



Talbot 230kV Bus Improvements

Implementation Plan

2018

CURRENT OWNER: Kelly Purnell



Puget Sound Energy	Rev 2
Project Implementation Plan	Talbot 230kV Bus Improvements Reviewed as of 7/25/18

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Section 1. Document Revision History and Chronological Summary

1.1. Document Revision History

Revision	Date	Description	Phase
0.0	9/30/15	Initiate document based on Planning 10 year documentation, CSA and Strategy Document	Project Plan Development
0.1		Present Strategy Document, 10 Year Plan, CSA and PIP to Planning Management for Approval	Project Plan Development
1.0	1/15/2018	Approved Gate 3 CSA PIP	Project Plan Development

1.2. Chronological Summary

2011


Preliminary discussions with controls and engineering to update

2015

Project Team is proposing to move forward with the Double Bus Double Breaker design and construction at Talbot. This option is less costly, more efficient and will require less rework.

Project Team has been working on the CSA. A meeting was held with the Directors on August 17th 2015 as a pre meeting before sending the CSA out for approvals and signatures. At that meeting the Director of Planning requested more information in a different format than the CSA presented that could be presented to executives and be easy to understand rather than the technical 10 year plan. The Director of Engineering and Project Management needed clarification on why the DBDB configuration was proposed rather than a breaker and a half or main and aux bus.

To supplement the CSA a Strategy Document was developed and the concept was approved by the Planning Director. The Project Team went forward with providing the project scope, needs, benefits, risks, alternatives all at a high level summary. During this time, there was another re-organization within the Planning Department. When the Team brought forward the completed Strategy Document, the new Manager did not agree that the information within that document and thought that the information should be in the Planning 10 year Document. The project team is moving all the updated DBDB information back to the 10 year plan and the Strategy Document is now a high level summary to supplement the 10 year plan. The Project Team is working to have all the documentation ready and approved before the end of 2015 in order to proceed with the Project Management Lifecycle approvals.

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Talbot 230kV Bus Improvements are included in the V4 2016 Budget. Proposed work at substation in 2016 includes demolition of the existing oil building, construction of a new control house between the existing control house and the Communication Building.

2016

During 2016, the project team continued to meet with BPA regarding the 230kV rebuild options. BPA has concerns that fault current potential will bypass BPA’s Current Limiting Reactors that are located inside the Maple Valley Substation once the bus tie is closed in on Talbot Hill and the Energize Eastside lines are landed. BPA performed short circuit studies and presented two options that they determined would allow the bus at Talbot Hill to be closed through. There options were:

- #1 – Replace approximately 15 disconnect switches within BPA Maple Valley Substation.
- #2 – Install CLR’s on both lines including the installation of arrestors outside the substations.

The second option was the preferred option by BPA due to cost and significant lead times (up to 3 years) to get approval for the outages necessary on the Maple Valley substation to replace the switches.


Joint planning meetings with BPA were continued throughout 2016 to discuss this issue. A mutual agreement was executed between PSE Transmission Contracts and and BPA to continue to study the issue.

Concurrently, Talbot Phase 1 – North Bus rebuild went out to bid in the 2nd quarter of 2016. The project was awarded to Pottle and Sons, Inc (Civil Contractor), with a start date for the North Bus early in Q2 2017 and a finish date of Q4 2017. Permits for the control house were submitted in November, 2016 but the issuance was delayed after the City of Renton reneged on the waiver of a building permit. The project manager, government affairs and land planning met with the planning director and City Manager to discuss the issue, and the solution was to grant the building permit, but defer the implementation of the frontage improvements that are required by City code. This challenge carried into early 2017.

2017

In Q1 of 2017, based on the December 2016 DNV GL report (AC Interference Analyiss – 230 kV Transmission Line Collocated with Olympic Pipelines OPL16 & OPL20) the Energize Eastside project was changed from a 115 kV/230kV project to a 230 kV/ 230 kV project. Accommodations for the additional 230 kV transmission line were made on the Talbot Hill Substation Double Bus – Double Breaker project.

The Talbot Hill 230 kV South Bus Re-build (Phase 1) project moved forward as planned. The outage started in May 2017 with a requirement to have the North Bus re-energized by 10/31 as requested by both the PSE Load Office and SCL. Pottle was awarded the contract and was responsible for all import and export, cutting down the first 13” of the yard, demo of the foundations, and installation of new foundations. PSE Substation Operations crews did all the assembly and wire work, conduit, grounding, security conduit, security pedestals, as well as demo of the existing steel.

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By mid-October 2017, the substation wire crew was complete with wiring and assembly. New relays were set up to operate both the SCL breaker and Meter Quality CT's, SCADA was complete, and grounding was complete. The work moved on to punch list items.

Simultaneously, the decision was made to store 2 of the new breakers for Phase 2 at Talbot Hill on the breaker foundation pads without being connected. The breakers would essentially still be in "stores" but already on-site. Long-lead materials and steel for Phase 2 – South Bus Re-build was ordered by the engineer at the end of 2017.

The completion of Phase 1 put Talbot Hill into a NERC CIP site classification. Appropriate actions were taken to ensure that CIP site security regulations were put in place, including a secure badge-in/badge-out policy of the control house, and more robust site security equipment.

Seattle City Light Coordination:


PSE and Seattle City Light have an interconnection, Talbot Hill-South 230kV line, that terminates at Talbot Hill on the north bus. 230kV bus improvements at Talbot including rebuilding the north bus in 2017. Discussions with SCL led to a study to determine whether there are reliability concerns with creating a long-line of the Talbot Hill-South and Talbot Hill-O'Brien lines during various outage scenarios.

The conclusion on the various studies was there was very little difference with the lines tied together. It was SCL's preference that the lines be long-lined to provide greater flexibility to take additional outages beyond those studied. Long-lining commenced in 2017 for the work that needed to be done for phase 1 of the Talbot Hill 230 kV Phase 1.

BPA Coordination:

Work continued on the development of a solution with BPA regarding the fault current potential. A great deal of discussion occurred to look at the option of closing in the bus tie during Phase 2 as planned to operate as a double-bus, double breaker, and keeping one of the two Talbot Hill – BPA Maple Valley lines open to minimize the risk. Ultimately, BPA was uncomfortable with this scenario, as it caused more risk to BPA's system. It was determined that two sets of current limiting reactors (CLRs) would be needed to be installed between the substations, three CLRs for each line (or one CLR per phase of each line) for a total of six to minimize the issue. These would need to be installed before the Energize Eastside lines were landed at Talbot Hill Substation. By the end of 2017, a joint grounding study proposal was being drafted at PSE's request by Power Engineers that would

“provide a recommended grounding system for Talbot Hill Substation which meets personnel touch and step voltage compliance per IEEE Std 80-2013 (IEEE Guide for Safety in AC Substation Grounding) and physical separation requirements for the new current limiting reactors (CLR) and 2) Determine appropriate mitigation measures necessary to provide touch voltage protection for the underground pipelines (Seattle Public Utility water pipeline and BP [OPL] petroleum pipeline) that run between Bonneville Power Administration (BPA)'s Maple Valley Substation and Puget Sound Energy's Talbot Hill Substation.”

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Additionally, a proposal was prepared at PSE’s request from Power Engineers for the design of the CLR’s as PSE does not have this type of equipment in its system. Therefore, a new specification needs to be developed alongside the design of the system that will include a 230 kV rated, two-ohm, air-core CLR that will be installed by PSE next to the Talbot Hill substation site within its own fenced area.

2018

Talbot Hill 230kV South Bus (Phase 2) is on schedule to be built in 2018. Currently, the schedule is as follows:

Civil Bid Package


- Substation civil bid/construction package is complete – February 26, 2018
- Advertisement civil bid package – February 27 – March 2, 2018
- Civil bids due to PSE – March 23, 2018
- Civil bids review by PSE – March 26 - March 28, 2018
- Civil substation contract award – March 30, 2018
- NTP – April 2, 2018

Preliminary Construction:

- Potelco to disconnect BPA Maple Valley Lines #1 and #2 and Talbot Hill – Berrydale #3 230kV line – April 2, 2018 (duration approximately 2 weeks)
- South King Substation crew to demo existing steel – April 16 – May 2, 2018
- Contractor to demo existing foundation and cut down the yard by 13”, install SPCC curb, pour foundations, drilled-pier foundations – March 5 – April 27, 2018
- South King Substation crew to construct all electrical assembly - April 30 – August 10, 2018
- Potelco to reframe BPA dead end towers, string new conductor and reconnect BPA Maple Valley Lines #1 and #2, and Talbot Hill – Berrydale #3 230kV line, and string new OHGW – July 16 – July 20, 2018

Outage Schedule:

- Talbot Hill 230kV South Main Bus – April 2 to approximately September 28, 2018
 - BPA Maple Valley - Talbot Hill #1 230kV Line
 - Talbot Hill - Berrydale #3 230kV Line
 - Talbot Hill Bank #1 230/115kV Transformer

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- Talbot Hill 230 kV West Main Bus (no lines out) – July 30 – approximately September 28, 2018
- Talbot Hill 230kV East Main Bus – October 27, 2017 – July 20, 2018 (~1 year duration – carryover from Phase 1)

The current schedule has completion by the end of September 2018. The outage ends September 28, 2018. Some punch list items will remain. There are overlapping issues with the Talbot Hill – Paccar 115kV rebuild project that is tentatively scheduled to start at the beginning of September 2018. The goal is to complete Talbot Phase 2 by the end of September 2018 to minimize the overlapping outage for Talbot – Paccar.

While the project moves towards construction, the grounding study for the Talbot Hill and BPA Maple Valley substations and the CLR is commencing mid-January 2018. The grounding study final deliverables are scheduled for completion by July 2018.

The CLR design and spec development will commence in mid-January 2018. Power Engineers will be traveling to Puget Sound region in mid-January to begin initial field work. PSE/Power Engineers will continue to work with BPA and SPU regarding this infrastructure need. As of July 2018, the spec is complete and the 30% civil design has been completed. 60% civil designs are due August 20th, 2018.

Next steps will entail internal decision making about the procurement timeline, the manufacturer selection, and permitting kick-off including the CUP. The CLR work, which will include relocating the Talbot Hill – BPA Maple Valley #2 line, is tentatively scheduled for construction in August of 2019 as the Talbot Hill Substation “Phase III” project.

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Section 2. Project Overview

2.1. Purpose:

The existing 230kV bus at Talbot is divided into a north and south 230kV bus and separated by a normal open switch that cannot be operated unless both buses are de-energized. This forces PSE to take excess system risk during maintenance, system improvements and unplanned transmission outages.

The EE230kV project will add a sixth and seventh line to Talbot, making Talbot the source for the new East Side 230kV substation. Using a DBDB bus configuration allows the new EE230 kV lines and other existing and future 230kV lines to be connected anywhere along the bus.


Project Objectives:

1. To improve the 230kV bus at Talbot from two independent north and south main buses to a configuration that is more reliable, removes credible contingencies and is more flexible allowing switching and breaker maintenance that does not result in a 230kV line path being broken.
2. Update protection to provide standard zones of protection and faster clearing times to improve the power quality impacts to a large industrial customer base.
3. To make provisions for the connection of the new E230kV lines at Talbot. Building a double bus double breaker 230kV bus design allows connection of the new line wherever it physically fits best.

2.2. Need Statement:

Talbot Hill Substation is a significant substation for PSE and the high-voltage transmission grid. It has two 325 MVA 230-115kV transformers, one 230 kV line to Seattle City Light, two 230 kV lines to BPA Maple Valley, and two PSE 230 kV lines to PSE O'Brien and Berrydale substations. A sixth 230 kV line will be added by to serve the E230 kV project making this the source for the new E230kV station. Talbot Hill is currently the strongest 230kV source in King and Pierce County and provides the most energy to our system of any of the regions 230kV stations. It will only become more important as future growth and system improvement occur. Conversely, the current bus design is one of the least reliable and doesn't meet current industry standards. It is also constrained by a mid-bus switch that cannot be operated unless both busses are de-energized. The current design forces PSE to take excess system risk during maintenance, system improvements and unplanned transmission outages. A substation of this importance should at a minimum meet current industry standards for this voltage level.

Study results show numerous overloads for a fairly large number of contingencies. Some of the overloads that show up in the base case are taken care of by construction of the E230 kV project regardless of how it is connected to Talbot. Other overloads show up when connecting the new line to the existing north or south separated 230 kV bus. Connecting to a completed DBDB arrangement at Talbot removes all but one overload result. This overload

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is due to the current limiting reactor on the BPA Maple Valley 230 kV bus. PSE is in discussions with BPA in order to resolve this contingency.

In addition to addressing overload conditions currently in the system and those projected due to the E230kV project, the bus improvements will allow routine breaker maintenance to be done without breaking a 230 kV line path. This is important to maintain reliable grid flows and to prevent the next contingency from taking up to three 230-115 kV transformers out in King County's transmission system.

2.3. Benefits:

Quantitative

1. The Double Bus Double Breaker is \$3.5M less expensive than going to a breaker and a half configuration and provides more flexibility with the 230kV Bus.
2. The Eastside 230kV Project would require a rebuild of at least the North Bus to land a new line by 2018. A rebuild of the North Bus is estimated at \$9.5M

Qualitative


1. The Eastside 230kV Project does not solve the issues unless the bus at Talbot is closed.
2. A 230kV line outage no longer would cause the loss of the entire Talbot 230kV bus
3. Breakers will be added to the BPA Maple Valley intertie lines
4. **[REMOVED FROM DOCUMENT AS INFORMATION IS CRITICAL ENERGY INFRASTRUCTURE INFORMATION]**Differential protection scheme improvements between Talbot and BPA Maple Valley
5. Aging infrastructure improvements (relays, control house, steel bus, copper differential scheme)

2.4. Planner's Assumptions:

1. Bus improvements are within the existing fence footprint
2. Improvements are complete prior to E230kV lines.
3. Phase reactor in BPA Maple Valley yard is removed and breakers and protection schemes upgraded prior to closing the Talbot 230kV bus.
4. Construction work can be phased to prevent a complete outage of Talbot.
5. New bus configuration will remove outage contingencies
6. New bus configuration allows flexibility in operating the station. 230kV line paths not being broken.
7. Existing and future 230kV lines can be constructed without crossing each other.

2.5. Alternatives

1. Eastside Make Ready work only. Not feasible.
2. Main and Aux Bus Arrangement
3. Breaker and a half configuration
4. Separate North and South 230kV DBDB.
5. Convert to a DBDB arrangement with the CLR phase reactors or line reactors. (Selected option)

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2.6. Scope:

Work Completed – Phase 1 (North Bus)

- Constructed a new control house, move the 230kV new relays, panels, and station battery (115kV remain in existing control house)
- Converted the existing split 230 kV main bus to a double bus double breaker arrangement
- Replaced existing lattice dead end towers for both 230 – 115 kV transformers with new tubular steel dead end structures.
- Replaced existing lattice dead end towers and cross beams with new tubular steel dead end structures at all line bays ZZ, A, B, C,D,E,F,G,H,J. These structures now hold two new 230 kV line disconnect switches and three phase CVTs
- Installed new 230 kV 3000 A breakers, relay packages and disconnect switches on the existing main bus at Bay C and Bay G for the BMA-TAL #1 & #2 lines.
- Installed new disconnect switches on the existing main bus for line bays B, C, D, E, G, H.
- Installed new 230 kV 3,000 A breakers, new relay packages and disconnect switches on the new east bus for all line bays ZZ, A, B, C,D,E,F,G,H,J
- Replaced the all yard rock in the 230 kV yard (approximately 50% of yard).
- Reinforced fence security hardware, barbwire, and tension wire on the entire substation fence.
- New drainage in 230 kV yard.
- New conduit, cable trench, and cable for all 230 kV equipment.
- Replaced existing 230 kV ground grid on north side.
- Replaced existing substation perimeter ground.
- Replaced/refurbished 5-foot wide yard rock shoulder around substation north side.
- Upgraded substation security.

At Gate 3 (End of Design Phase) – Phase 2 (South Bus)

- New foundations for the south half of the substation (south bus), transformers, breakers, switches, drilled pier foundations for DE towers, in the south half of the yard, one RIC, - TAL, BER – TAL, BPA Maple Valley – TAL #1 and BPA – Maple Valley #2 ,
- New drainage in 230 kV yard for south half
- New conduit, cable trench, and cable for all 230 kV equipment.
- Reroute PSE Network Fiber
- Replace existing 230 kV ground grid on south side.
- Finish substation driveway entry which is the last 25' toward the ROW gate on the road. The gate is already in PSE's possession. The road frontage work will be a fee in lieu of or PSE may be required to perform this improvement as part of the City of Renton permit.
Upgrade substation security for compliance with the status change to NERC site requirements.

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- Remove the existing bus differential scheme that is tied with the BPA breaker. The copper wire has been dug up in the past. Depending on which wire is severed this would clear one or both of the 230kV busses. Using fiber optics removes this contingency, as the scheme will automatically switch to backup protection.
- Install 6 current limiting reactors (CLR) just east of the Talbot Hill fence line on PSE property. These CLRs are part of the mitigation for BPA to close in the bus on Talbot to operate the DBDB configuration. Without these CLRs, closing in the bus will essentially cause a bypass of BPAs CLRs and increase the potential for damage to their system should a fault scenario occur.

2.7. Project Assumptions:


1. BPA Maple Valley Substation will not need to replace breakers on their end of the line but they will need to upgrade their relays to meet our project schedule and PSE would be cost sharing of 50% - ~\$250,000 estimate. This work on the BPA side will require outages on BPA's, the schedule is uncertain.
2. Metering with SCL can be used in the new breaker and not moved out on the transmission line.
3. Pre-characterization of soils at Talbot to identify contaminants will be minimal to lessen handling, excavation and disposal quantities.
4. Permits can be obtained. This work is being permitted separately from the E 230 kV project.
5. The current limiting reactors will be on a separate permitting request.
6. For Phase II, a substantial portion of the station will still be energized so safety watch support will be needed for the civil contractor.
7. Outages to rebuild bus sections can be given and with the appropriate amount of time to rebuild

2.8. Project Constraints:

1. BPA and PSE are working collaboratively to resolve phase reactor issues in their system. The current solution will be to install two-ohm, air-core CLRs to minimize the issues. This must be installed prior to energizing the new 230 kV lines from RIC. Permitting for this project component could create challenges for the issued overall Talbot Hill Re-build project.
2. Seattle City Light has a 230kV line into Talbot. Need to address and resolve any issues with them prior to construction including metering.
3. Required grading for bus rebuild will require a Grading License. The License process includes a public hearing. This is resolved, PSE has the license.
4. Building Permit has conditions, which include frontage improvements (sidewalks, sewer, water,..). PSE is seeking clarification from the City of Renton as to the requirement for this.
5. Construction will be limited to May to September to avoid prolonged outages. North bus rebuild was about 65% of the construction. South bus scope includes 5 bays and the remaining 35%.

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6. Permit condition allows for typical day-time work hours.
7. Material Lead Time – all long-lead items are ordered and scheduled to arrive on time.
8. Outages need to be requested and coordinated with other projects within the two year construction window. Requests have been submitted.

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Section 3. Budget and Schedule Milestones

3.1. Estimated Budget

Assumptions:

1. BPA contingency estimated at \$2,000,000. Assumed PSE would be required to resolve the CLR issues and BPA relay replacements.


Planning Estimate						
	Actual Costs through 2015	2016	2017	Current Year 2018	2019	Total Lifetime
Capital	\$0	\$0	\$0	\$0	\$0	\$16,400,000
Expense	\$0	\$0	\$0	\$0	\$0	\$0
90% Design Estimate						
	Actual Costs 2015	Actual Costs 2016	Actual Costs through 2017	Current Year 2018	2019	Total Lifetime
Phase (at year end)	<i>Development</i>	<i>Engineering</i>	<i>Construction</i>	<i>Construction</i>	<i>Construction</i>	
Capital	\$234,149	\$2,524,370	\$13,238,187	\$6,322,444	\$5,179,356	\$27,498,506
Expense	\$0	\$0	\$0	\$0	\$0	\$0
Estimate to Completion (ETC)		\$27,498,506				
Risk Contingency (15%)		\$4,124,776				
Note: Estimate accuracy is \$1.72 - 3.68M (-10% to +15%) based on ETC						

PROJECT PLAN DEVELOPMENT PHASE: CONTINGENCY = N/A, RANGE = -30% TO +50%

DETAILED ENGINEERING PHASE: CONTINGENCY = 15%, RANGE = -20% TO +30%

PROCUREMENT PHASE: CONTINGENCY = 10%, RANGE = -5% TO +15%


CONSTRUCTION PHASE: CONTINGENCY = 5%, RANGE = -2% TO +5%

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Project Estimate vs. Actual Summary				
Gate	Planning/ Gate 2	Gate 3	Gate 4	Actual
Year Completed	20XX	20XX	20XX	
Est. Lifetime Capital	\$1	\$1	\$1	\$1
Est. Lifetime Expense				
Capital % Delta				
		0.00%	0.00%	#REF!
Capital % Delta to Planning Estimate				
		0.00%	0.00%	0.00%

3.2. Milestones and Deliverables

Milestones and Deliverables	Description	Schedule Baseline Date	Approximate Date
	Feasibility	8/15	
	Develop Project Plan	12/15	
	Detailed Design	2/2016	
	Order Material		
	230kV Breakers	2016	
	Steel	9/2016	
	CT/PT Combo	2016	
	Disconnect Switches	2016	
	Permitting		
	Control House		
	Demo Permit	1/2016	
	Building Permit	2/2016	
	North and South Bus		
	Clear and Grade License	2/2016	
	Construction		
	Control House	08/2016	
	North Bus	10/2017	
	South Bus	10/2018	
	Current Limiting Reactors	08/2019	
	Commissioning Complete	2018	
	Project Close-Out Complete	2019	12/31/2019

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Section 4. Engineering Baseline Scope

4.1. Transmission/Distribution

Line route

Talbot Hill Double-Bus, Double-Breaker – South Bus (Phase 2)

Voltage

230kV

Special considerations

BPA Maple Valley – Talbot Hill #1 230kV will need to be disconnected and the conductor removed, likely by Potelco. The 230kV deadend tower will be reframed to accommodate the new angle on the pole when the line is moved from bay SS to bay PP (Talbot Hill Ultimate Layout).

BPA Maple Valley – Talbot Hill #2 230kV will need to be disconnected and the conductor removed, likely by Potelco. The 230kV deadend tower will be reframed to accommodate the new angle on the pole and the line move from bay WW to bay SS (Talbot Hill Ultimate Layout). A new 230kV steel pole will be installed between the deadend tower and the deadend in the substation. This work will occur at the end of Phase 2 once the CLR issue has been resolved, but before the Energize Eastside 230kV lines are landed at Talbot Hill.

Talbot Hill – Berrydale #3 Temporarily removed (rolled back). The tower will be reframed to accommodate the new angle of the conductor when it is reconstructed to the new bay (Talbot Hill Ultimate Layout). The existing conductor will be re-strung to the new DE tower. The associated OPGW/Network Fiber will be removed, rolled back and re-routed to a UG as ADSS and through a vault and into the substation control house via new duct and vault.

There are also Fiber network ties to BPA that may need to be re-configured for this work. Scope to be determined.

4.2. Station

Type of Station/Description

230kV Substation Rebuild- north and south bus to double bus – double breaker configuration

Property


Existing Talbot Hill Substation Property

Special Considerations

N/A

Security

[REMOVED FROM DOCUMENT AS INFORMATION IS CRITICAL ENERGY INFRASTRUCTURE INFORMATION]

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Consultant/Design Contractor

N/A

4.3. Equipment/Materials

Long Lead Items

Switches, breakers, dead-end steel, control house, Current Limiting Reactors

Special considerations

n/a

Consultant/Design Contractor

Power Engineers has been commissioned to design the CLRs

4.4. Protection & Controls


Narrative...

4.5. Special considerations

Narrative...

4.6. Consultant/Design Contractor

Narrative...

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Section 5. Permitting and Real Estate Strategy

5.1. Permitting Jurisdictions Impacted

1. City of Renton

5.2. Permits Needed

1. Demolition Permit
2. Building Permit (frontage improvement requirement)
3. Grading License

5.3. Permitting Special Considerations

The quantity of fill requires a Grading License which has a public hearing associated.

Another CUP will also be needed for the CLR project.

5.4. Easements Needed

NA

5.5. Condemnation


NA

5.6. Real Estate Special Considerations

BPA owns the permit for the transmission OH crossings over Seattle Public Utilities between Talbot Hill substation and BPA Maple Valley substation. PSE will need to amend these crossing permits with SPU in coordination with BPA.

5.7. External Consultants

Power Engineers - CLRs

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Section 6. Communications Strategy

6.1. Project External Stakeholders

1. City of Renton
2. Seattle Public Utilities
3. Bonneville Power Administration

6.2. Public Relations/Corporate Communications Strategy


1. The permitting for the Talbot Hill substation rebuild was broken out of the Energize Eastside project as it can be considered a standalone project that needs to be completed for system reliability. There have been questions regarding this decision from the City of Renton and why it is not included in the EIS.

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Section 7. Coordination with Other Projects

[Insert a paragraph describing coordination with other internal or external projects]

Talbot Hill 230kV South Bus Re-build (Phase 2) needs to be coordinated with the Talbot – Paccar 115kV re-build project during Q3 and Q4 of 2018. The Load Office is not comfortable having both the South Bus out, BPA Maple Valley #1 and #2, Talbot Hill – Berrydale #3 and Talbot – Paccar out at the same time for long durations. The Talbot – Paccar project was tentatively scheduled to begin at the beginning of September, immediately following the substantial completion of the Talbot Hill Phase 2 project at the end of September 2018 with the two projects having short duration outage overlaps. However, as of July 2018, TAL-PCR has been deferred due to extreme delays in WSDOT permitting.

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Section 8. Summary of Risk Assessment and Mitigation Plan

[List significant risks and opportunities for each phase of the project, which Project Team assessed with more likelihood of occurring and include brief description of mitigation strategies]

8.1. Risks and Opportunities

Design and Scope Change Risk

Control House Building Permit

Environmental and Permitting Risk

Control House Building Permit

Frontage improvement requirements attached to Phase 1 building permit

Grading License Public Hearing

CLR CUP and clear and grade permits

Political and Other External Influences Risk

Demolition of old oil building

Concern that CLR permitting will be associated with Energize Eastside

Third Party Utilities Risk

Bonneville Power Administration

- CLR installation and grounding study

Seattle City Light

Seattle Public Utilities

- Grounding study and potentially CLRs

Construction Risk

Demolition of old oil building


Work within an energized substation

Copper differential connecting Maple Valley to Talbot ground grids is very close, if not in potential conflict with footprint of south CLR foundation.

8.2. Mitigation Plan

Permitting Mitigation

The project team had to meet with high ranking staff at the City of Renton just prior to the mobilization of Phase 1 due to a misunderstanding of the building permit requirements for


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the control house. The resolution/mitigation was that PSE would construct frontage improvements per city code and as required by the permit at a later date. Conversations are on-going with the City and PSE Government Affairs staff to determine whether the better option is to contribute funds to the fee in lieu program rather than building the frontage improvements. The reason for this is that the improvements would essentially be “islanded” in that they would not be connected on either end to any existing frontage improvements, leaving potentially dangerous bike lanes and sidewalks in place that end in road shoulder. Additionally, the City of Renton has a capital project planned in the next ten years to fully construct multi-modal transportation and drainage improvements at this location that will fully connect to existing infrastructure. The project will likely result in PSE’s frontage improvements being demo’d and rebuilt to match the design the City will eventually develop. It is the project team’s opinion that the roughly estimated \$400,000 frontage improvement would be better served as a fee in lieu where those dollars can be applied to the City’s project in the near future, rather than an independent throwaway project.

Close coordination with the City, BPA and SPU will be required for the CLR permitting. Well defined project scope will need to be communicated with City staff to emphasize that this is not part of Energize Eastside.

Construction Mitigation

Accurate locates and potholing of the copper differential cable during construction of the CLRs (Talbot Hill Phase III). Close coordination with BPA when working around that cable.


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Approved By:

System Planner		Date
David Meyer		
Project Manager		Date
Kelly Purnell		
Project Engineer		Date
Alison Klima		

Appendices


- Appendix A. Project Team
- Appendix B. Work Order Structure
- Appendix C. Planner Estimate and Assumptions
- Appendix D. 10-Year Plan
- Appendix E. Project Change Request (PCR) History Log
- Appendix F. Estimated Costs
- Appendix G. Current Schedule
- Appendix H. Risk Assessment and Risk Management Report
- Appendix I. Project Change Approval Record (CAR) Log
- Appendix J. Lessons Learned Document
- Appendix K. Maps

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Appendix A. Project Team

Current Project Team	
Name	Role Description
Alison Klima	Substation Electrical Engineer
Chris Russell	Substation Civil Engineer
Kerry Kriner	Municipal Land Planner
Ryan Wieder	Transmission Engineer
Louis Tibbs	System Protection
David Meyer	System Planning
Dan Morman	Metering and Controls
Jeremy Deibell	Project Controls
Cody Spence	Construction Management
Pete Maxwell	Supervisor Substation Operation SK
Joel Snow	IT PM
Phil Moran	Corporate Security
Darryl Walker	Supervisor Substation Meter/Relay
N/A	Vegetation PM
Erik Olson	Transmission Contracts
Sunitha Kothapalli	System Planning
Pete Jones	Transmission Contracts
Kelly Purnell	Project Manager

Past Project Team Members		
Name	Role Description	Date Involved
Charlene Reyes	Metering and Controls	2014-2015
Doug Long	Project Manager	2014-2015
Josh Peavler	Substation Electrical Engineer	2014-2016

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Past Project Team Members		
Name	Role Description	Date Involved
Rob Stewart	Substation Civil Engineer	-
Brad Strauch	Municipal Land Planner	2014-2017
Andrew Lightfoot	Transmission Engineer	2014-2016
Dean Holsberry	Project Controls	2014-2015
Stan Haralson	Vegetation PM	
Eleanor Ewry	Transmission Contracts	
Carol Jaeger	System Planning	
Molly Reed	Project Manager	2015-2017
Wayne Harris	Transmission System Planning	2016 (?) - 2018

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Appendix B. Work Order Structure

[Include WBS, Notifications, and WO#'s]

9/06/2016 - Talbot Hill 230kV Double Bus - Double Breaker

Leading order	Sub1	Sub2	Order type	MAT code	FuncLoc	UMAP/Description	Notification#	WBS element	Tax Jurisdiction	Basic start date*	Basic finish date	Brief scope of work
111022315			CET1	TSI	TSB-TAL	2305E077 Talbot Hill 230kV Double Bus Double Breaker North Bus	111021857	P.10004.10.03.16.01.11	WA11700250	4/1/2017	12/30/2017	Rebuild North 230kV Bus
	111022316		CET1	ZPC	TSB-TAL	2305E077 Talbot Hill 230kV Double Bus Double Breaker North Bus Pre Con		P.10004.10.03.16.01.11				
	141022881					Talbot Hill Subs IP SCADA - HW		P.10004.10.03.16.01.11				
		141002886				Talbot Hill Sub CMM		P.10004.10.03.16.01.11				
		141002887				Talbot Hill Sub FIB		P.10004.10.03.16.01.11				
	108094887		CED3		TSB-TAL	2305E077 Talbot Hill 230kV North Bus Removal		P.10004.10.03.16.01.11	WA11700250	4/1/2017	12/30/2017	
	111		CET1	TSI	TSB-TAL	2305E077 Talbot Hill Landscape		P.10004.10.03.16.01.11	WA11700250	9/6/2016	12/30/2017	
111023022			CET1	TSI	TSB-TAL	2305E077 Talbot Hill 230kV Double Bus Double Breaker South Bus		P.10004.10.03.16.01.11	WA11700250	4/1/2018	12/30/2018	Rebuild South 230kV Bus
	111023023		CET1	ZPC	TSB-TAL	2305E077 Talbot Hill 230kV Double Bus Double Breaker South Bus Pre Con		P.10004.10.03.16.01.11	WA11700250	3/16/2016	3/31/2018	
	108094888		CED3	ZTR	TSB-TAL	2305E077 Talbot Hill 230kV South Bus Removal		P.10004.10.03.16.01.11	WA11700250	4/1/2016	12/30/2018	
111023024			CET1	TSI	TSB-TAL	2305E077 Talbot Hill 230kV Control House		P.10004.10.03.16.01.11	WA11700250	6/1/2016	12/30/2016	Build new control house
	111023065		CET1	ZPC	TSB-TAL	2305E077 Talbot Hill 230kV Control House Pre Con		P.10004.10.03.16.01.11	WA11700250	3/15/2016	5/31/2016	
	108094889		CED3	ZTR	TSB-TAL	2305E077 Talbot Hill Removal of Oil Building		P.10004.10.03.16.01.11	WA11700250	6/1/2016	12/30/2016	Remove existing building
	571012918		E571	L15	TSB-TAL	2305E077 Talbot Hill OMRC		P.10004.10.03.16.01.12	WA11700250	6/1/2016	12/30/2016	

Talbot Hill Distribution Poles – Transformer Removal (PHASE I work)

Order type	MAT code	FuncLoc	UMAP/Description	Notification#	WBS element	Tax Jurisdiction	Basic start date*	Basic finish date	Brief scope of work
CED1	OPR	ROL-16	2305E077 Talbot Hill Distribution Pole Relocation	11336216	R.10005.01.01.02		10/3/2017	10/31/2017	Relocate pole
CED3	OPT	ROL-16	2305E077 Talbot Hill Distribution Pole Removal		R.10005.01.01.02		10/3/2017	10/31/2017	Remove Pole
E593	E593-L10	ROL-16	2305E077 Talbot Hill Distribution Pole Transfers		R.10005.01.01.11		10/3/2017	10/31/2017	Wire transfer work
		ROL-16	2305E077 Talbot Hill Retire OH Transformer				10/3/2017	10/31/2017	Retire OH transformer

Talbot Hill Frontage Improvements

Leading order	Sub1	Sub2	Order type	MAT code	FuncLoc	UMAP/Description	Notification#	WBS element	Tax Jurisdiction	Basic start date*	Basic finish date	Brief scope of work
111023191						2305E077 Talbot Hill 230kV Double Bus Double Breaker						
	111023676		CET1	CET1-TSI	TSB-TAL	2305E077 Talbot Hill Frontage Improvements		R.10005.01.01.11	WA11700250	5/10/2017	5/12/2017	Frontage improvements driven by permit conditions



Project Implementation Plan

Talbot 230kV Bus Improvements

Reviewed as of 7/25/18

Talbot Hill T-Line Phase 1 – TAL – BER #1

Leading order	Sub1	Sub2	Order type	MAT code	FuncLoc	UMAP/Description	Notification#	WBS element	Tax Jurisdiction	Basic start date*	Basic finish date	Brief scope of work
111022315			CET1	CET1-TPR	TSB-TAL	2305E077 Talbot Hill 230kV North Bus Rebuild		R.10005.01.01.02	WA11700250	4/1/2017	5/30/2017	
	111023590		CET1	CET1-TPR	TLN-025	2305E077 Talbot Hill 230kV Berrydale #1 Line Relocate		R.10005.01.01.02	WA11700250	4/6/2017	5/30/2017	Install 8 new poles
		108100450	CED3	CED3-OPT	TLN-025	2305E077 Talbot Hill 230kV Berrydale #1 Line Remove Poles		R.10005.01.01.02	WA11700250	4/6/2017	5/30/2017	Remove 8 old poles
		571014328	E571	E571-L33	TLN-025	2305E077 Talbot Hill 230kV Berrydale #1 Line Misc Line Work		R.10005.01.01.11	WA11700250	4/6/2017	5/30/2017	

Talbot Hill T-Line Phase 1


Leading order	Sub1	Sub2	Order type	MAT code	FuncLoc	UMAP/Description	Notification#	WBS element	Tax Jurisdiction	Basic start date*	Basic finish date	Brief scope of work
111022315			CET1	CET1-TPR	TSB-TAL	2305E077 Talbot Hill 230kV North Bus Rebuild		R.10005.01.01.02	WA11700250	4/1/2017	5/30/2017	
	571014198		E571	E571-L33	TLN-161	2305E077 Talbot Hill 230kV Transmission Line Disconnect Talbot Hill-SCL South		R.10005.01.01.11	WA11700250	4/6/2017	5/30/2017	
	108099385		E571	E571-L33	TSB-TAL	2305E077 Talbot Hill 230kV Transmission Line Disconnect Talbot Hill-Bank #2		R.10005.01.01.02	WA11700250	4/6/2017	5/30/2017	
	571014243		E571	E571-L33	TLN-161	2305E077 Talbot Hill 230kV Transmission Line Disconnect Talbot Hill-O'Brien #3		R.10005.01.01.11	WA11700250	4/6/2017	5/30/2017	
	571014244		E571	E571-L33	TLN-057	2305E077 Talbot Hill 230kV Transmission Line Disconnect Talbot Hill-BPA Maple Valley		R.10005.01.01.11	WA11700250	4/6/2017	5/30/2017	

Talbot Hill – Phase 2 T-Line Disconnect/Reconnect

Leading order	Sub1	Sub2	Order type	MAT code	FuncLoc	UMAP/Description	Notification#	WBS element	Tax Jurisdiction	Basic start date*	Basic finish date
111023023			CET1	CET1-TPR	TSB-TAL	SOUTH BUS		R.10005.01.01.02	WA11700250	4/1/2017	12/31/2018
	571014966		E571	E571-L15	TLN 095	2305E077 Talbot Hill 230kV Transmission Line Disconnect/Reconnect Talbot Hill - BPA Maple Valley #1		R.10005.01.01.11	WA11700250	4/1/2017	12/31/2018
	571014967		E571	E571-L15	TLN 057	2305E077 Talbot Hill 230kV Transmission Line Disconnect/Reconnect Talbot Hill - BPA Maple Valley #2		R.10005.01.01.11	WA11700250	4/1/2017	12/31/2018
	111024085		CET1	CET1-TPR	TLN 057	2305E077 Talbot Hill 230kV Transmission Line New 230kV transmission pole Talbot Hill - BPA Maple Valley #2		R.10005.01.01.02	WA11700250	4/1/2017	12/31/2018
	571014968		E571	E571-L15	TLN 170	2305E077 Talbot Hill 230kV Transmission Line / Disconnect-Reconnect Berrydale 230kV		R.10005.01.01.11	WA11700250	4/1/2017	12/31/2018


Talbot Hill – Phase 3 Current Limiting Reactors

Leading order	Sub1	Sub2	Order type	MAT code	FuncLoc	UMAP/Description	Notification#	WBS element	Tax Jurisdiction	Basic start date*	Basic finish date	Brief scope of work	Expected units of property **
111023023			CET1	CET1-TPR	TSB-TAL	2305E077 TALBOT HILL 230KV DOUBLE BUS DOUBLE BREAKER SOUTH BUS		R.10005.01.01.02	WA11700250	4/1/2017	12/31/2018		
	111024153		CET1	CET1-TIM	TLN 095	2305E077 Talbot Hill 230kV Transmission Line Disconnect/Reconnect Talbot Hill - BPA Maple Valley #1		R.10005.01.01.02	WA11700250	4/1/2018	6/1/2019	install new Current Limiting reactors	3
	111024154		CET1	CET1-TIM	TLN 057	2305E077 Talbot Hill 230kV Transmission Line Disconnect/Reconnect Talbot Hill - BPA Maple Valley #2		R.10005.01.01.02	WA11700250	4/1/2018	6/1/2019	install new Current Limiting reactors	3

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Appendix C. 10-Year Plan


Talbot 230 kV Improvements CEA Document 8-12-15

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Appendix D. Corporate Spending Authorization History Log


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PIP - Scope\CSA**

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Appendix E. Cost Report

**Eastside_230kV_Project:\103 Budget\1 Proj Cntrls\1 Cost Reports\2017 CR\EE
 Subs\R.10005.01.01.02 E-EASTSIDE 230KV SUBS-TALBOT HILL**

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Appendix F. Current Schedule

Civil Bid Package

- Substation civil bid/construction package is complete – February 26, 2018
- Advertisement civil bid package – February 27 – March 2, 2018
- Civil bids due to PSE – March 23, 2018
- Civil bids review by PSE – March 26 - March 28, 2018
- Civil substation contract award – March 30, 2018
- NTP – April 2, 2018

Preliminary Construction:

- Potelco to disconnect BPA Maple Valley Lines #1 and #2 and Talbot Hill – Berrydale #3 230kV line – April 2, 2018 (duration approximately 2 weeks)
- South King Substation crew to demo existing steel – April 16 – March 2, 2018
- Contractor to demo existing foundation and cut down the yard by 13”, install SPCC curb, pour foundations, drilled-pier foundations – March 5 – April 27, 2018
- South King Substation crew to construct all electrical assembly - April 30 – August 10, 2018
- Potelco to reframe BPA deadend towers, string new conductor and reconnect BPA Maple Valley Lines #1 and #2, and Talbot Hill – Berrydale #3 230kV line, and string new OHGW – August 10 – August 31, 2018

Outage Schedule:


- Talbot Hill 230kV South Main Bus – April 2 to September 28 (?), 2018
 - BPA Maple Valley - Talbot Hill #1 230kV Line
 - Talbot Hill - Berrydale #3 230kV Line
 - Talbot Hill Bank #1 230/115kV Transformer
- Talbot Hill 230kV West Main Bus (no lines out) – July 30 – September 28(?), 2018
- Talbot Hill 230kV East Main Bus – October 27, 2017 – July 30, 2018 (~1 year duration – carryover from Phase 1)



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Talbot Hill CLR's (Phase III)

- 60% civil design – August 20, 2018
- Procurement Q4 2018
- Construction Q3 2019

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Appendix G. Risk Assessment and Risk Management Report

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**Appendix H. Project Change Approval Record
(CAR) Log**

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Appendix I. Lessons Learned Document


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Appendix J. Maps


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30% Design

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Preliminary Ultimate Layout

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