



Spurgeon Creek Distribution Substation and Switching Station

Implementation Plan

2017

CURRENT OWNER: Peter McKenzie


	Puget Sound Energy	Rev 1.6
	Project Implementation Plan	Spurgeon Creek Substation and Switching Station Reviewed as of 12/8/2017

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Section 1. Document Revision History and Chronological Summary

1.1. Document Revision History

Revision	Date	Description	Phase
0.0	07/01/09	Initiate document based on scoping documents from TESP	Project Plan Development
0.1	06/28/10	Scope and Schedule changes	Project Plan Development
1.0	7/1/10	Approved Gate 3 PCR PIP	Project Plan Development
1.1	07/20/12	Project Manager change to Doug Long	Project Plan Development
1.2	08/02/12	PIP updated per recent 5 year budget and scope	Detailed Engineering
1.3	10/17/12	Update per Need, Milestones, Permitting, and Community Relations changes	Detailed Engineering
1.4	7/15/13	Cost Estimates updated; additional clarity on alternatives.	Detailed Engineering
1.5	12/6/13	Updated Chronological Summary	Detailed Engineering
1.6	12/8/17	Project Completion Summary	Project Completion

1.2. Chronological Summary


2010 – Lack of growth in Thurston County has required that this project be deferred.

- a. Stop substation Civil and electrical engineering at 60% level
- b. Submit drainage plan for review by jurisdiction
- c. Continue transmission engineering of loop-thru design and additional lines

2011 – Continued lack of growth in County – project deferred

- a. Community meetings
- b. Complete remaining substation engineering to 90%
- c. Complete new transmission line engineering; decide on 3 additional routes

2012 – Corporate budget decisions and Electric Planning priority has deferred construction for 2012.

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- a. Substation engineering completed. Since project was deferred, engineering would eventually need to be redesigned.
- b. Metal Clad and MPAC buildings put out for bid. No MPAC was purchased at this time.
- c. Remaining transmission line routes determined.
- d. Long lead materials ordered (Dead End Tower).

2013 – Corporate budget decisions and Electric Planning priority has deferred construction for 2013.

- a. Complete Metal Clad and MPAC building design for bid.
- b. Land Planning indicated a CUP will be required for the Switch Station Electric Assembly. Will begin permitting for this in 2014.

2014 – Project was deferred

2015 – Project received approval of \$3.6 million funds for civil only construction.


- a. Complete all clearing and grading
- b. All foundations up to anchor bolts, conduits, and ground grid completed. Drill new well
- c. Electrical assembly drawings complete
- d. Go out for bid for MPAC building

2016 – Project received approval of \$5.7 million funding for electrical assembly

- a. Substation fence installed
- b. Purchase MPAC
- c. Top course gravel put in at substation
- d. Complete DE Tower installations
- e. Build out breaker and a half scheme with two rungs
- f. Metal Clad and MPAC building installations

2017 – Project was delayed in 2016 and significant items carried over into 2017

- a. Transmission and Distribution Line connections
- b. Finalize Fiber connections and Metal Clad Power
- c. Energization and Point to Point testing

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Section 2. Project Overview

2.1. Purpose:

There is a need to develop a new switching substation in Olympia area to reduce transmission outage impacts to a large customer base. At present more than a 3rd of the 120,000 customers in Thurston County are served by two transmission lines between Olympia and St Clair substations. Spurgeon Creek is one of two transmission switching substations planned for Olympia / Lacey area that will not only limit outage exposure to fewer customers but also set the frame work to establish a more redundant power supply transmission network for the county.

Spurgeon Creek is to be developed at a site that is large enough to accommodate a capacity driven new distribution substation and a transmission switching substation to interconnect 3 transmission segments that serve 28,000 customers. This project will also allow an interconnection with BPA Olympia to mitigate future NERC compliance requirements.

Project Objectives:

1. Increase distribution substation capacity in the Olympia / Lacey area of Thurston County by 2013-2014 timeframe.
2. Develop a new transmission switching substation to reduce outage risk to 25,000 customers in the Lacey / Olympia area by 2015.
3. Set the stage to establish a third interconnection to BPA Olympia 115 kV to meet future NERC compliance requirements.

2.2. Need Statement:


2.2.1 Capacity

The Olympia / Lacey area was served by Southwick, Patterson, Chambers and Lacey substations. Growth was estimated at about 1% in these areas, customer usage was approaching a utilization target where a new substation was required by 2013. In 2004, the transformer capacity of Southwick Substation was upgraded from 20 MVA to 25 MVA to delay a larger capital outlay that would have been required to develop a new substation site. This upgrade increased the winter load-carrying capability by a net 7 MW and deferred the need for a new substation by about 8 years.

2.2.2 Reliability

The development of a switching station was needed to provide the interconnection of several 115 kV transmission lines to create an efficient power flow distribution in central Thurston County. Previously, PSE's Olympia and St. Clair transmission stations provide the terminus hub for several transmission lines serving the county.

About half of the 120,000 customers in the county are served from 12 substations on three (3) 115 kV transmission lines between the Olympia area and St. Clair. Spurgeon Creek was

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one of two transmission stations that were planned to split these lines and reduce the number of customers served from each 115 kV line. Hoffman Switching Station is a second long-range project in the 10-year Plan scheduled to be in-service at some point in the future.

2.2.3 Future Compliance

With Saint Clair 230 kV in service 2014, N-1-1 compliance will still remain an issue for Thurston County bulk power supply system as shown in the Do Nothing Risk Table. This project has set the transmission frame work where a 3rd 115kV transmission interconnection with BPA Olympia can be established to mitigate this problem in the near term.

2.3. Benefits:

Quantitative

1. A switching substation, co-located with the distribution substation, is \$6-10M less expensive than standard looped distribution built with Switching Station in another location.
2. Additional cost savings, estimated to be \$25M, will be realized because the property acquired will accommodate 12.5 kV, 115 kV, and future 230 kV.

Qualitative


1. Meets PSE long range plan to serve a growing customer base in the area and improve reliability.
2. Proximity to BPA 230 KV transmission, approximately 0.5 mile.
3. Provides interconnection of several 115 kV transmission lines to create an efficient power flow.
4. Provides a new 230 kV delivery point for the county over the long term.

2.4. Planner's Assumptions:

1. Land is available for purchase.
2. Permits can be obtained.
3. Easements can be obtained for several transmission lines.
4. Thurston County PUD Initiative is defeated.

2.5. Alternatives

1. Defer Transmission.
 - a. Limit development of Spurgeon Creek to a standard looped distribution substation. Prepare site for ultimate plan and defer transmission switching station to future years.
 - b. Rejected due to:
 - i. Delays transmission reliability benefits.
 - ii. Potentially increased transmission easement acquisition difficulty and costs in the future.

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2. New 230 kV Site Option.
 - a. Develop a 230 kV transmission substation at an undetermined location in the future when needed.
 - b. Rejected due to:
 - i. Delay in committing to a site presents a risk of not finding another suitable site.
 - ii. Does not provide for a long term staged plan.

2.6. Scope:

At Gate 3

1. Purchase property to build a new substation in the general area of the existing Blumaer-St Clair 115 kV line.
2. Build a new 115 kV- 25 MVA substation with seven 115 kV circuit breakers, 115/12.5kV 25 MVA transformer with TLC.
3. Loop the existing Blumaer-St Clair 115 kV line. This will be done concurrent with the substation project.
4. Site prep the entire property and establish foot print for the ultimate plan; includes 230 kV transformation, 115 kV switching, and two (2) 25 MVA distribution transformers.
5. Extend the Olympia-Airport Substation Tap to Spurgeon Creek Switching Station.
6. Loop the Olympia-St Clair #1 115 kV line into Spurgeon Creek Switching Station. This takes place at two locations and one line becomes the Olympia-Spurgeon 115 kV line and the other becomes the St Clair-Spurgeon #1 115 kV line.
7. Set provisions for future connection to Tono/Yelm (these improvements will significantly upgrade the Thurston County transmission system and provide the T&D needed to support future growth over the long term).

At Gate 4

1. Separate construction into two packages: Civil and Electrical Assembly

At Gate 5


1. Project Completion

2.7. Project Assumptions:

1. No material shortages or delays in long lead items – Metal Clad, MPAC. This was the only assumption that did not prove true, the MPAC delivery was delayed over 6 months and cause the project to continue into 2017

2.8. Project Constraints:

1. The project has been completed

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Section 3. Budget and Schedule Milestones

3.1. Final Costs

Category:	Previous Years	2016	2017	Lifetime Costs	
Capital (incl. contingency)	\$8,132,228	\$6,369,256	\$912,862	\$15,414,346	
Project O&M	\$0	\$0	\$0	\$0	
OMRC (T&D only)	\$0	\$6,206	\$7,541	\$13,747	
Ongoing O&M	\$0	\$0	\$0	\$0	
Cash O&M Benefits	\$0	\$0	\$0	\$0	

3.2. Milestones and Deliverables

Milestones and Deliverables	Description	Schedule Baseline Date	Approximate Date
	Feasibility	6/13/05	3/1/06
	Property Purchase	5/26/06	5/26/06
	Develop Project Plan	3/1/06	1/1/08
	Detailed Design	6/28/07	5/13/15
	Order Material and Permitting	9/24/07	1/30/14
	Construction:	6/23/08	-
	Civil	-	7/13/15
	Electrical Assembly	-	4/4/16
	Commissioning Complete	7/7/08	6/2017
	Project Close-Out Complete	7/23/08	7/2017

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Section 4. Engineering Baseline Scope

4.1. Transmission/Distribution/High Pressure/Intermediate Pressure

Line route

1. Blumaer-St Clair – looped-thru new station to energize new bank
2. Future: Airport – also called Olympia #2, approximately 7.5 miles, over-build the existing distribution
3. Future: East (Olympia-St Clair) - also called Olympia #1, approximately 2.0 miles, may require Wetland permit (to Yelm Highway via Rainier Rd.)
4. Future: West (Olympia-St Clair) – also called St Clair #2, approximately 3.0 miles (to Yelm Highway via Rich Rd.)

Voltage

1. Voltage – 115 kV, 1272 conductor, 100-degree Celsius line rating

Special considerations

1. Double circuit may be necessary but NOT preferred
2. Thurston County follows DOT guidelines for Clear Zone requirements; less than 35 mph does NOT require any CZ.
3. BPA steel towers clearance issue

Distribution

1. The distribution system was completed prior to construction of the station. It included the addition of three new circuits to the existing distribution system.
 - a. SPU-11: north from the station to Rainier Rd
 - i. 2700-feet of 3-phase 336 ACSR Tree Wire north on Rainier Rd.
 - ii. 9000-feet of 3-phase 336 ACSR Tree Wire south on Rainier Rd.
 - b. SPU-13 /14: included 1900-feet of 3-phase 336 ACSR Tree Wire along Rich Rd.

Fiber


1. Network/Communications was provided by PSE Telecom via fiber from the existing fiber network in the Olympia area.

Type of Station/Description

1. Transmission station with provision for 325 MVA, 115/230 kV single bank and 230 kV loop-thru design.
2. The 115 kV Switchyard is a breaker and half bus configuration.
3. The Distribution substation is designed for five UG feeders (single bank) and has room to expand for another five UG feeders (second bank).

Property

1. Property purchased in Lacey at 7802 Diagonal Road SE in Olympia, WA.

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Special Considerations

1. One 25 MVA bank plus one future bank (two bay positions)
2. Future 230-115 kV Autotransformer (one bay position)
3. 4.8 MVAR cap bank (one bay position, with room for a second)
4. 230 kV transmission getaways will be challenging to design the routes because of neighborhood concerns.
5. Two sources for station service with provision for a third source
6. Fiber optic lines into the substation

Security

1. Transmission substation security system
2. Surveillance camera
3. Key-card access for automatic-gate

Consultant/Design Contractor

1. David Evans & Associates - civil engineering
2. GeoEngineers – GIS/LIDAR mapping and critical areas
3. HDR – future transmission route study/preliminary engineering
4. Icicle Creek Engineering - Geotechnical Engineering Services
5. Triad Associates – Land survey
6. Johansen Excavating, Inc – Bollard design/installation
7. Pottle and Sons, Inc – Foundation installation
8. Tim’s Well Drilling – Well inspection and testing

4.2. Equipment/Materials

Long Lead Items


1. Order MPAC, one-year in advance of Distribution side work, this did not begin far enough in advance.
2. Order Metal clad, one-year in advance of Distribution side work. It was actually ordered 5 years in advance.

Special considerations

None

4.3. Protection & Controls

1. Special considerations
 - a. Transfer trip

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Section 5. Permitting Strategy

5.1. Jurisdictions Impacted

1. Thurston County
2. City of Lacey
3. WSDOT (Future)
4. BNSF Railroad (Future)
5. BPA – cross under lines in two locations (Future)

5.2. Permits Needed


1. Permits for substation were:
 - a. Grading
 - b. SEPA
 - c. CUP
 - d. NPDES
 - e. Building permits for control house
2. Railroad permits (lateral crossing) will be submitted 6 months prior to transmission line construction (Future)

5.3. Special considerations

None

5.4. Consultant

None

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Section 6. Communications Strategy

6.1. Project External Stakeholders


1. City of Lacey
2. Community of Normandy/74th
3. City of Olympia
4. Thurston County
5. BPA

6.2. Public Relations/Corporate Communications Strategy


The public Relations and Corporate Communications strategy was a large part of this project. External stakeholders and the residential community were important components of the overall project plan.

Below are the various channels we used to communicate the construction activities for this substation.

1. Jurisdictional Requirements
 - a. All jurisdictional requirements were met.
2. Route/site analysis
 - a. The substation property is at the end of a dead end road, with access restricted by bollards, fences, and the railroad to the west.
 - b. The future transmission lines are planned to be overbuild on existing distribution to limit additional poles and disturbance to private property or ROW.
3. Project need, benefit to community
 - a. The area surrounding the substation site is low density residential park. Since it has been built, it can service the growth in the area consisting of commercial/office park and high-density residential plats.
 - b. There was a risk if PSE did not build this substation. The load reading for Southwick Substation had reached the maximum. There were not enough feeders or capacity to support the SWI load if we did not add a new substation nearby.
4. Understanding of community/neighborhood "personality"
 - a. 79th and Normandy community in Thurston County had voiced concerns regarding:
 - The proposed line direction out of the Substation
 - The visual impact of the line
 - The EMF and radiation effects of the line
 - The process to have input on the line
5. Communications plan
 - a. Project update mailer/public meeting invites

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- b. Advisory group invitation mailers
- c. Public meeting to share substation construction schedule, transmission line route selection progress, and plans for advisory group.
- d. Advisory group process

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Section 7. Coordination with Other Projects

The Thurston 230 kV project must be completed prior to the 2016 construction of the St Clair – Spurgeon 115 kV line. This is to ensure an open and ready Bay at St Clair Substation to accept this line. **This project was completed.**

In addition, there is a need to develop a new 230 kV delivery point for the county over the long term. Spurgeon Creek will serve as a future 230 kV delivery point, requiring construction of about 0.5 mile of 230 kV transmission line. This is in the TESP ten year plan.

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Section 8. Summary of Risk Assessment and Mitigation Plan

8.1. Risks and Opportunities

Permitting Risk

Permitting was expected to only take 3 months.

Construction Risk

The area is tight and was a concern for access with large equipment. The distribution substation and the switching station were constructed at the same time.

The soils on the site are susceptible to moisture. Therefore, it is imperative to complete civil construction during the dry season.

8.2. Mitigation Strategy

Permitting Mitigation


Started permitting early, also Thurston County was the lead agency.

For the Spurgeon Substation we completed SEPA, Special (Conditional) Use Permit, and Clearing/Grading Permit requirements. Building Permits for the Sound Wall and Control House were required.

Construction Mitigation

The site is at the end of a cul de sac, access is satisfactory. A few neighbors were affected by the construction activities, but followed BMP's for dust control, noise, traffic, etc.

Civil construction was started in August of 2015 and completed in January 2016. This delayed project a few month because of winter weather.

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Approved By:

System Planner _____ Date _____

Project Manager _____ Date _____

Project Engineer _____ Date _____

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


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Appendix A. Project Team

Name	Role Description
Kim Lane Peter McKenzie	Project Management
Chris Hancock Alison Klima	Substation Engineer and Project Engineer
Kebede Jimma Rachit Arora	Transmission Planning
Cody Spence	Construction - Substation
Yung Fu	Controls Engineer
Andy Markos Julie Nelson	Permitting – Land Planner
Jason Henry	Civil Engineer
Frank Gu	Electrical System Engineer
Bryan Brennan	Protection Engineer
Ralph Potts	ROW, easements, RR permit
Chad Larson	Distribution Planning
Vince Xaudaro	Project Controls
Aimee Schellentrager	Contracts
	Construction - Lines
Janet Brown	Vegetation Management
	Corporate Communications
Marta Gronlund	Community Relations
Gary Veach	Corporate Security
Amy Tousley	Municipal Liaison Manager
Red Bonnette	Substation Operations

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Appendix B. Work Order Structure

SAP	Number
Notification Number:	10549395; 10647962; 10647965
Telecom Internal Order:	141000841
Spurgeon Transmission Switching Station Work Breakdown Structure:	R.10050.05.01.05
Superior Order:	111012685
Pre-con Order:	111012686
Spurgeon Distribution Substation Work Breakdown Structure:	R.10050.05.01.03
Superior Order:	101027619
Pre-con Order:	101027620
Spurgeon Distribution Substation – Feeders Work Breakdown Structure:	S.00611.04.01
Superior Order:	101045722
Pre-con Order:	101045723
Spurgeon Distribution Substation – Transmission Work Breakdown Structure:	S.00611.05.01
Superior Order:	111012085
Pre-con Order:	111012086

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Appendix C. Planner Estimate and Assumptions

See Notification 10549395

This is from the original scoping documents of 2004. Although many justified reasons to defer, one can see what deferment does to costs over the years.

Funding for 2005 will be for pursuing the property purchase. If a suitable site is available, then a PCR would be submitted for the purchase in 2005.

If a suitable substation property is found, this project would involve constructing a new substation with a 15/20/25 MVA D-Y with LTC and building supporting feeders and a transmission tie that would most likely loop Blumaer-St Clair 115kv line.

2005-2006:

Acquire a 200 X 200 ft (about one acre) site some where near Rainier Rd.m.

2006-2007:

Engineer a single bank 25 MVA D-Y substation with provision for double banking in the future. Include full SCADA and switchable 4.8 MVAR cap bank.

Engineer supporting feeders for Spurgeon Substation

2007


Complete permitting and construct Spurgeon substation. Complete and Complete permitting and construction of a new feeder.

BUDGET DETAILS					
	WBS LL Element #		P100032101		
	<u>Planners Capital Estimate</u>	<u>Planners Expense Estimate</u>	<u>Capital Contributions</u>	<u>Expense Contributions</u>	
2004	\$0.00	\$0.00	\$0.00	\$0.00	
2005	\$50,000.00	\$0.00	\$0.00	\$0.00	
2006	\$600,000.00	\$0.00	\$0.00	\$0.00	
2007	\$1,850,000.00	\$0.00	\$0.00	\$0.00	
Grand Total:	\$2,500,000.00	\$0.00	\$0.00	\$0.00	

The most current Planner Estimate

BUDGET DETAIL (LAST UPDATED: 7/15/2013)

Project Stage / Year	Project Capital Cost	Project O&M Cost
Project Initiation to 2012	\$1,688,000	\$0
2013	\$103,000	\$0
2014	\$11,200,000	\$0
2015	\$1,500,000	\$800,000
2016-2017	\$12,500,000	\$350,000
Grand Total:	\$26,991,000*	\$1,150,000


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Appendix D. 10-Year Plan

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2014 Distribution Substation Study

H:\~ T&D Project Folders\Electric\Spurgeon_Sub_101027619\402 Project Closeout\Final CSA & PIP

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Appendix E. Project Change Request (PCR) History Log

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 PCRs

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Appendix F. Estimated Costs

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Appendix G. Current Schedule

<i>Lifecycle Phase</i>	<i>Start</i>	<i>Finish</i>	2006	2007	2008	2009	2010	2011	2011	2012	2013	2014	2015	2016	2017
Feasibility	Jan-14	Jan-14													
Planning	Feb-06	Dec-07													
Design & Engineering	Jan-08	Feb-16													
Construct, Deliver, Implement	Aug-16	Apr-17													
Closeout	May-17	Nov-17													

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Appendix H. Risk Assessment and Risk Management Report

Risk	Likelihood	Impact of Occurrence	How Monitored	Mitigation
Community resistance to new transmission line impacts current	Medium	Medium	Completed	The project team will continue community outreach efforts; schedule another neighborhood meeting to form a Community Action Group (CAG) that will represent the neighborhood interests. The CAG will participate in the review process of the proposed transmission paths through the neighborhood.
Easement Acquisition	Medium	Medium	This acquisition will be monitored when building the transmission lines. This was not specific to building of the substation. Acquisition for the substation has been completed.	Easement acquisition, specifically for the new transmission lines heading south and north from the substation. There is a medium probability that some of these acquisitions will need to be acquired through condemnation; but we are not certain at this point. PSE has a new condemnation process, implemented on another project (Pierce 230) that will be utilized. All dollars associated with assigned risk are included in the easement acquisition
Lack of approved CUP for Switching Station	Medium	High	Completed	The initial 115KV line to be looped in the Switch Station bay, not the Distribution Substation which has an approved Conditional Use Permit (CUP). The permitting team will request a modification to the existing CUP; the default is an amendment, a more onerous and lengthy process. If the CUP is not received, the project will enter a holding pattern.

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Appendix J. Lessons Learned Document

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