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# Eastside Solution Study Executive Summary

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## Executive Summary

The planning analysis discussed in this report has identified five alternative solutions to address the transmission capacity deficiency identified in the "Eastside Needs Assessment Report – Transmission System King County" dated October 2013 ("Needs Assessment Report"). Each of these five solutions fully satisfies the needs identified in the Needs Assessment Report and satisfies the solution longevity and constructability requirements established by PSE as discussed in the body of this report.

These five solutions include two 230 kV transmission sources and three transformer sites, which are summarized in Table 1-1. Routing analysis performed by Tetra Tech, Inc. shows the two line alternatives can be broken down into 16 different segments. These segments can be combined to form multiple routes options to use to develop the line. These segments are shown in Figure 1-1.

The next step will be to engage the public in a series of events and outreach efforts to collect their input. Concurrently, PSE will continue data collection and environmental analysis. Both the public input and collected data will be used by PSE to select a preferred route for the 230 kV source and determine the substation location for the transformers. Once PSE selects the preferred route, the project will move into design, environmental review and the permit application process.

**Table 1-1: Eastside Transmission and Transformer Solutions**

| 230 kV Line Alternative | Substation Alternative |
|---|---|
| Rebuild one Talbot Hill-Lakeside-Sammamish 115 kV line to 230 kV and loop through new substation | Westminster |
| Rebuild one Talbot Hill-Lakeside-Sammamish 115 kV line to 230 kV and loop through new substation | Lakeside |
| Build new Talbot Hill-Sammamish 230 kV line on new right of way, loop through new substation | Westminster |
| Build new Talbot Hill-Sammamish 230 kV line on new right of way, loop through new substation | Vernell |
| Build new Talbot Hill-Sammamish 230 kV line on new right of way, loop through new substation | Lakeside |

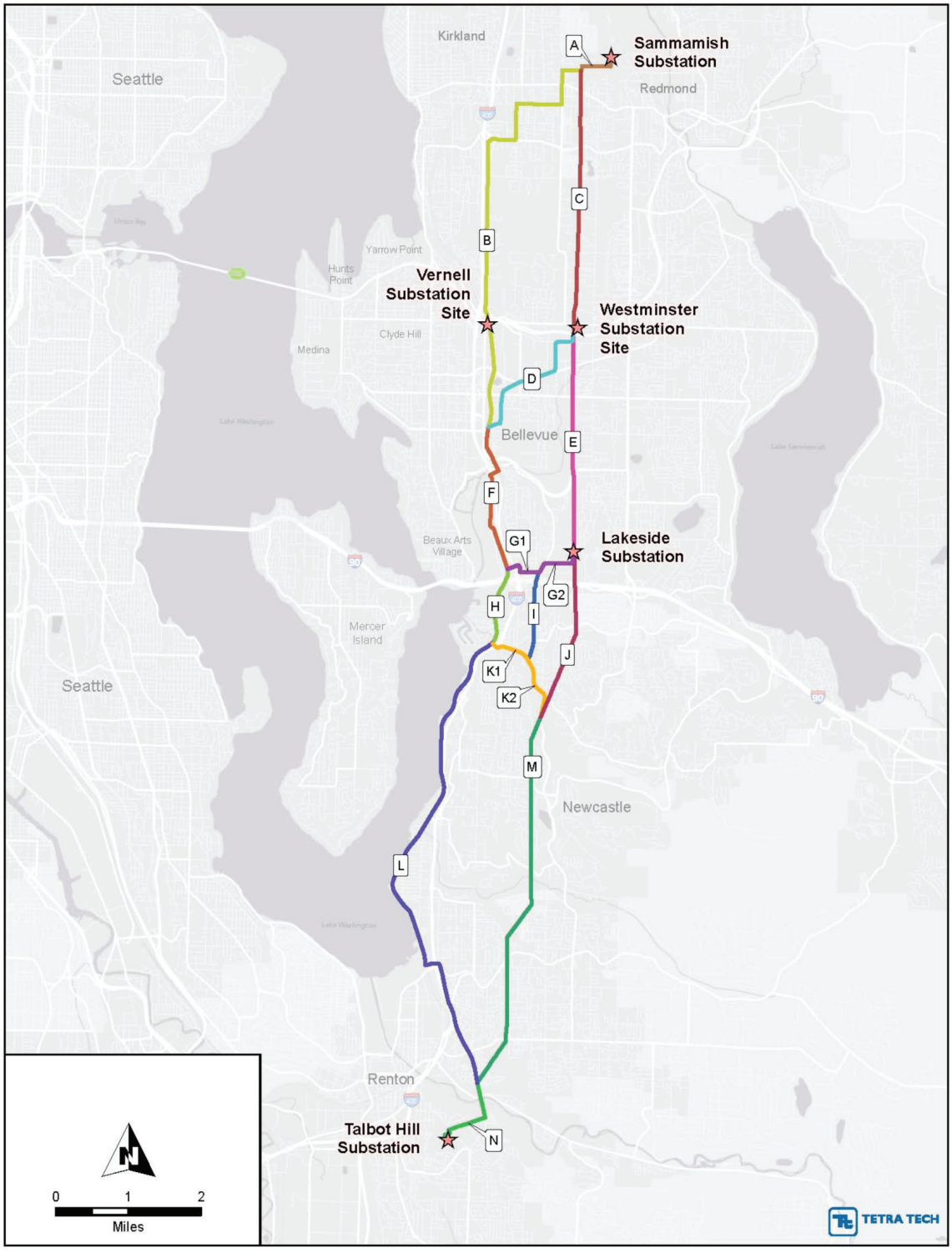


Figure 1-1: Segment Ladder Diagram

## Solution Study Objective

The objective of the Solution Study was to address the transmission capacity deficiency in the Eastside area of Lake Washington which will develop by the winter of 2017-18. As identified in the Needs Assessment Report, this transmission capacity deficiency is expected to continue to increase beyond that date. Cities in the deficiency area include Redmond, Kirkland, Bellevue, Clyde Hill, Medina, Mercer Island, Newcastle, and Renton along with towns located at Yarrow Point, Hunts Point, and Beaux Arts. In that assessment, there were four main areas of concern identified:

- Overload of PSE Facilities in the Eastside Area
- Small Margin of Error to Manage Risks from Inherent Load Forecast Uncertainties
- Increasing Use and Expansion of Corrective Action Plans
- Emerging Regional Impacts Identified by ColumbiaGrid

## Method and Criteria

### The Solution Study used the following process:

**Step One:** Brainstorm potential solution types to solve this problem including: Demand Side Management, Generation, Transformers, Transmission Lines, and combinations of all. The team identified 52 potential alternatives – seven potential 230 kV sources, seven potential transformation sites, and three generation sites.

**Step Two:** Identify possible alternatives for each solution type and perform power flow analysis on the alternatives using cases from the Needs Assessment and an extensive list of contingencies.

**Step Three:** Assess the most promising alternatives from the perspective of system performance, operational flexibility, and longevity.

**Step Four:** Refine the list of viable electrical solutions using non-electrical factors to determine the most promising electrical solutions.

**Step Five:** Review the impact of land use and environmental factors on each of the remaining viable electric solutions using the linear routing tool (LRT) to develop real world physical routes.

**Step Six (Future):** Take the resulting route options to the public and collect input through a series of open houses and a Community Advisory Group process. Continue to collect data and perform environmental analysis necessary to address requirements and constraints. Review collected data, study results, and consider public input to identify a preferred route.

To be a viable solution, the proposed project must solve the power flow issues identified in the Needs Assessment Report, satisfy longevity criteria, be constructible, and comply with environmental requirements.

## Study Assumptions

For the Solutions Study analysis, the following key assumptions were adopted from the Needs Assessment Report:

- The study horizon selected was the ten year period from 2012 to 2022.
- System load levels used the PSE corporate forecast published in June 2012.
- Area forecasts were adjusted by substation to account for expected community developments as identified by PSE customer relations and distribution planning staff.
- Generation dispatch patterns reflected reasonably stressed conditions to account for generation outages as well as expected power transfers between PSE and its interconnected neighbors.
- Winter peak Northern Intertie transfers were 1,500 MW imported from or exported to Canada.
- Summer peak Northern Intertie transfers were 2,850 MW imported from or 2,000 MW exported to Canada.

These generation dispatches and Northern Intertie flows are used in PSE's modeling methodology for conducting annual mandatory NERC transmission reliability studies.

## Solution Screening Process

During the brainstorming session, the team evaluated four main solution types: 1) Demand Side Reductions, 2) Generation, 3) Transformer Addition with Minimal System Reinforcements, and 4) Transmission Lines plus Transformers.

**Demand Side Reduction:** After investigation, the planning team determined that significant demand side reductions were already included in the analysis since the effects of conservation were reflected in the load forecast used as the basis for the study. The possibility of additional conservation measures was discussed with PSE's Energy Efficiency Group. However, that group indicated they have already estimated the maximum amount of conservation available in the area. As a result, additional demand side reductions would not be a viable solution and therefore were eliminated as a potential alternative.

**Generation:** The planning team also evaluated generation and determined that a 300 MW gas turbine could be located within the eastside and may, therefore, be a feasible solution. Three locations were evaluated: Lakeside Switching Station, Lake Tradition Substation and Cedar Hills. Lakeside and Lake Tradition were found to be extremely challenging to permit due to environmental constraints related to noise and atmospheric emissions. The Cedar Hills site was retained for further analysis; however new transmission lines would be required.

**Transformer Only Addition:** The planning team evaluated three sites for a new 230-115 kV transformer: Sammamish substation, Talbot Hill substation and Lake Tradition substation. All three sites currently have nearby 230 kV sources. These sites were modeled and studies showed numerous 115 kV overloads, which indicated a substantial amount of new 115 kV lines would need to be constructed. As a result, the transformer only solution was not deemed a viable alternative.

**Transmission Line plus Transformer:** Finally, the planning team identified seven potential new 230 kV transmission lines and seven potential transformer sites. By inspection, it was clear that not all transformer sites aligned well with the new transmission options. Aligning the transformer sites with the lines reduced this set to 26 different alternatives. The 26 transmission line plus transformer alternatives in addition to the Cedar Hills generating station site (27 total) were considered for further analysis.

## Detailed Powerflow Analysis

Detailed powerflow studies were performed on the 27 alternatives to determine the best performers. The analysis evaluated the ability of each alternative to address the need and how well its performance compared with the others. The team reduced the 27 alternatives down to the 12 that had sufficient performance.

The Cedar Hills generation site was eliminated from further study since it was not sufficient to resolve the transmission capacity deficiency even though the solution study included connecting two 115 kV lines to the site. These two line interconnections required building 17 miles of new transmission and rebuilding an additional 24 miles of existing lines to connect to the Lake Tradition and Berrydale substations.

The remaining 12 alternatives were then assessed for their impacts on other adjacent portions of the PSE system, longevity, and operational flexibility to reduce or eliminate reliance on Corrective Action Plans (CAPs).

Based upon this analysis, the team determined that all 12 alternatives were sufficient to resolve the transmission capacity deficiency and recommended as solutions for further evaluation using non-electrical factors.

## Non-Electrical Based Factors

PSE did a non-electrical based review of these 12 solutions and, as a result, further reduced the set of solutions down to five. This reduction occurred for the following reasons:

- The Maple Valley to SnoKing 230 kV double circuit line was removed as an alternative since Seattle City Light determined they will need the lines to satisfy their own future needs.
- The Woodridge site alternative was removed from consideration since Woodridge is a new site not owned by PSE that requires additional siting analysis, has site acquisition costs and there are three other viable sites that already satisfy the performance requirements.
- The Vernell transformer site was eliminated from use with PSE's Talbot Hill – Lakeside - Sammamish corridor since Lakeside and Westminster sites are much closer to that corridor.

The five remaining solutions are summarized in Table 1-1 on page 1.

## Right of Way Assessment

For the two remaining 230 kV source solutions, PSE performed a right of way (ROW) assessment to identify a specific routing plan for these lines using TetraTech's Linear Routing Tool (LRT) . Based upon a scoring methodology that weighted multiple available GIS data layers and combined them to recognize the areas of greatest opportunity and greatest constraint, 16 different, viable routing segments were identified that could be combined to create multiple paths for the final circuit to be built. These segments are laid out in a ladder arrangement with two north to south routes that have multiple crossover segments as shown in Figure 1-1 on page 2.

## Next Steps

Following completion of this study, PSE will engage the public in a months-long process that will provide critical input into PSE's preferred route selection, using the ladder of segments identified by the LRT. PSE will collect public input through an engagement process that includes a series of events, outreach efforts and engagement of a Community Advisory Group (CAG) that reflects Eastside stakeholders. PSE will also continue to evaluate requirements and constraints. Once PSE selects the preferred route, the project will move into design, environmental review and the permit application process.