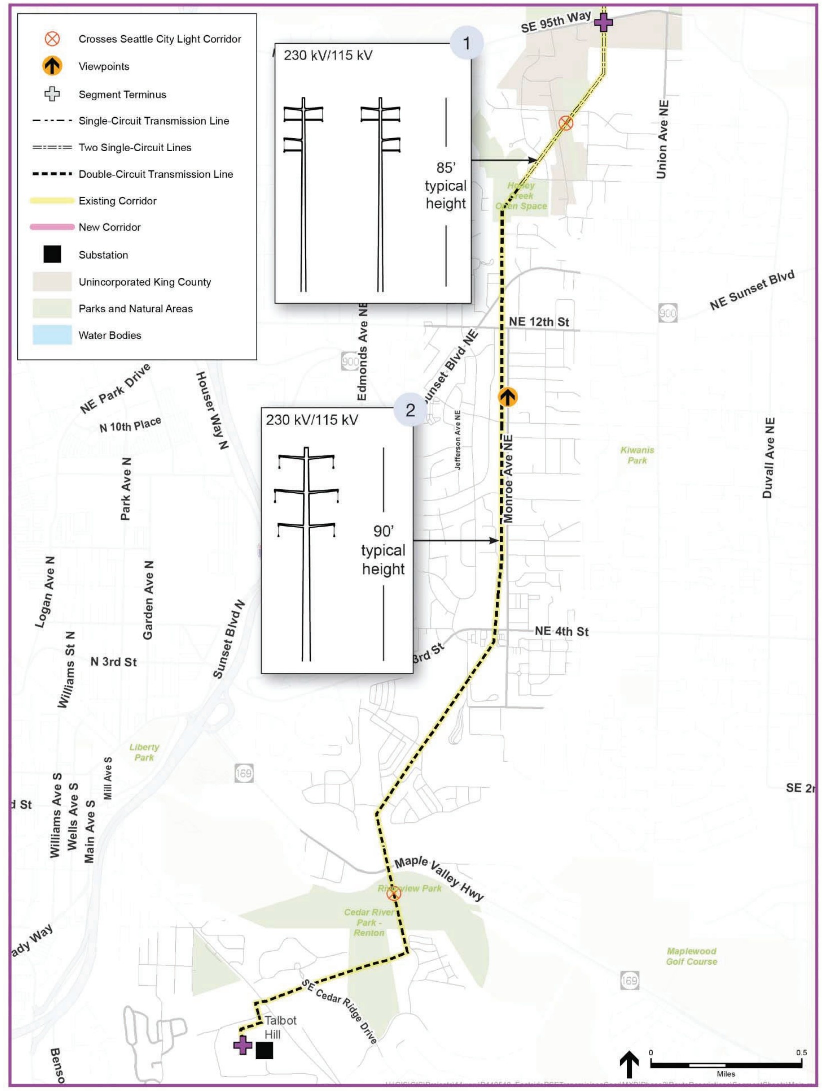
- Entirely in PSE's existing 100-foot, 115 kV corridor; no new easements or property acquisition needed.

Olympic Pipeline Info

- Co-located in existing corridor for 0.2 mile in this segment. Pipelines leave corridor where it crosses SCL line near Honey Creek Open Space. Pipelines buried on one side (east or west) of corridor.
- Poles would be placed in the center of the corridor south of Honey Creek Open Space.


From Monroe Ave NE looking north (existing conditions)


Simulation of proposed project (Power Engineers, 2016)



2.1.3 Construction

Construction activities associated with the proposed Energize Eastside project are summarized below, both for the No Action Alternative and for Alternative 1. The description of Alternative 1 construction is organized by its two main components (the Richards Creek substation and the 230 kV transmission line), because these differ in associated activities. Construction of the 230 kV transmission line would involve similar activities regardless of segment or option selected; therefore, that discussion is not presented or organized by segment. In addition, the alternatives and associated routes analyzed in this Phase 2 Draft EIS are in the pre-design phase. PSE and its contractors will continue to refine site-specific construction plans throughout the permit process. Site-specific construction impacts associated with the project (e.g., impacts to a particular element of the environment) are described as appropriate in Chapter 4.

As described earlier, because of public concern during the scoping process regarding pipeline safety, a detailed analysis of issues associated with the presence of the Olympic Pipeline, especially in the context of construction, is included in the Phase 2 Draft EIS. Construction-related information associated with the pipeline is noted in general here, but the full analysis is presented in Chapter 4, Section 4.9 (*Environmental Health – Pipeline Safety*).

More details on the construction methods, equipment used, and sequencing for the Energize Eastside project is included in Appendix A, as well as in the Phase 1 Draft EIS (Section 2.3.5, *Construction Summary*; Section 2.3.2.2.3, *Construction*).

2.1.3.1 No Action Alternative

Under the No Action Alternative, no construction activities would occur. Occasional pole, wire, and related equipment replacement or repair are considered to be maintenance activities, and therefore are evaluated for long-term (operation) impacts.

2.1.3.2 Alternative 1

The following construction elements would occur in consecutive intervals (except for substation construction): substation construction, vegetation management, access, foundations, and pole/wire installation.

New Richards Creek Substation and Improvements to Other Substations

Construction of a new substation would require clearing and grading to prepare the area for foundations to support the new transformer that converts the bulk power for use in the distribution system. The new transformer would also require supporting equipment (circuit breakers, electrical bus, control house, and connections to the new transmission lines) that would be placed on a concrete pad in accordance with regulatory requirements and industry standards.

Construction related to the transformer would require the delivery of the transformers to the site; grading of the site and creation of a foundation; and placement of the transformer on the foundation. Construction equipment required would include, among other things:

- Specialized oversize trucks and trailers
- Backhoes or excavators
- Concrete trucks
- Cranes or other specialty equipment to place transformers

Use of oversize trucks could be restricted to certain hours to avoid or minimize traffic impacts. Additional information on construction equipment and sequencing is included in Appendix A. Construction of the substation could take up to 18 months. The substation and transmission lines could be constructed concurrently.

Access to the substation site is via SE 30th Street. The existing driveway and access road would be reconfigured to improve access. The new reconfigured driveway would be paved and likely be 24 feet wide at the corners and 20 feet wide at the straight sections. The driveway would include 2-foot shoulders on each side of the pavement. Construction of the new substation would not likely require the use of a temporary staging area. If equipment storage is required prior to installation, it would likely be stored at PSE's Shuffleton Yard in Renton or other PSE-owned facility.

No night construction work would be needed for the new substation, although the transformer might be delivered to the site at night because of highway restrictions for oversize loads. Extended construction hours may be necessary. Road closures are not typically necessary for substation construction.

The size and type of crews used to develop the substation would vary over time as the station is built. Each crew could have between two and five vehicles to support their various activities. Vehicles associated with construction of the control house and electrical assembly work would primarily be smaller vehicles, such as personal vehicles and work trucks. The actual number of vehicles used depends on the contractors' approach to construction and what is necessary to meet contractual schedule obligations. Trucks would also deliver equipment and materials to the substation site. Heavy equipment would be employed primarily during civil construction work, including shoring, grading, and drainage installation. Equipment such as cranes would be used to set electrical equipment on foundations.

In addition to the construction of the new Richards Creek substation, some construction would be needed for the planned upgrades to the Lakeside, Talbot Hill, and Sammamish substations, as well as the Somerset substation (depending on route option). In general, all upgrades to the existing substations would occur within the existing footprint of these facilities. Work would include connecting the substation equipment to the new 230 kV line. Periodic single lane closures may be necessary at the Somerset substation site to facilitate delivery of large equipment.

Construction of the 230 kV Transmission Lines

The new transmission lines would occur within PSE's existing 115 kV transmission line corridor, with the exception of the Bellevue Central Segment bypass options and Bellevue South Segment route options, where it could be within or adjacent to existing road rights-of-way. Most of the line can be accessed via the highly developed road system in the project area, although temporary access roads will need to be constructed in some locations.

Construction methods along road right-of-way and along the existing corridor would be similar in nature. Common elements of anticipated construction activities are summarized below.

Coordination with Olympic Pipeline. For portions of the corridor, construction of a 230 kV line poses potential risks of interaction with or disruption to the Olympic Pipeline, necessitating particular attention to these risks. Extensive coordination with the Olympic Pipe Line Company would be required during project design and construction to avoid disruption to the line. For details about construction considerations associated with the presence of the pipeline, see Chapter 4, Section 4.9 (*Environmental Health – Pipeline Safety*).

Coordination with Seattle City Light. For portions of the corridor where the proposed transmission lines cross or run parallel to the existing 230 kV line owned and operated by SCL, PSE would coordinate with SCL during project design and construction to avoid disruption to the line.

Construction Phasing and Schedule. Construction of the transmission lines would take approximately 12 to 18 months (over two construction seasons) and would be constructed concurrently with construction of the Richards Creek substation. The schedule for construction of PSE's project depends on the completion and outcome of the environmental review process, including the duration of regulatory agency reviews and timing of permit approvals. If the project is approved and implemented, construction would likely begin at the end of 2017 or the beginning of 2018. Construction work would be done in phases, with construction occurring on more than one structure at a time in different parts of the transmission line right-of-way.

At a given location, typically, the foundation for a steel transmission line pole involves work at a site for 1 to 3 days; setting the pole occurs in 1 day; and stringing the wires across the pole occurs within 1 or 2 days. These three stages of work can be separated by up to 1 month or more. Therefore, in any given location, construction activity would take place over 3 to 7 days within a period of approximately 2 months. For wood poles and direct embed steel poles, no foundation is set. Typically, the hole is prepared and the pole is set in a single day, with the wires installed up to a month later. The sequence of construction activities is illustrated in Figure 2.1-5.

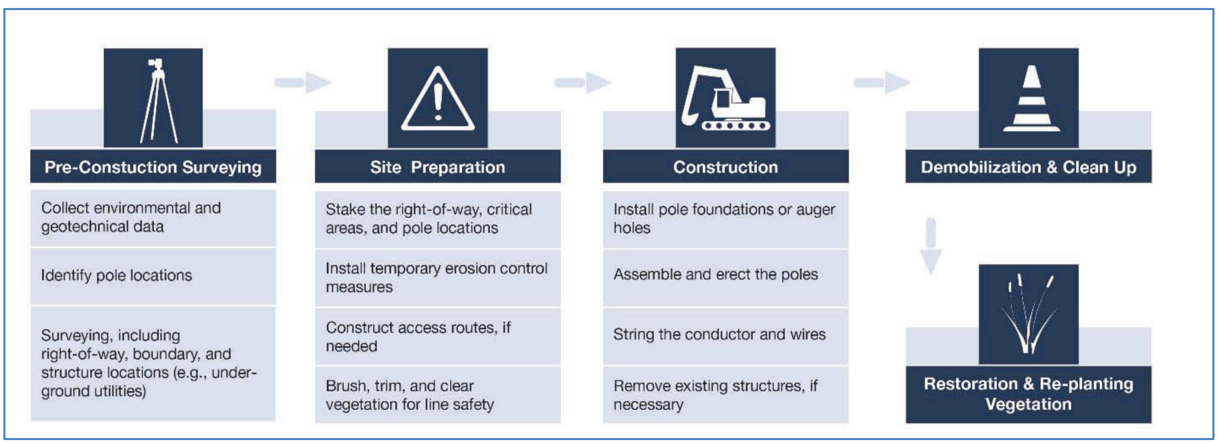


Figure 2.1-5. Construction Sequencing

The overall construction would be a combination of linear progression and grouping of similar size structures. Construction of foundations requiring similar size equipment (e.g., augers and cranes) would be one construction sequence, while poles not requiring foundations would be another sequence. As the foundations cure and become ready for pole installation, the pole and wire crews come through and install the poles. Once all of the poles are installed in a stringing section, the line crews can install the new conductor.

Construction Activities and Equipment. A typical construction crew for a transmission line installation project consists of 10 to 40 people, including transmission line and road construction workers, inspectors and administrative personnel, surveyors, and other support personnel.

Construction equipment required for construction of the overhead transmission lines would include the following:

- Bulldozers
- Backhoes
- Trackhoes
- Trucks to transport bulldozers, backhoes, trackhoes, cranes
- Bucket trucks
- Auxiliary rubber tire vehicles
- Auger or vacuum trucks
- Dump trucks
- Concrete trucks or concrete pump trucks
- Cranes
- Line trucks
- Wire reel trailer for hauling conductor reels
- Tensioner for applying tension to the wire coming off reels during pull
- Puller for pulling rope/hard line with attached wire

Clearing and Grading. Trees and vegetation would be removed within the managed right-of-way zone (also called the clear zone) to facilitate project construction and to ensure the safe operation of the line. Grasses, shrubs, and saplings would be trimmed or cleared in areas subject to ground-disturbing activities. All areas disturbed by tree clearing within the managed right-of-way would be revegetated following construction, and trees within the tensioning sites outside of the PSE right-of-way would be allowed to regrow. For more information on tree clearing, see Sections 3.4 and 4.4, *Plants and Animals*.

Managed Right-of-Way Zone

To ensure safe and reliable operation of overhead transmission lines, the NESC specifies minimum horizontal and vertical clearances between the transmission lines and vegetation, buildings, and the ground. Trees and overhanging branches must be managed or removed to maintain appropriate clearances. For more details, see Sections 3.4 and 4.4, *Plants and Animals*.

Disturbance of site soils would be necessary for clearing and grading to prepare foundation pads, as well as potential temporary staging areas and equipment access depending on the location of the proposed transmission line. Construction would require temporary construction access roads in some locations. Typical structure removal and installation activities would disturb an area about 50 feet by 50 feet (0.06 acre). In some areas, the disturbance area may need to be larger (e.g., where the terrain is more difficult). Conversely, it may be possible to reduce the disturbance area in other areas to minimize impacts to sensitive resources, such as wetlands.

Access Roads. Along the existing corridor, PSE has existing access roads and will use these pathways to the greatest extent possible. At some sites, access roads may need to be improved to accommodate construction equipment. Improvements may include vegetation clearing, widening, or laying of gravel. As there are many road crossings, the use of an access road for the project would likely be limited to the installation of nearby poles and wire installation (i.e., pulling and tensioning). Typically, an access road would be used to access two to five pole sites. Construction best management practices will be used to control run-off. Access roads will be restored to their previous condition or to NESC vegetation specifications when within the managed right-of-way zone. Where poles would be placed along roadways, PSE could utilize the existing roadway network for construction access. Maps showing preliminary access road locations are provided in Appendix A.

These maps reflect preliminary access routes identified by PSE prior to individual property owner consultation that was ongoing during the preparation of this Draft EIS.

Pole Installation. Pole installation methods along road right-of-way and along the existing transmission line corridor are similar. Along roadways, it is often necessary to temporarily close a lane of traffic when moving in equipment, delivering materials, setting foundations, and placing poles. PSE would obtain street use permits when this work is performed, which include traffic control plans and construction windows. Traffic control with caution signs, flaggers, and cones are used to direct and control traffic around the work area to allow for the safe handling and placement of both equipment and materials. If necessary, sidewalk access would be blocked off and pedestrian traffic is detoured. Similarly, if parking spaces are in the work area, they may be temporarily coned off to preserve the space needed to complete the work. Work in the road right-of-way can be limited to specific working hours as established by the permit. For this reason, pole installation along roadways may require additional working days if the daily working times are limited.


Vacuum truck in the existing corridor in the Newcastle segment excavating a hole for installation of a transmission pole.

The methods used to install new steel poles will depend on the type of pole used and both its physical and functional location. Poles can be directly embedded in the ground (similar to a wood pole). Such poles do not require a foundation and are installed using a vacuum truck to excavate the hole, which typically results in less surface area disturbance than other equipment (such as a backhoe or drill). Conversely, drilled pier foundations can be utilized, which involves setting the anchor bolts in a poured column of concrete. Drilled pier foundations for new 230 kV poles are typically augered (drilled) 4 to 8 feet in diameter with steel reinforcements that could extend 25 to 50 feet deep depending on the structure type and soil conditions. Steel poles are set and anchored to the foundations. (Typically, no foundations are used for wooden poles.) Approximately 160 to 180 concrete pole foundations would need to be installed along the 18-mile distance between the Sammamish and Talbot Hill substations; however, the actual number will be determined during final design.

Steel poles would be delivered to the site in 30- to 50-foot sections, and assembled in the field. The delivery would require one or two vehicle trips per pole. The base is installed first, as described above; once the base is installed, the subsequent sections are added. No welding is required, as the ends of the segmented poles are tapered, designed to overlap using slip joints or connected with flange joints.

After installation of the new poles, existing wooden poles and wires would be removed. The old structures would be removed after the new poles are installed and the wires restrung (as described below). Because the existing wood poles are treated with a preservative, they are regulated as hazardous waste; the removed poles would be disposed of at an approved landfill in compliance with state and federal regulations.

Transmission Line (Wire) Installation. Once the pole is set in place, the transmission line conductor (wire) is installed (Figure 2.1-6). The wire-stringing operation requires equipment at each end of the section being strung, with the establishment of temporary pulling or tensioning sites. An estimated 8 to 10 pulling sites would be needed for the project. Wires are pulled between these pulling sites through pulleys affixed to each pole structure. These pulling sites would be set up at various intervals along the right-of-way, typically 2 to 3 miles apart. Specific pulling sites would be determined close to the time the stringing activity takes place. Once the wire is strung, the pulleys would be removed and the wire clipped into its final hardware attachment. Following the installation of wires, surfaces around the new poles and in work areas would be restored.

For safety reasons, the NESC has established minimum wire clearances (i.e., the wire height above the ground). PSE has designed the Energize Eastside wires to typically be 28 feet or more from the ground for 230 kV lines, which meets or exceeds NESC's minimum conductor wire height. Additional clearance would be provided over roadway and highway crossings.

Work Within a New Corridor and Underground Utility Installation. Route options for the Bellevue Central and Bellevue South Segments involve some degree of new corridor, depending on the option. Similarly, the Willow 2, Oak 1, and Oak 2 Options (for the Bellevue South Segment) include some degree of underground utility installation, including electrical distribution and telecommunication lines.

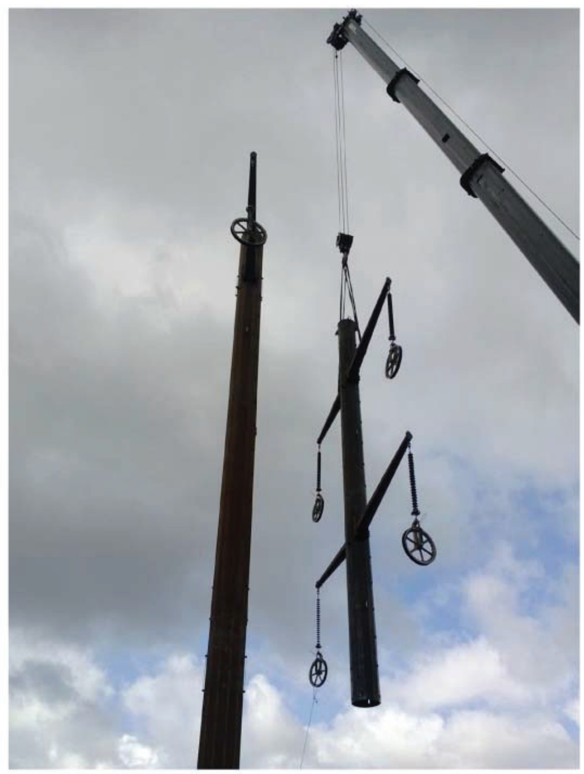
Undergrounding of distribution and communication lines entails establishing the necessary road or lane closures prior to cutting and removing the hard surface. The cables can be installed in either the roadway or sidewalk. Once the hard surface is removed, the trench is excavated to the appropriate depth, typically 3 feet. Trench width depends on the number of cables being placed in the trench. Upon completion of the excavation, the duct bank is installed in the trench. Depending on the length of the section to be undergrounded, the duct bank may be installed in sections over multiple days, at a rate of around 100 to 300 feet per day. Additionally, approximately every 1,500 feet, a subsurface pull or connection vault is installed. The trench is then backfilled and the hard surface restored. When the duct bank is complete, the cables can be pulled through and connected.

I-90 and SR 520 Crossings. The Bellevue North Segment crosses SR 520 and the Bellevue South Segment crosses I-90. Poles installed at these crossing locations would need to be 10 to 15 feet taller than the other nearby poles, although the existing topography at both of these crossing sites limits the need for taller structures. When stringing the transmission lines at the highway crossings, PSE would work with the Washington State Department of Transportation to determine appropriate times to conduct the work and related safety factors. Construction and stringing may require rolling slowdowns along the highway (with the use of flaggers), as well as some night work. Also, dead-end structures would be installed in the vicinity of the I-90 and SR 520 crossings for line stability.

Worker rebuilding a transmission line

Workers connecting a transmission line to insulators

Stringing a transmission line



Installing a steel monopole with pulleys attached

Figure 2.1-6. Transmission Line Pole and Wire Installation

Staging Areas. Staging areas and a construction field office would be required along the project corridor during construction. Specific staging sites would be selected after the proposed route has been decided. In most instances, staging sites are located on properties that have already been developed, such as parking lots or graded lots. For a project of this scope, PSE would identify sites near the corridor with good access. Some staging sites are for short-term use (less than 3 months), while others may be used for the entire duration of the project (greater than a year). Short-term sites are used to accept delivery of materials (e.g., pole sections, insulators, conductors, and associated hardware). Longer term sites can be used for temporary construction offices (e.g., trailers) in addition to material storage. The longer term sites are often larger and are used to accommodate parking for construction vehicles in addition to material storage. To the extent possible, PSE locates and uses staging area sites on properties that it already owns or leases, that are already paved, and that are close to the transmission line corridor. It is possible that recreation sites or facilities may be used for temporary construction staging. PSE would work with the appropriate cities to identify suitable locations for staging that would have minimal adverse impacts to recreation. Following construction, PSE would work with the cities to restore staging areas.

Other Activities. Installation of new overhead transmission lines would require other construction activities that may include additional boring holes for geotechnical investigations, or relocating existing distribution and telecommunications facilities.

Demobilization and Restoration. Areas temporarily disturbed by construction activities will be restored to pre-project conditions. Site restoration includes removal of temporary erosion control measures and temporary access roads, ground level regrading, revegetation, wetland mitigation (if needed), and other activities. Restoration will be coordinated with the property owner and relevant permitting agencies.

2.2 ALTERNATIVES CONSIDERED BUT NOT INCLUDED

The following alternatives were identified through scoping but are not included for analysis in the Phase 2 Draft EIS for the reasons explained below. Additional information on the full range of alternatives considered to meet PSE's identified capacity needs is included in Chapter 2 of the Phase 1 Draft EIS.

2.2.1 Seattle City Light Transmission Line

Use of the SCL transmission line corridor was evaluated in the Phase 1 Draft EIS, and is described in more detail in the Phase 1 Draft EIS, Section 2.3.2.3. The SCL line is not under PSE's control. SCL has indicated to the City of Bellevue that they expect to need the corridor for their own purposes and are not interested in sharing the corridor with PSE (SCL, 2014). The existing SCL line would have to be rebuilt to provide a feasible solution for the Energize Eastside project, because the current rating of the SCL line is insufficient to meet PSE's needs (Strauch, personal communication, 2015). PSE has estimated that rebuilding the SCL line would provide sufficient capacity for a period of less than 10 years, which does not comply with PSE's electrical criteria (as described in Section 2.2.1 of the Phase 1 Draft EIS) to meet performance criteria for 10 years or more after construction. Neither the City nor PSE can compel SCL to allow the use of this corridor; therefore, this option is not feasible and was not carried forward. Even if compelled use of the corridor were allowed, the negotiations would likely prove lengthy, and would likely preclude completion of the project within the required timeline to meet project objectives.

2.2.2 Underground Transmission Line

The option of placing the new 230 kV transmission lines entirely underground was evaluated in the Phase 1 Draft EIS (as Option C).

Underground transmission lines involve several technical challenges that would necessitate acquiring a new or expanded right-of-way, including greater restrictions on surface vegetation and uses than are present in PSE's existing 115 kV right-of-way. Factors contributing to the need for additional right-of-way include the need for heat dissipation from each conductor, and the need for separation from the Olympic Pipeline, which is collocated in much of PSE's existing 115 kV corridor, in order to prevent corrosion of the pipeline. For heat dissipation, underground transmission lines must be placed approximately 12 to 15 feet apart and 3 feet below the surface (Power Engineers, 2014), which means there can be no trees or large shrubs planted over them. The potential for the electrical line to cause unacceptable corrosion of the pipeline is greater if the electrical line is underground than for overhead lines because soils are more conductive than air. Access vaults are also required every quarter mile, and must remain unobstructed by surface structures.

While PSE has an easement for their overhead lines, placing a transmission line underground would require permission from both the Olympic Pipe Line Company and each property owner to place its lines underground. Gaining such permission would likely require extensive legal action that would delay the project and thus not meet the project objectives regarding timing. A study of potential undergrounding of the transmission lines prepared for PSE by Power Engineers (2014) states that installation adjacent to the pipeline is technically viable, but that the Olympic Pipe Line Company has stated to PSE that they will not consent to other underground facilities being installed longitudinally in their easements. PSE would therefore have to place its transmission lines outside the Olympic Pipeline easement which is, in some places, nearly as wide as the PSE corridor. Even in places were the pipeline easement is substantially narrower than PSE's corridor, PSE generally does not have enough easement area to provide the necessary separation without the pipeline being relocated. As such, an underground line would require a new corridor to avoid colocation with the Olympic Pipeline (Power Engineers, 2014). This would need to be in a street or on other public or private property that PSE would have to obtain rights to use.

Beyond the cost of new right-of-way, underground lines require larger conductors, and are more costly to construct, repair, and maintain (PSE, 2016). Construction costs, not including right-of-way costs, for underground installation of a 230 kV line for the Energize Eastside project were estimated to be approximately $23 million to $28 million per mile (Power Engineers, 2014) as compared to $3 million to $4 million per mile for an overhead line.

Given the high cost of acquiring and developing an entirely new underground corridor, and the likely delays it would entail, this option was not considered reasonable as an alternative for the entire corridor, although it is considered as an option for mitigation in limited areas, should one or more jurisdictions determine that it was necessary to avoid significant impacts. Impacts generally associated with the undergrounding of the transmission lines are addressed in the Phase 1 Draft EIS (in the analysis of Option C).

2.2.3 Underwater Transmission Line in Lake Washington

The option of using a submerged or underwater transmission line in Lake Washington was included in the Phase 1 Draft EIS, and is described in more detail in Section 2.3.2.5 of that document (as Option D). Additional detail about constructing a submarine cable in Lake Washington is included in the *Eastside 230 kV Project Lake Washington Submarine Cable Alternative Feasibility Report* (Power Engineers, 2015). As described in the Phase 1 Draft EIS (Chapter 10, Land Use and Housing), a submerged line would be prohibited by shoreline regulations in two of the communities north of the proposed Richards Creek substation (Beaux Arts Village SMP Table 6.1 and Hunts Point SMP Table 6.1), because new utility corridors are prohibited in the aquatic environments of these communities. Therefore, a submerged line connecting the Sammamish substation to the Richards Creek substation would not be allowed. South of the Richards Creek substation, the City of Renton shoreline regulations (RMC 4-10-095) prohibit utilities in some shoreline environments, but it appears technically feasible to avoid prohibited environments if this option were chosen. However, this option would also require the construction of approximately 5 miles of new transmission corridors from the Talbot Hill substation to Lake Washington, and from Lake Washington to the Richards Creek substation, in order to avoid impacts to 8 miles along the existing corridor. As described in the Phase 1 Draft EIS, development of new corridors is expected to have higher environmental impacts than use of existing corridors, including permanent displacement of existing uses, vegetation removal, visual impacts, and construction duration. As such, this alternative was not seen as a reasonable alternative to using the existing corridor as proposed by PSE. For these reasons, an underwater line in Lake Washington was not carried forward.

2.2.4 New 115 kV Transmission Line

Alternative 3 in the Phase 1 Draft EIS included a system of new 115 kV transmission lines and new transformers at three substations in the Eastside area. This alternative would have required up to 60 miles of new transmission corridor. As described in the Phase 1 Draft EIS, PSE's basis for the need of this additional 115 kV infrastructure in lieu of the 230 kV system was independently reviewed (Stantec, 2015) and considered to be consistent with standard engineering for transmission line systems. Although 115 kV transmission line corridors can be narrower than 230 kV line corridors, the Phase 1 Draft EIS found that creating up to 60 miles of new 115 kV transmission corridor would have cumulatively higher environmental impacts (and higher costs) than 230 kV transmission lines using the existing transmission line corridor for most of the alignment as proposed by PSE.

For example, the Phase 1 Draft EIS estimated that Alternative 3 could result in clearing up to 114 acres of forested land under a worst-case scenario, as compared to 44 acres of forested land under the Phase 1 Draft EIS Alternative 1, which relies on PSE's existing corridor (Chapter 4 Phase 1 Draft EIS). New corridors for Alternative 3 would require the acquisition of up to 291 acres of right-of-way, with higher potential displacement of existing uses than under Alternative 1 (Chapter 10 Phase 1 Draft EIS), while the alternatives studied in this Phase 2 Draft EIS would not require displacement of any uses. Uses along both the existing corridor and the likely corridor for a 115 kV system upgrade are predominantly residential, which in some case can be accommodated without displacement. However, acquisition of up to 60 miles of right-of-way for new 115 kV lines would likely result in some displacement. Delays due to the legal steps required for such acquisition, which could include condemnation, would not meet the project objectives for timeliness to meet reliability requirements. For these reasons, this alternative was not carried forward.

2.2.5 Seattle Public Utilities Water Line Corridor

During the scoping process for the Phase 2 Draft EIS, the possibility of using an existing Seattle Public Utilities (SPU) water main corridor as an optional route through the City of Newcastle was proposed and examined. The Partner Cities asked PSE to examine how such a route would connect to their transmission lines to the north and south, and tasked the EIS Consultant Team and the City of Newcastle with inquiring with SPU regarding the feasibility of using this corridor. SPU considered the proposal for sharing this corridor, but determined that it would likely place too much of a constraint on their future needs (Wells, 2016). In particular, SPU found that the corridor was too narrow to allow placement of the transmission line and still retain the ability to build a replacement for the water main, which they eventually will need to do. Because SPU determined that the project is incompatible with SPU's existing use, co-location is not feasible. Compelled acquisition is also not possible within existing legal authorities, and could not in any event be accomplished within project timeline needs. As such, this corridor is not available to PSE for this project and was not carried forward as an alternative.

2.2.6 Other Routes and Options

During the scoping process for the Phase 2 Draft EIS, commenters suggested the possibility of using other routes farther east to provide transmission capacity. Many of these comments focused on the idea that the deficiency had to do with providing capacity for energy flowing to Canada. This is a misconception. Due to the interconnected nature of the transmission grid, and the flow of electricity through the grid, minor energy flows through the Eastside to Canada are inevitable, but they are not the source of the problem PSE has identified. PSE has indicated that the deficiency is within the Eastside. Bulk transmission (230 kV) is needed to connect to a new transformer (such as the proposed Richards Creek substation) to service growing Eastside demand. Creating additional capacity outside of the Eastside area specifically to attempt to draw Canadian flows through the system, even if 100 percent effective, would not correct the deficiency within the Eastside for the long term. A project built farther east of the service area would not meet the project's objectives. At best, it would offer a short-term solution that would not meet PSE's performance criteria for serving 10 years or more after construction (electrical criterion #1 - see the Phase 1 Draft EIS, Section 2.2) (Gentile et al., 2014). The project need and objectives are explained in full in Chapter 2 of the Phase 1 Draft EIS and Chapter 1 of this Phase 2 Draft EIS.

Chapter 2 of the Phase 1 Draft EIS also addressed a number of routes and options that were considered for Phase 1 but not carried forward.

2.2.7 Alternative 2 and "Alternative 2B"

Alternative 2 from the Phase 1 Draft EIS includes a number of technologies other than new transmission lines with the intent of addressing the transmission deficiency PSE has identified for the Eastside. Alternative 2 was designed to address the projected deficiency in transmission capacity on the Eastside by reducing the growth in peak period demand through energy efficiency, storing and releasing energy when needed to address peak demand, and providing reliable additional peak period energy sources in the area where the transmission capacity is deficient. As described in Chapter 2 of the Phase 1 Draft EIS, in order to assess potential impacts from a combination of these technologies capable of meeting the transmission capacity deficiency, a number of assumptions were made about the potential contribution each technology could make. The basis for these assumptions is described in detail in Section 2.3.3 of the Phase 1 Draft EIS, and it is recognized that a different combination could also theoretically achieve the same result.

Numerous comments were received during the scoping process for the Phase 2 Draft EIS that referred to a variation on Alternative 2 from the Phase 1 Draft EIS. This was referred to as "Alternative 2B." Alternative 2B was developed by EQL, a consultant hired by the Coalition of Eastside Neighborhoods for Sensible Energy (CENSE), and submitted during the Phase 1 Draft EIS public comment period. Alternative 2B would use the same or similar technologies as those evaluated for Alternative 2 but in different quantities. Part of the argument provided for Alternative 2B is the assertion by EQL that PSE has overstated the need and thereby made the use of these alternatives to transmission lines appear infeasible. As described in Chapter 2 of the Phase 1 Draft EIS, the EIS Consultant Team reviewed the methods used for developing the load forecast and assessing transmission capacity (Gentile et al., 2015), and found them to be in line with industry practice (Stantec, 2015).

Both Alternative 2 and Alternative 2B represent options that PSE could pursue. However, PSE has determined that these solutions either do not meet the project objectives, or they offer a short-term solution that would not meet PSE's performance criterion for serving 10 years or more after construction (electrical criterion #1- see Chapter 1 Phase 1 Draft EIS). Specifically, PSE determined that it did not have the ability to require its customers to install energy efficiency measures or peak period generation facilities, so it could not count on these measures being adopted in time and at sufficient scale to address a significant portion of the transmission deficiency (Gentile et al., 2014). To ensure a timely solution, PSE would need to build its own peak generation facilities and/or battery storage facilities. PSE found that transmission-level battery storage technology was not sufficiently developed at this time to address the full need for the Eastside (Strategen, 2015), although it could be a partial solution. Therefore, peak generation facilities would be needed. These would likely be gas-fired and would need to be near substation sites, most of which are in residential areas, where the generators could have significant adverse noise and air impacts. To avoid such impacts, larger scale facilities would be needed in industrial areas, which would lead to impacts such as the need for significant water supply, major new gas pipelines, and other issues (Gentile et al., 2014). The lack of reliability of some measures, the potential impacts of peak generation facilities, and the potential delays due to permitting for such facilities were cited by PSE as reasons that these options did not meet their objectives.

Alternative 2B would not eliminate either the uncertainty or the impacts of these technologies. Additional conservation and energy efficiency are projected to be achieved by higher incentives and other methods of promotion, but would remain voluntary, as would implementation of a network of privately owned peak power supplies that could be used during high demand periods. Reducing the target capacity for these technologies on the basis that PSE has overstated future demand would not address the deficiency PSE has identified. For these reasons, the resource technology alternative was not carried forward.

2.3 BENEFITS AND DISADVANTAGES OF DELAYING THE PROJECT

PSE has identified the need to provide additional capacity by the winter of 2017–2018 to comply with its anticipated capacity requirements. PSE's objectives for the project, and criteria for evaluating options to meet its objectives, are described in detail in Section 2.2 of the Phase 1 Draft EIS. The impacts and potential benefits of a conservation-focused non-transmission alternative are evaluated as part of Alternative 2 in the Phase 1 Draft EIS, including a number of potential combinations of approaches.

Delaying the project for 1 to 2 years would have the benefit of avoiding the impacts in the near future for the action alternative described in the Phase 2 Draft EIS. It is possible that by delaying the project, some of the expanded conservation measures described in the Phase 1 Draft EIS would be incorporated into development, reducing energy demand further than PSE has projected. However, as noted by the EIS Consultant Team in their independent review of PSE load projections and needs assessments (Stantec, 2015), PSE has assumed high levels of conservation in their estimates of load projection, which are considered optimistic. Under the No Action Alternative, the Phase 2 Draft EIS assumes that PSE would continue to achieve 100 percent of the company's conservation goals as outlined in its 2015 Integrated Resource Plan (PSE, 2015), systemwide and for the Eastside, which means that a very aggressive campaign would be needed to exceed these goals. Conservation goals are achieved through a variety of energy efficiency improvements implemented by PSE and its customers, largely through voluntary participation. Additional conservation could have the benefit of reducing greenhouse gas generation from electrical consumption on the Eastside. Under WAC 480-100-238, however, PSE "has the responsibility to meet its system demand with a least cost mix of energy supply resources and conservation." Accordingly, PSE's ability to fund conservation and new technologies is limited to those that are cost-effective. Delaying the project could allow technological advancements to occur in areas such as battery storage or generation, providing additional feasible alternatives to increased transmission capacity in the near term; however, identifying a time frame when these advancements could occur is speculative. At this time, there are no currently known, widely accepted technologies that PSE would employ that could feasibly and reliably address the transmission capacity deficiency on the Eastside. Under the No Action Alternative, however, PSE would not be precluded from seeking out new technologies.

The disadvantages of delaying the project are that the risks of power outages (described in Chapter 1 of the Phase 1 Draft EIS) that would be associated with the No Action Alternative could develop over time. PSE's customers could respond with increased energy conservation during peak periods to avoid outages, but PSE could not rely on voluntary conservation during such periods unless they have control over customers' rates of consumption. This type of demand reduction is technically feasible, but PSE cannot compel customers to adopt it, and few have shown willingness to employ that option under their current conservation program. Therefore, PSE would still be faced with creating temporary outages to protect the regional grid. Given the lack of certainty regarding potential effectiveness of conservation measures, project delay would therefore likely fail to achieve the project objectives. It is also possible that the awareness of the risk of outages could discourage development within the Eastside that would place the Partner Cities at an economic disadvantage to other jurisdictions in the region. Declining reliability of the electrical power supply on the Eastside would be inconsistent with local planning policies.

3

Long-term (Operation) Impacts and Potential Mitigation

energize EASTSIDE EIS