West Point Treatment Plant Power Quality Report Findings and Recommendations

MWPAAC General Meeting

September 23, 2020

King County

Department of
Natural Resources and Parks
Wastewater Treatment
Division

Background and Objective

- A series of voltage sags in 2019 at the West Point Treatment Plant (WPTP) resulted in sewage bypasses and NPDES permit violations.
- WTD and Seattle City Light (SCL) entered into a Memorandum of Understanding to characterize voltage sags affecting power reliability.
- WTD commissioned a consultant study to prepare recommendations to minimize emergency flow diversions due to voltage sags.
- Study evaluated power reliability and quality both internal to WPTP and SCL's connected feeds (Canal and Broad Streets).
- Objective is to reduce sewage bypasses caused by voltage sags.

Nature of Voltage Sags at WPTP

Voltage sags are common at WPTP due to:

- Lower voltage fed to WPTP (27kV, distribution-level service) than to South Plant and Brightwater (115kV, transmission-level service).
- Inherent interconnectedness of a distribution network means voltage sags occur more broadly across the network.
- Above ground distribution grid is more susceptible to disruptions (e.g. – tree falling on line, car hitting power pole, etc.).

Report Recommendations

- WTD reviewed over 30 recommendations, many were deemed infeasible or provided marginal improvements to quality.
- Nine recommendations deemed feasible and would contribute to improving electrical reliability and/or mitigating voltage sags.
- Continued collaborative and positive relationship with SCL to jointly implement report recommendations.

Recommendations

#	Recommendation Title	Responsible Party	Effectiveness of Mitigating Voltage Sags	Next Steps
1	Master Plan to Prioritize and Schedule Electrical Improvements at WPTP	WTD with input from SCL	High	Develop master plan priorities and implement program to upgrade West Point electrical infrastructure.
2	Ovation Control System Revisions	WTD	High	Completed revisions; Systems testing underway.
3	Improve Power Monitoring and Metering Capabilities	SCL and WTD	Medium/High	WTD to improve power monitoring data acquisition and analysis capabilities. Continue to engage SCL to establish clear protocol in post-sag investigation and data sharing.
4	Study Electrically Driven Raw Sewage Pump (RSP) Vulnerabilities	WTD	Medium/High	WP RSP Project is evaluating alternatives to mitigate repercussions from voltage sags.
5	Evaluate New Voltage Regulation Equipment	WTD and SCL	High	A new project request has been submitted to Portfolio Management to evaluate addition of voltage regulation equipment at West Point.

Recommendations (continued)

#	Recommendation Title	Responsible Party	Effectiveness of Mitigating Voltage Sags	Next Steps
6	Study new SCL Interbay Substation to serve Sound Transit and WPTP	SCL and WTD	High	Pursue with SCL to understand commitment, timeline, and proposed design as it relates to WP power.
7	Replace WPTP Main Switchgear	WTD with input from SCL	Medium	Planned project for 2022-23 budget request.
8	Influent Control Structure (ICS) Uninterruptible Power Supply (UPS)	WTD	Medium	A new project request has been submitted to Portfolio Management to replace the UPS at ICS.
9	Evaluate cogeneration facility modification to provide base-load capacity	Primarily WTD with input and coordination with SCL	High	Submit new project request to evaluate modifications to cogeneration to run essential equipment.

Near Term Recs - Cost & Timeline

#	Recommendation Title	Cost *	Timeline	Notes
1	WPTP Electrical Master Planning	Study $300,000	Estimated start Q3, 2020 with end date of Q1, 2021	Master Plan will prioritize, sequence, and schedule all electrical equipment upgrades and replacements at West Point.
2	Ovation System Revisions	WTD self performing; $60,000	Ongoing; Effluent Pump Station (EPS) ride-through logic installed; IPS ride-through testing underway	This modification would likely have mitigated repercussions of previous four major voltage sags; continue to monitor efficacy of revisions.
3	Improve Power Monitoring and Metering Capabilities	Study $100,000, Construction $300,000 (WTD), $300,000 (SCL)	Design underway; Construction to start Q4, 2021; completion Q4, 2023	WTD and SCL need to establish protocol and procedures for sharing power disruption information in order to identify issues quickly and coordinate response.

* Rough order of magnitude cost

Near Term Recs - Cost & Timeline Cont.

#	Recommendation Title	Cost *	Timeline	Notes
4	Study Electrically Driven Raw Sewage Pump (RSP) Vulnerabilities	Evaluation of reliability currently scoped in RSP project; cost of recommendations tbd	Ongoing; included in alternatives analysis with anticipated delivery of alternatives report Q1, 2021	Alternatives development for RSP replacement will assess reliability of each alternative and evaluate mitigation measures.
5	Evaluate New Voltage Regulation Equipment	To be determined; project to proceed to formulation	Initiate formulation in 2020 for completion 2021	Project to be formulated to better understand preferred technology, scope, schedule, and budget.
6	Study new SCL Interbay Substation to serve Sound Transit and West Point	Cost of initial study estimated at $500,000	West Seattle Ballard Link Extension to be completed in 2035. Initiate discussions with SCL and Sound Transit in 2020 to address WTD's long-range interests	WTD will engage SCL and Sound Transit to evaluate potential opportunity for an underground dedicated feed from proposed Interbay sub-station to WP.

* Rough order of magnitude cost

Near Term Recs – Cost & Timeline Cont.

#	Recommendation Title	Cost *	Timeline	Notes
7	Influent Control Structure (ICS) Uninterruptible Power Supply (UPS)	Total project cost estimated at $0.9M	Start pending project approval in 2022/2023 biennium budget	This recommendation does not directly address voltage sags; it is a vital piece of equipment affecting reliability and is approaching end of life.
8	Replace West Point Main Switchgear	Total Project Cost estimated at $16M	Start pending project approval in 2022/2023 biennium budget	New power monitoring equipment to be installed as part of switchgear replacement which will help with data collection and monitoring.

Long Term – Cost & Timeline

#	Recommendation Title	Cost *	Timeline	Notes
9	Evaluate cogeneration facility modification to provide base-load capability	Cost of initial study estimated at $300,000	TBD – longer term	WTD to evaluate best use of cogen (power essential equipment vs. sell power to SCL).

* Rough order of magnitude cost.

Follow-up Actions:

- WTD to work with SCL to more clearly determine feasibility, challenges, and benefits of installing transmission level power (115 kV) to WPTP.
- Approach SCL and Sound Transit to evaluate benefits of incorporating a dedicated feed from proposed Interbay substation to serve ST's West Seattle Ballard Link Extension project.
- WTD to prioritize recommendations that mitigate voltage sags.
- Continue to coordinate efforts and communications with SCL to ensure collaboration

Questions

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