

**EXH. RBB-6rC
DOCKETS UE-220066/UG-220067
2022 PSE GENERAL RATE CASE
WITNESS: ROQUE B. BAMBA**

**BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION**

**WASHINGTON UTILITIES AND
TRANSPORTATION COMMISSION,**

Complainant,

v.

PUGET SOUND ENERGY,

Respondent.

**Docket UE-220066
Docket UG-220067**

**FIFTH EXHIBIT (CONFIDENTIAL/EXEMPT)
TO THE PREFILED DIRECT TESTIMONY OF**

ROQUE B. BAMBA

ON BEHALF OF PUGET SOUND ENERGY

REDACTED VERSION

REVISED VERSION

FEBRUARY 8, 2022



Electron Heights – Enumclaw 55/115kV Conversion Project
CSA Design to Execution
Corporate Spending Authorization (CSA)

| | |
|---------------------------------|-------------|
| Date Submitted: | 12/7/2021 |
| Officer Sponsor: | Dan Koch |
| Project Director: | Roque Bamba |
| Responsible Cost Center: | 4022 |

I. Project Overview

Update each section with high level information as applicable, noting any changes from the previous request/Gate.

Business Need:

This project will provide an additional 115 kV feed at Krain Corner substation and Electron Heights substation. The additional feeds will eliminate the potential for voltage collapse and overloading of the 115-55 kV transformers in the area during N-1-1 contingencies. The project will also increase the reliability of the Enumclaw, Buckley, and Wilkeson substations, as a 115 kV loop will be created instead of the substations being radially fed due to the normal open at Stevenson Switch.

The need drivers for this project are Compliance, Aging Infrastructure, and Reliability.

- **Compliance:** The 2012 NERC Transmission Planning (TPL) studies (and subsequent TPL studies since then) have showed thermal overloads and low voltage conditions for contingencies in the near term studies at both the Krain Corner and Electron Heights areas.

Krain Corner

At 2013 -2014 winter load levels a loss of two of the 115 kV transmission lines to [REDACTED] resulted in the 115 kV bus voltage at [REDACTED] dropping to 0.6 pu. This voltage level will affect up to 6 substations on the 115 kV system and 7 substations on the 55 kV system. Subsequent TPL assessments have continued to identify this condition as well. In this scenario, the [REDACTED] transformer, the [REDACTED] transformer, and the [REDACTED] 55 kV line would all overload above emergency limits.

An Under-Voltage Load Shedding (UVLS) relay exists at [REDACTED] to drop all of the substations on the 115 kV system to remove the overloads and restore voltage to as much of the system as possible (Scheme 170). This could result in an outage of around 26,000 customers.

Electron Heights

The loss of both the [REDACTED] 115 kV line and the [REDACTED] 115 kV line for existing winter and summer loadings cause an overload of the [REDACTED] 115 kV line.

A UVLS relay exists at [REDACTED] that may operate and drop the 55 kV load on the [REDACTED] line, but in summer the voltage collapse may not be severe enough and manual intervention will be needed quickly (Scheme 85).

SHADED INFORMATION IS DESIGNATED AS EXEMPT PER WAC 480-07-160
FOR SAFETY AND SECURITY REASONS, INFORMATION IS DESIGNATED AS INFORMATION RELATED TO CRITICAL ELECTRIC INFRASTRUCTURE

REDACTED VERSION

- **Aging Infrastructure:** The 115/55 kV transformers are at the end of their original design life, as the Krain Corner 3 phase transformer was installed in 1973 and the Electron Heights 3 single phase transformers were installed in 1943. The grounding banks at Krain Corner and Electron Heights are also aged, installed in 1960 and 1949, respectively.

There are 3 single phase spare transformers stored at Krain Corner that can be used at Electron Heights or Krain Corner (with substation modifications), and are similarly aged, being built in 1958. The Buckley and Wilkeson substation 55/12 kV transformers are also of this same vintage, built in 1958 and 1960, respectively.

The 55 kV windings of the Electron Heights and Krain Corner transformers have been subject to over-excitation due to the voltage variations that take place on the 55 kV system. The Electron Heights transformer has a failed sudden pressure relay protection scheme and there are no parts available to replace it.

In 2019 crews replaced the 115kV oil breakers with 115kV gas breakers at PDNs 556, 586, and 852, replaced the 55kV potential transformers, added cable trench with new wiring, and installed new relays in the control house.

- **Reliability:** There are several reliability needs in the area, at both Enumclaw and on the Electron Heights-Stevenson transmission line.

Enumclaw

The Enumclaw substation is fed radially from the Krain Corner Substation. Outages of the 115 kV sources to Krain Corner have resulted in Enumclaw substation outages on separate occasions. These outages effected up to 4,500 customers.

Electron Heights – Stevenson

The Stevenson breaker on the Electron Heights-Stevenson-Krain Corner lines is currently operated as a normal open to decrease the protection clearing times of the Greenwater Tap due to power quality issues. This change has resulted in the Buckley and Wilkeson substations being radially fed from Electron Heights, reducing reliability to 6,300 customers.

Proposed Solution:

This project will convert the Electron Heights to Stevenson 55 kV line to 115 kV operation, connecting the line to the 115 kV bus at Electron Heights and looping the other end through Enumclaw substation. The project requires the addition of a new 115 kV Buckley substation and conversion of the existing Wilkeson substation to 115 kV operation. The project will involve a complete rebuild of the Buckley substation at a new greenfield site and the removal of the current substation from the system. The system conversion is also triggering the need for a new 115kV/55kV/34.5kV substation along Greenwater Tap east of Enumclaw which is being managed under a separate project associated with reliability improvements on the Greenwater system.

Project Outcome/Results:

This project will create a 115 kV backbone transmission system eliminating 55 kV in the area.

OCM, Process & Training Impact:

N/A
 Low Impact
 Medium Impact
 Significant Impact

N/A

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|---------------------------|---|--|
| Primary ISP Alignment: | Processes & Tools | ISP strategy descriptions |
| ISP Strategy Description: | Process & Tools - System reliability and integrity | |
| Portfolio Description: | Strategic | Capital Allocation Definitions |
| Project Complexity: | <input type="radio"/> Straightforward and well understood <input checked="" type="radio"/> Complex and well understood <input type="radio"/> Complex and not well articulated | |

II. Key Schedule and Financial Information

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| Expected Start Date If Funded: | This project has been in progress for over ten years dating back to 2011 where property acquisition for Buckley Substation was completed as well as the rebuild of transmission lines from 55 kV to 115 kV standards. The project is on track for completion in 2024. |
| Expected In-Service Date: | 03/29/2024 |

High-Level Schedule *Enter Expected # of Years and Months*

| Duration | | | | |
|------------------------------|----------------------------|-------------------------------|---------------|---------------------------|
| Planning | Design | Execution | Total Project | Anticipated Closeout date |
| 3.5 years 1/2011 – 6/2014 | 7 years 6/2014 – 6/2021 | 3.5 years 6/2021 – 12/2024 | 13 years | 12/2024 |

Initial Estimated Funding % by Phase as of 12/7/2021: Enter values to include both O&M and Capital in the cells below for percentage of funding to be used in each phase of the project.

| Initiation | Planning | Design | Execution | Closeout |
|------------|----------|--------|-----------|----------|
| 2% | 5% | 21% | 71% | 1% |

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| Initial Grand Total Estimate contingency included just under 25%: Contingency Standard | Capital: \$21,226,000 | OMRC/Project O&M: \$138,000 (Not including O&M Tail) |
|---|------------------------------|--|

Estimated Five Year Allocation: Enter values in the cells below for years anticipated, up to five years, plus any expected future years. Change "Year 1, Year 2, etc. to the relevant years for this project. Ongoing O&M begins after project close-out.

| Category: | <2020 | 2021 | 2022 | 2023 | 2024 | Total |
|-----------------------------------|-------------|-------------|-------------|-----------|-----------|--------------|
| Capital (contingency included) | \$4,934,000 | \$1,411,000 | \$7,132,000 | 7,489,000 | \$260,000 | \$21,226,000 |
| OMRC / Project O&M | \$3,000 | \$0 | \$0 | \$100,000 | \$35,000 | \$138,000 |

Ongoing Benefits

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| Summary Benefits (see Benefits realization plan for details): | <p>This project will provide a 115kV path between Electron Heights and Krain Corner as well as conversion of Wilkeson and Buckley Substations to 115/12.5kV substations.</p> <p>Based on outage information over the last five years, this project would translate to a positive impact of 0.6 substation outages saved for both Wilkeson and Buckley substations or a benefit gain of about 29% and 23% reduction of SAIDI minutes for Wilkeson and Buckley.</p> |
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| Category: | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Total |
|--|---------------|---------------|---------------|---------------|---------------|---|
| Ongoing O&M (to be funded by business) | N/A | N/A | N/A | N/A | N/A | N/A |
| Ongoing O&M (requesting \$'s) | * | * | * | * | * | *O&M increase based on business planning analysis for major CAP plant additions |
| Benefits | N/A | N/A | N/A | N/A | N/A | N/A |
| Net impact (= Benefits – O&M) | N/A | N/A | N/A | N/A | N/A | N/A |
| * Payback in Years | N/A | | | | | |

III. Risk Management Summary

Identify high level risk categories expected for the project. Consider Project Dependency, Project Timing and Resourcing, as well as Regulatory Risk.

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| Summary of high level risks sentence: | Risk Detail and Mitigation Long Lead Permitting (New Buckley): City of Buckley permitting could have potential impacts to schedule and costs. Similarly, Army Corps permitting could have significant impacts to the schedule of the project. |
| The following are the high level risks associated with design phase of the conversion project. | Easements (New Buckley): The current location of the designated New Buckley Substation requires Buckley City Council approval for 5 of the necessary 13 easements for the transmission loop thru and distribution getaways. This could have significant cost and schedule impacts if not approved. In addition, there are other easements that are needed for the New Buckley feeds that will be acquired from private property owners. |
| Project Dependency on Greenwater Tap Project. | The ability to convert the 55 kV system to 115 kV will first require that the scope of the Greenwater Project (new substation) be commissioned before the Buckley and Enumclaw conversion can be energized (Finish to Finish). |

IV. Phase Gate Change Summary

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| Phase: | Planning to Design |
| Scope: | <p>Scope identified in Planning Phase include:</p> <p>Convert the remaining portions of the existing 22 mile transmission line and two substations from 55 kV to 115 kV operation.</p> <ul style="list-style-type: none"> • Retire 70-year-old 55 kV substation equipment at three substations. • Loop the converted line into the Enumclaw Substation. • Protection and auto control schemes will result in improved reliability. |

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| Budget: | \$13.78M ¹ |
| Schedule: | Project to be placed in service by end of year 2018. |
| Benefits: | <ul style="list-style-type: none"> • Maintains customer load and voltage for all identified violations in 2013 NERC studies. • Improvements will reduce actual outage minutes and frequency. • Faster fault clearing capability will improve safety. • Retire aging infrastructure. |

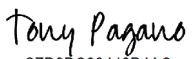


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| Phase: | Design Phase Update (5/15/2020 CSA) |
| Scope: | <p>Additional Scope identified in the Design Phase includes the following:</p> <p><u>Electron Heights Substation</u></p> <ul style="list-style-type: none"> • 55kV equipment (transformer and breaker) will need to be removed and new 115kV breaker, disconnect switch and relay will be installed. <p><u>Wilkeson Substation</u></p> <ul style="list-style-type: none"> • The Wilkeson 55-13.09 kV Y-Y transformer will be replaced with a 115-13.09 kV Delta-Y transformer for cut over to 115 kV operation. • Install new high side circuit switcher and deadend tower. • Install new control house <p><u>Buckley Substation</u></p> <ul style="list-style-type: none"> • Will require a new substation because there is not enough room on existing Buckley Substation Parcel. • Install new distribution getaways for substation to integrate into existing system and phase shifting transformer. • Loop through transmission from existing Electron Heights – Stevenson 55kV when converted to 115kV. • Installation of fiber from Krain Corner to new Buckley Substation. • Fiber network connecting White River, Berrydale and Krain Corner. • Removal of Old Buckley Substation. • Reconductor 6 spans of Electron Height – Stevenson transmission line outside of Old Buckley. |
| Budget: | \$17,150,000 |
| Schedule: | Project to be placed in service March 29, 2024. |
| Benefits: | Benefits remain the same as previous CSA |

¹ Previous CSA erroneously noted \$4.8M and should have been \$13.78M.

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| Phase: | Design to Execution |
| Scope: | <p>Additional Scope identified in the Design Phase includes the following:</p> <p><u>Wilkeson Substation</u></p> <ul style="list-style-type: none"> Property restoration for mobile substation required during Wilkeson rebuild <p><u>Buckley Substation</u></p> <ul style="list-style-type: none"> Permitting condition to add wetland mitigation area, includes clearing, civil construction, and plant installation |
| Budget: | \$21,226,000 |
| Schedule: | Project to be placed in service March 29, 2024. |
| Benefits: | Benefits remain the same as previous CSA |

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| Prepared by: | Jeff McMeekin |
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V. CSA Approvals

| Project Phase | Select Phase | | | |
|--------------------|-------------------------------|-------------------|------------|---|
| Approved By | Title | Role | Date | Signature |
| Tony Pagano | Manager of Project Management | Manager | 12/17/2021 | DocuSigned by:  C7D3BC09443B4AC... |
| Roque Bamba | Director of Project Delivery | *Director Sponsor | 01/03/2022 | DocuSigned by:  BC203E4E58BB426... |
| Dan Koch | Vice President Operations | Executive Sponsor | 01/03/2022 | DocuSigned by:  7E7434ECBF5B4C0... |

*Director Sponsor attests that all considered documentation has been approved.

Please direct any questions to either:

1. The Capital Budget team at CSA-TeamMail@pse.com, or
2. The Enterprise Project and Performance Project Practices team at EPP-ProjectPracticesTeam@pse.com