EXH. RPB-1T
DOCKETS UE-22___/UG-22___
2022 PSE GENERAL RATE CASE
WITNESS: RYAN P. BLOOD

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-22____** **Docket UG-22____**

PREFILED DIRECT TESTIMONY (NONCONFIDENTIAL) OF

RYAN P. BLOOD

ON BEHALF OF PUGET SOUND ENERGY

JANUARY 31, 2022

PUGET SOUND ENERGY

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I. INTRODUCTION

Q. Please state your name, business address, and position with Puget Sound Energy ("PSE").

A. My name is Ryan P. Blood. My business address is 355 110th Ave. NE, Bellevue, WA 98004. I am the Director of Northern Generation with PSE.

Q. Have you prepared an exhibit describing your education, relevant employment experience, and other professional qualifications?

A. Yes, I have. Please see Exh. RPB-2 for an exhibit describing my education, relevant employment experience, and other professional qualifications.

Q. Please describe your responsibilities as Director of Northern Generation?

A. I am responsible for overseeing power generation operations and budgeting of PSE's Northern fleet of power plants, including Encogen, Sumas, PSE's Simple Cycle Fleet, Wild Horse Wind Farm, and the Baker River Project. In particular I am responsible for ensuring the safe and reliable operation of all of our facilities.

Q. Please summarize the purpose of this prefiled direct testimony.

A. My testimony provides an overview of PSE's plans to regrout and modernize the Baker River Hydro generating station. My testimony describes the purpose of the

project, the need it is intended to meet, and the approach PSE is taking to enable construction and grouting activities to be planned and executed effectively and in the best interest of customers. I describe these plans in detail and present the estimated schedule and cost milestones that apply to the project.

II. OVERVIEW OF PSE'S BAKER RIVER HYDROELECTRIC GENERATING STATION AND RE-GROUTING PROJECT

Q. Please describe the Baker River Hydroelectric Project.

A. The Baker River Hydroelectric Project ("BRH Project") is the largest hydroelectric facility in PSE's generation fleet. It is comprised of Upper Baker Dam and Lower Baker Dam, as well as their associated powerhouses and facilities. The project's reservoirs, Baker Lake and Lake Shannon, are fed by runoff from Mount Baker and Mount Shuksan, while the dams themselves sit on a tributary of the Skagit River in northwest Washington. Upper Baker Dam, completed in 1959, is a concrete gravity dam with a height of 312 feet and power-generating capacity of 107 megawatts ("MW"). The Lower Baker Dam ("LBD"), completed in 1925, is a semi-gravity concrete arch dam with a height of 285 feet, crest length of 550 feet, and power-generating capacity of 111 MW. Leakage through LBD and through geologic features within the bedrock has occurred since original construction. Prior grouting programs were carried out on the dam in 1934, 1959, and 1982.

Q. How has hydroelectric power, and particularly the BRH Project, benefited PSE's customers?

A. Hydroelectric power, and the BRH Project in particular, continues to play a crucial role in PSE's generating fleet. The two dams that compose the BRH Project have been in operation since 1925 and 1959 and provide a combined 218 MW of clean, renewable power. For nearly a century the BRH Project has provided numerous and substantial benefits to Washington electric customers by reliably producing carbon-free energy, enhancing fuel diversity, and insulating customers from commodity price spikes. Into the future, the BRH Project will make a material contribution to PSE's achievement of mandates under the Clean Energy Transformation Act ("CETA").

Q. Please explain why PSE initiated the BRH Project.

A. In terms of station operations, the BRP Project continues to run safely and efficiently, producing power at levels as would be expected. However, in 2012, during a regularly-scheduled comprehensive inspection by independent consultants (which occurs every five years, as required by the Federal Energy Regulatory Commission ("FERC")), it was determined that the leakage through the Lower Baker Dam bedrock foundation was increasing with time, and it could pose a threat to dam stability if left unmitigated.

That same year, at PSE's request, Tetra Tech Inc. conducted several investigations into the nature of the leakage, potential erosion below the dam

apron, and the presence of sub-channel flow pathways. These investigations were not definitive, and Tetra Tech, and later Shannon & Wilson, performed subsequent further studies and testing.

In February 2013, FERC required PSE to establish a three-member independent Board of Consultants ("BOC") to assist FERC with assessing the ongoing investigations and the potential threat the leakage posed to dam stability. The members of the BOC are experts in rock mechanics, geological engineering, and structural engineering.

Based on the extensive studies conducted through 2017, PSE determined that the ongoing leakage through the dam foundation did indeed present a potential dam safety issue. PSE presented the results of these studies to the BOC in December 2017 and solicited its opinion on whether it felt the ongoing leakage presented a dam safety issue. Specifically, PSE asked the BOC if it was necessary to mitigate the leakage to ensure dam safety. The BOC responded in the affirmative, and its response is captured in a BOC Report, Exh. RPB-3.

On January 29, 2018, PSE submitted to FERC the BOC Report, plus a plan and schedule to comply with the BOC's recommendations. PSE's letter to FERC is provided as Exh. RPB-4. FERC responded to PSE's letter on March 12, 2018 and did not dispute the BOC's conclusion that the leakage at Lower Baker Dam posed a dam safety issue if left unmitigated. See Exh. RPB-5.

Q. What are PSE's plans to address the leakage at the BRH Project ?

A. PSE plans to treat the Lower Baker Dam foundation with a modern, comprehensive grout curtain. This grout curtain will treat a much wider and deeper area than previous grouting projects and will result in longer flow pathways that will decrease flow velocities and thus lower the potential for foundation erosion and degradation. Debris upstream of the dam will also be grouted to increase the effectiveness of the grout curtain. Such activity will not only address the current leakage but will also minimize the potential for future leakage.

Q. What are the estimated costs for this treatment?

A. Total construction costs for this treatment from 2021 forward are estimated to be $341 million. This figure includes the construction itself, a construction management contract, the engagement of an engineer of record, PSE labor associated with the project and its oversight, PSE overhead costs that are typical for construction projects of this nature, and a contingency allowance to account for unexpected scope elements that are often discovered through the course of a project of this scale.

Q. Why is it in the public interest to make these investments in the BRH Project?

A. First and foremost, this is a dam safety issue that must be resolved to retain PSE's operating license for the facility from FERC. Also, this grouting project will

enable the BRH Project to continue to generate carbon-free electricity for another five decades or more. The clean power the BRH Project provides to PSE's customers is stable and predictable, and the construction will help PSE's meet its objectives related to environmental stewardship.

In addition, maintaining diversity in PSE's generating fleet through pursuit of this project is particularly important in light of its ability to mitigate exposure to fuel price volatility that would exist with a fleet concentrated on one specific generating fuel, such as natural gas.

III. PSE'S APPROACH TO THE BRH PROJECT

Q. Please describe how PSE identified the best method for accomplishing the project.

A. PSE convened a team of subject matter experts, including the FERC-required BOC and engineering experts from Shannon & Wilson, Hatch, GeoHydros, and PSE. This team participated in a comprehensive alternatives analysis workshop in July 2017 to evaluate six methods that had been identified and determined to be suitable for consideration to mitigate leakage at the BRH Project. The team of experts considered the following criteria for evaluation: fatal flaws, relative cost, constructability, schedule, environmental issues, licensing, reliability, and dam safety during construction as.

Q. What did this team of experts determine?

A. The team of experts determined that the combination of a grout curtain of significant depth and width, including grouting of the debris upstream of the dam, was the most effective method for reducing the seepage and resolving the dam safety concerns. The BOC's support for this determination is memorialized in its Board of Consultants Report for Meeting No. 6. See Exh. RPB-3.

Q. What alternatives were considered, and why were those approaches rejected?

A. PSE considered the following five alternatives to the BRH Project:

Low hydraulic conductivity blanket over the reservoir bottom upstream of the dam. The team considered several variations on this alternative, with differing features such as the blanket material (synthetic fabrics versus low permeability sediments) and extent of the treatment area (extensive blanket versus targeting the known leakage paths). Ultimately, the team concluded this option would be challenging to construct and only an effective solution for a limited period (days to months, versus decades). This option was originally included in the request for proposals ("RFP") as a measure to assist with the grout curtain installation. It was eventually removed due to the uncertainty in effectiveness and its price of approximately $50 million. A more localized geosynthetic blanket is still being used to control localized flows in the rock face on the right side of the reservoir.

A continuous, positive cutoff wall. The team considered several permutations of this alternative, including variations in location (upstream of the dam versus through the dam) and construction methodology (hydromill versus secant pile). Ultimately, this option was not the preferred option due to a number of factors, including: 1) the larger equipment necessary to construct a cutoff wall would necessitate a larger platform, which would ultimately need to be free standing and therefore significantly more expensive than the grout curtain platform; 2) cutoff walls constructed with slurries require the ground to be pretreated by grouting to prevent slurry loss during construction and would therefore be more expensive; and 3) the site is quite confined, and execution of cutoff walls requires a working area much larger than that available at site.

Grouting debris and soil just above its contact with bedrock in the reservoir upstream of the dam. This alternative was ultimately rejected as a stand-alone option because of leakage occurring through the bedrock at elevations above the top of the debris. However, this alternative has been incorporated into the larger grout curtain program. PSE anticipates that this will improve the ability to execute the grout curtain and ultimately reduce grouting time and materials and reduce overall project cost.

Injecting gravel and sand through the debris upstream of the reservoir to partially fill joints and fractures. This option was also originally included in the suite of 2019 proposals and presented lower costs than other options considered. However, historic reports indicate that similar measures had not proven effective

in the past. At other areas within the forebay, after placing material in the debris, the seepage paths simply migrated elsewhere within a period of hours or days. This option was subsequently removed as a standalone option.

Construction of a new dam downstream of the existing dam. This option was considered but relatively quickly dismissed as the most expensive and least timely of the options considered. Construction of a new dam would require decades of study and design and would be significantly more costly than the preferred alternative. And, if this alternative was approved by FERC, it would still require some form of interim safety measures that would be nearly as costly as the preferred alternative.

Although not officially considered as a mitigation measure for the ongoing seepage, removal of the dam was informally considered. As with the construction of a new dam, dam removal would require decades of environmental studies and relicensing and would ultimately be as costly, or more costly, than the preferred alternative. All the alternatives, including the preferred alternative, are discussed in the Shannon & Wilson report Seepage Reduction Alternatives, Lower Baker Dam, Concrete, Washington dated July 7, 2017. See Exh. RPB-6.

Q. Please describe how PSE selected the contractor for the BRH Grouting Project.

A. Once the best method for accomplishing the project was identified, PSE worked with Shannon & Wilson and experts in the field of ground treatment to identify

specialty contractors to execute the project. These contractors are leaders in drilling and grouting, heavy civil construction, marine construction, geotechnical engineering, and instrumentation. The contractors were invited to submit statements of interest and qualifications in June 2018. They were also invited to an industry day at Lower Baker Dam on July 18, 2018 to review the project. Thirty-four individuals from sixteen contractors participated. Four prospective contractor teams ultimately submitted statements of interest and qualifications and three were found to be qualified and responsive and were selected to receive the formal RFP.

The three prequalified teams received the RFP on March 18, 2019 and all three responded on August 22, 2019. Teams were evaluated by a panel of four engineering experts based on technical approach, management plan, schedule, experience, past performance, proposed monitoring system, and proposed temporary structures. Once teams were ranked for technical ability, the proposed bid prices were reviewed and all three were found to be within 10 percent of the mean. Based on proposal evaluation and price, the Lower Baker Constructors, LLC was identified as the team that provided the best value. However, the total price proposal was higher than PSE had anticipated, and the decision was made to work with the preferred contractor in an "early contractor involvement" ("ECI") relationship to lower the overall project cost while still achieving the desired project outcome. Following a successful ECI period, the construction contract was awarded to Lower Baker Constructors, LLC on October 22, 2021.

Q. Please briefly describe the contractor's team and the work each member will perform on the project.

A. Lower Baker Constructors, LLC is a joint venture of Traylor Bros. Inc (heavy civil construction), Ballard Marine (marine construction), and Advanced Construction Techniques (drilling and grouting specialist). The joint venture team members are supported by Golder Engineering, Schnabel Engineering, and VAK Engineering.

Traylor Bros. Inc will perform site preparation and construction of the temporary access/working platform. Ballard Marine will execute the marine construction to include installation of all underwater features and any required diving support. Advanced Construction Techniques will be performing all of the onsite drilling, drill hole washing and surveying, and all grout preparation and injection. Golder Engineering will be supporting Advanced Construction Techniques in the interpretation of the grouting results and in real-time adjustments to grout mixes and injection rates. Schnabel Engineering will be providing geotechnical and dam safety engineering support. VAK Engineering will provide structural engineering support.

PSE issued an additional RFP on July 20, 2020 seeking construction management services for the duration of the project. This RFP was provided to three well-established construction management firms. Two of the three firms provided responses. The two proposals were evaluated based on team experience, knowledge and experience of key individuals, project understanding, and

implementation and staffing plan. HDR, Inc was selected and will be providing a resident engineer, office engineer, and inspector support during construction.

Shannon & Wilson is the engineer of record and will provide engineering support during construction.

Q. How has PSE estimated the costs for this work?

A. Project cost estimates at the conceptual stage were based on scaling of the 1983 grouting project costs. As the project progressed, costs were estimated by PSE personnel with considerable drilling and grouting experience, as well as by representatives from Shannon & Wilson.

Q. How is PSE validating the cost estimates?

A. PSE hired Jim Cockburn, a recognized expert in the industry, to review PSE's and the contractors' cost estimates. PSE also hired HDR to review the validity of the contractors cost estimates. Reviews indicate that the estimates were correct, and that conclusion is supported by the close spread in the three proposals received in 2019. As stated above, all three proposals fell within ten percent of the mean projected cost.

In addition, PSE asked HDR to perform a Monte Carlo simulation on the project costs with many of the design and execution variables in hand. This resulted in a Cost and Schedule Risk Analysis Report, which is provided as Exh. RPB-7.

Q. How did PSE prepare for the possibility of higher costs?

A. PSE incorporated both contingency and management reserves into the cost estimates.

Q. What is contingency, and why is it included in the project cost?

A. Contingency is incorporated into a project to account for known and measurable risks, as identified through a risk assessment process (i.e., "known unknowns"). Contingency can apply to both the project budget and project schedule, which are often correlated. Contingency is particularly important for projects similar in profile to the BRH Project. Geotechnical projects in general and grouting projects in particular are subject to moderate to large swings in costs associated with unknown conditions below the surface. Contingency reserves are under the purview of the Project Manager.

Q. What is a management reserve, and why is it applicable for this project?

A. In contrast to contingency reserves, management reserves are set aside to account for unidentified risks (i.e., "unknown unknowns"). With a project of the scale and complexity of the BRH Project grouting, it is difficult to identify every risk at the outset. The work that must be done is somewhat comparable to projects that have been completed in the North American hydro generation industry, but aspects of the engineering are unique, the river flow dynamics are specific to the BRH Project, and other project elements can be considered "first-of-a-kind" challenges. It is reasonable to expect that conditions will appear that have not been

considered, despite the rigorous risk inventory and management activities that PSE has completed with its vendors. This type of project management challenge is not uncommon in the power construction industry. Such uncertainty is managed, mitigated, and accounted for through a Management Reserve.

Q. Has PSE's Board of Directors been apprised of plans related to the BRH Project?

A. Yes. Because the BRH Project grouting is part of PSE's strategic project portfolio, the Board of Directors has been receiving, and continues to receive, formal monthly updates on the health of the project (scope, schedule, budget, resources). The Board also received regular updates on project status during its quarterly meetings. On September 27, 2021, the BRH Project grouting work was formally presented to the Board of Directors' Asset Management Committee ("AMC") for project approval, as is standard practice for projects of this magnitude. See Exh. RPB-8, for a copy of the AMC presentation. The AMC recommended project approval and the full Board of Directors concurred.

IV. PSE'S PROJECT MANAGEMENT AND OVERSIGHT PLANS

Q. Does PSE have a Project Implementation Plan that will guide execution of the BRH Project's modernization and grouting?

A. Yes. The BRH Project's modernization and grouting project will be conducted in a manner generally consistent with PSE's approach to all large capital projects. The requirement to incorporate the FERC mandated Board of Consultants into the

project has resulted in some deviation from a standard construction project in that studies and design often progressed concurrently. The project execution will be operated consistent with best practices for project management and construction management in use throughout the energy industry. A Project Implementation Plan has been maintained during the project development and is considered a living document that will continue to be updated as the project moves forward. Detailed execution plans are developed for individual phases of the project and will be captured in the construction management system being maintained by PSE's construction management contractor. Schedule and project costs will be closely monitored and tracked throughout the life of the project.

Q. In addition to PSE's Board of Directors, what internal organizations have been and will continue to be involved in planning the BRH Project?

A. PSE has engaged subject matter experts from across a range of its operating teams to plan the BRH Project, including: Dam Safety, Resource Sciences and Asset Management, Project Management, Project Controls, Procurement, Financial Planning and Analysis, Internal Legal, Internal Audit, Environmental Services, and Licensing and Permitting.

Each of these functions will be critical to ensuring a successful project execution process. Please see Table 1 below for an explanation for how each will contribute to cost-effective project execution.

Table 1: PSE Internal Organizations

Function	Description
Dam Safety	This project has been developed in response to a potential dam safety issue, and the Dam Safety team has been intimately involved to make sure it can be executed without causing harm to the existing dam and appurtenant structures.
Project Management	The Project Manager is an experienced industry professional with 27 years of heavy construction experience. The Project Manager is part of the Dam Safety team and will be responsible for managing of the project's budget, scope, and schedule. PSE has contracted with an outside construction management firm to assist the Project Manager.
Project Controls	PSE has engaged an external construction management firm to conduct all project controls so that the project is executed in a manner consistent with the project design and contract terms. PSE personnel will provide technical oversight of the construction management firm and provide guidance when needed.
Procurement	The Procurement team has been instrumental in all phases of the project, including issuing RFPs and awarding contracts for engineering services, construction management services, and construction. The procurement team will remain a core function to certify that all resources are procured in a manner consistent with PSE's corporate procurement processes and regulatory obligations.
Quality Assurance/Quality Control	PSE's QA/QC organization will see that project execution, including assembly of safety-related equipment, is consistent with industry best practices.
Internal Audit	The Internal Audit function conducts assessments of the budgeting and invoicing practices and will ascertain that project costs are appropriate and properly allocated to PSE's cost centers. Also, PSE's project management staff will review all invoices with the external construction management firm.
Resource Sciences and Asset Management and Environmental Services	The Resource Sciences and Asset Management and Environmental Services teams work collaboratively to guaranty that the planning and execution of the BRH Project's grouting work is completed in a manner consistent with PSE's environmental obligations related to migratory fish pathways and other environmental and wildlife-related concerns. PSE has contracted with an expert environmental and engineering firm to confirm compliance with all project regulated activities.
Licensing & Permitting	The Licensing and Permitting group will obtain and maintain all necessary permits for the project period and the period of the BRH Project's continued operations after grouting and modernization are completed. PSE is working with two external firms to make sure PSE complies with all permit conditions.

Q. Please describe how PSE plans to manage the BRH Project in the planning, execution, and commissioning phases of work.

A. PSE has designated a full-time senior project manager and senior construction manager to oversee this project. As of Q3 2021, the planning phase is complete and the project has moved into execution. To assist PSE during the execution phase, PSE has hired a construction management firm, HDR, Inc., with extensive experience in complex and high-risk hydroelectric projects. The firm will provide industry experts to conduct the following services: assist in managing day-to-day construction activities, inspect on-site activities to conform with project plans and specifications, monitor conformance with environmental permits/conditions, oversee administrative process (i.e. document management), evaluate contractor's schedule (including critical-path items), and perform cost evaluations and contractual validity assessment for all proposed change orders.

PSE has also retained the services of the design Engineer of Record, Shannon & Wilson, Inc., to be onsite during all drilling and grouting operations. Their role will be to oversee construction activities so they conform with the project design documents.

Q. What mechanisms does PSE have in place to prudently manage the BRH Project throughout its planning and implementation?

A. PSE's Project Practices Center of Excellence ("COE") organization will require monthly reporting for the BRH Project. PSE's senior project manager assigned to

this project will develop these reports. Items captured in each report include: status (progress), budget (anticipated versus actual costs), schedule (anticipated versus actual durations), and on-going risk identification and assessment. The COE will evaluate each report and share with PSE executives.

V. PROJECT MILESTONES COMPLETED AND EXPECTED DURING THE RATE PLAN

Q. What major milestones have been completed to date?

A. Initiation and planning phases have been completed. Permitting is underway and on schedule. The contract with the major execution team is signed and ready for the execution phase. FERC is currently reviewing the required project documentation.

Q. What are the key milestones for the BRH Project from 2021 through 2025?

A. Early contractor involvement occurred from Q4 of 2020 into Q4 of 2021, and the contract and pricing negotiations were finalized in Q4 2021. Submittals and pre-construction started in Q4 of 2021 and will continue into Q1 of 2022. Mobilization and site preparation will follow in Q1 and Q2 of 2022. Vertical tiedown anchors and temporary platform construction will begin in Q2 of 2022 and continue through Q3 of 2023, at which point drilling and grouting will commence. Drilling and grouting will then be the longest phase, extending from Q3 2023 through Q4 2024. Deconstruction, demobilization, and final inspection

will take place through 2025, and the project is expected to be finalized by July 2025. The total project construction is expected to take approximately 44 months.

VI. CONCLUSION

Q. What plans does PSE have in place to brief the Washington Utilities and Transportation Commission and its Staff apprised of the BRH Project's modernization and grouting progress?

A. At a minimum, PSE project staff will provide updated project reports at significant project milestones. In addition to project updates, Commission staff will be invited to visit the site at those same project milestones.

Q. Does this conclude your prefiled direct testimony?

A. Yes, it does.