# Updated Transmission Expansion Plan for the Puget Sound Area to Support Winter South-to-North Transfers

Approved by PSAST on 4-25-11



## Overview

- Why the Update?
- Proposed Transmission Expansion Plan
- TCRM & TTC Results
- Cost Estimates
- Next Steps

## Why the Update?

- Additional Scenarios
  - Focus on alternatives to series reactors and Bothell –
     SnoKing Maple Valley upgrades
- Increased likelihood that Puget Sound Energy will move forward with Sammamish-Lakeside-Talbot project
- Increased likelihood that Seattle City Light will move forward with their North Downtown Substation Project
- Seattle area line rating increases

# Changes to South – North Expansion Plan

#### **Original Plan**

- Rebuild Bothell SnoKing
- Reconductor Maple Valley SnoKing
- 26 ohm Series Inductors on SCL's 115 kV Cables
- 3<sup>rd</sup> Covington Transformer
- Extend Northern Intertie RAS

#### Updated Plan

- Reconductor Bothell SnoKing
- Lakeside 230 kV Upgrade Project
- 6 ohm Series Inductors on SCL's 115 kV Cables
- 3<sup>rd</sup> Covington Transformer
- Extend Northern Intertie RAS
- Reconductor Delridge Duwamish 230 kV Line
- NODO



Proposed Additions

## TCRM & TTC Results: 26 ohm Series Inductor Alternatives

	TCRM	TTC
6 ohm Series Inductors	8,666	2044
26 ohm Series Inductors	10,460	1773
Thermal Protection System	22,445	1912
Phase Shifting Transformers	11,500	2136

- 230 kV Option: Lakeside
- Delridge Duwamish Reconductor in All Scenarios
- TPS Unacceptable to Seattle City Light Due to Reduced Reliability
- Refined Model for Phase Shifters is Needed
- Preferred: 6 Ohm Series Inductors
  - Good Performance
  - Low Cost Estimate

# TCRM & TTC Results: 26 ohm Series Inductor Alternatives

6 ohm Series Inductors	3rd 115 kV Underground Cable	Maple Valley-SnoKing High Temp	Lakeside Project	TCRM	TTC
Х		Х		8,433	2297
	Х	Х		19,027	1513
Х			х	8,666	2044
	Х		Х	11,213	2297

- 6 Ohms Performs Better for TCRM
- TTC benefits from a Third Cable when Paired with Lakeside
- Preferred: 6 Ohm Series Inductors
  - Good Performance
  - Low Cost Estimate
- Replacing the Existing Cables Provides Very Similar Results

## TCRM & TTC Results: 26 ohm Series Inductor Alternatives

	TCRM	TTC
6 ohm Series Inductors	8,666	2044
NODO	38,594	-832
NODO & 6 ohm Inductors	9,101	2207

- 230 kV Option: Lakeside
- 6 Ohm Inductors Needed with NODO
- NODO Provides Benefit to TTC & Detriment to TCRM
- NODO Provides Additional Reliability to Seattle's System
- Preferred: NODO with 6 Ohm Series Inductors
  - Good Performance
  - Adds Reliability to Seattle's
     System

### TCRM & TTC Results: Maple Valley – SnoKing Reconductor Alternatives

	TCRM	TTC
Maple Valley-SnoKing		
High Temp	8,778	2672
Maple Valley-SnoKing		
Rebuild	7,111	2708
Lakeside	9,101	2207
Lakeside & Maple Valley		
– SnoKing High Temp	9,296	2732

- 115 kV Option: NODO with 6 Ohm Inductors
- Preferred: Lakeside
  - Good Performance
  - Provides Needed Load Service at Lakeside Substation

#### TCRM & TTC Results: Maple Valley – SnoKing Reconductor Alternatives

	TCRM	TTC
Maple Valley-		
SnoKing High Temp	8,778	2672
Lakeside	9,101	2207
Lakeside & Maple		
Valley – SnoKing		
High Temp	9,296	2732
Monroe-Echo Lake		
#2 500kV	4,143	2916

- 115 kV Option: NODO with 6 Ohm Inductors
- Monroe Echo Lake #2
   Provides the Lowest
   Overall TCRM & Highest
   TTC
- Monroe Echo Lake #2 is Not Preferred Due to a High Cost Estimate (\$300 M)

#### TCRM & TTC Results: Bothell – SnoKing Rebuild Alternatives

Lakeside Project	Bothell - SnoKing Rebuild	Bothell - SnoKing High Temp	TCRM	TTC
Х	Х		9,101	2207
Х		Х	10,286	2233

- 115 kV Option: NODO with
   6 Ohm Inductors
- Minor Reduction in Performance with Reconductor
- Preferred: Lakeside with Bothell – SnoKing Reconductor
  - Good Performance
  - Cost Savings from Rebuild

#### PSAST Preferred South-to-North Plan Cost Estimate

	Cost Estimate (M)		
Reconductor Bothell-SnoKing 230kV #1 & #2 with high temperature conductor	\$3		
Extend the Northern Intertie RAS to trip for the combined outage of the Chief Joseph- Monroe and Monroe-SnoKing-Echo Lake 500 kV lines	\$3		
Add a third Covington 500/230 kV transformer, a 500 kV terminal at Raver for the third Raver-Covington 500 kV line, and a 500 kV Bus at Covington	\$60		
Reconductor Delridge - Duwamish 230 kV Line with high temperature conductor	\$2		
SCL's North Downtown Substation with 6 ohm inductors on all 3 cables (Two sets of inductors may be initially installed for \$13 M)	\$260		
Lakeside 230/115 kV Transformer and 230 kV Sammamish - Talbot 230 kV Upgrade Line Work	\$70		
Total Preferred Projects	\$398		
* The majority of these estimates are preliminary estimates. More detailed estimates will be developed by			

the Puget Sound Area utilities.

## Next Steps

- Identify Parties Responsible for Each Project
- Agree on Cost Allocation
- Further Develop Projects
- Update Study Work for North South Transfer Conditions
- Refine Series Inductor Sizes
- Determine the Longevity of the Proposed Plan
- Provide Study Support for Proposed Projects
- Continue to Investigate Cost Effective Ways to Reduce the Remaining Risk of Firm Curtailments

#### Questions?