Updated February 16, 2023

Disclosure of Hydroelectric Generation and Transmission Equipment Issues at Rocky Reach and Rock Island Projects and other related issues.

This disclosure document addresses 'specific' issues that are not considered to be outages for preventative maintenance, normal maintenance, or unit rehabilitations for equipment normal use and aging. Chelan PUD ("District") provides a separate list of 'planned' outages for both Rocky Reach and Rock Island that should be considered when evaluating the District's Slice Product. This disclosure document also addresses miscellaneous items associated with District's Slice Product.

ROCKY REACH AND ROCK ISLAND RESERVOIR ENERGY CONTENT CURVES:

Issue

Energy content tables currently used for the Rocky Reach and Rock Island reservoirs have been in use since 1999 and were constructed using data and tail water elevation estimates dating back to the 1970's. These tables also included adjustments for both upstream and downstream encroachment. It has been determined that the energy content tables need updating to correct for 1. inaccuracies from using 1970's data and estimates, and 2. removal of the adjustments for both upstream and downstream encroachment energy which is now dealt with separately.

Remedy

The District will be revising both the Rocky Reach and Rock Island energy content tables to 1. correct for inaccuracies in the energy content tables and 2. remove the adjustments of upstream and downstream encroachment energy. Recent production data was used to calculate the proposed energy content tables. The District plans to revise the Rocky Reach maximum pond to 2,970 MWh from 3,283 MWh and the Rock Island maximum pond to 418 MWh from 623 MWh.

The revised energy content tables should help alleviate the physical to paper reservoir mismatch that has been continuously 'worked off' or 'trued up' in the energy accounting software. The performance and flexibility of the slice products should not be materially impacted since the physical reservoir remains the same and only the modeled paper reservoir is being corrected.

WANAPUM TO ROCK ISLAND ENCROACHMENT ENERGY:

Pending Litigation Regarding Encroachment. Public Utility District No. 1 of Chelan County v. Public Utility District No. 2 of Grant County, Kittitas County Case No. 20-2-00242-19 (filed May 29, 2020).

Issue

Over fifty years ago, defendant Public Utility District No. 2 of Grant County ("Grant") proposed to construct the Wanapum Dam downstream from plaintiff Public Utility District No. 1 of Chelan County's ("Chelan's") Rock Island Hydroelectric Project (the "Rock Island Project"). Grant's proposed Wanapum Dam would cause an encroachment on Chelan's Rock Island Project, thereby reducing the Rock Island

Project's generating capacity. In exchange for Chelan's agreement not to protest the construction of Wanapum Dam, Grant committed to make Chelan whole for the losses to hydropower generation at the Rock Island Project caused by the Wanapum Dam's encroachment.

In the decades since, Grant has been delivering to Chelan the hydropower energy necessary to make Chelan whole under the parties' agreements. However, due to a recent change in the delivery mechanism between the parties, as well as statements made by Grant regarding the scope of its commitments under the parties' agreements, Chelan has a well-grounded fear that Grant will fail to meet its obligation to provide Chelan with encroachment power from hydropower sources. Therefore, Chelan is seeking judicial relief to declare Chelan's right under the parties' agreements to receive encroachment power from hydropower sources, as well as judicial relief to prevent Grant from failing to honor its commitments under the parties' agreements to make Chelan whole for Grant's encroachment on Chelan's property.

Remedy

Pending litigation

ROCK ISLAND HYDROELECTRIC PROJECT POWERHOUSE NO. 1:

Current Unit Status:

Unit	Status as of today's date	Description	Outage Start	Expected Return
B1	Out of Service	Turbine replacement	Apr 2016	Aug 2026
B2	Out of Service	Turbine replacement	Jan 2016	Apr 2025
B3	Out of Service	Turbine replacement	Apr 2016	Dec 2023
B4	In Service			
B5	In Service			
B6	Out of Service	Contract Warranty Repair Work	Dec 2022	Aug 2023
B7	In Service			
B8	In Service	Unit Modernization	Feb 2024	Feb 2026
B9	In Service	Contract Warranty Repair Work	Aug 2023	Apr 2024
B10	In Service			

Background

Rock Island Powerhouse No. 1 consists of 10 generating units. The four original units (B1-B4) were installed in the 1930's and an additional six units were added in the 1950's. Three of the four original units at Powerhouse No. 1 (B1, B3 and B4) have upgraded generator stators and have their original generator rotors and turbine runners. Units B9 and B10 were rehabilitated with new stators, turbines and governor and excitation systems.

A second powerhouse (Powerhouse No. 2) was built in the late 1970's with eight generating units.

Rock Island B1-B4 Turbine Corrosion Fatigue

Issue

During the Unit B2 generator stator replacement work, fatigue cracks were observed on the blades of the turbine. From October 2015 through January 2016, District maintenance staff made repeated attempts to grind out the cracks and repair the resulting excavations with various welding procedures. After each repair procedure, inspections resulted in the observation of new fatigue cracks. Engineering analysis indicated the B2 turbine is experiencing a phenomenon known as Corrosion Fatigue. The turbines of Units B1, B3 and B4 are of similar design and vintage as Unit B2. These three units were taken out of service and inspected to determine if similar cracking exists in their turbine runner blades. These turbines also had significant cracking due to Corrosion Fatigue. All four turbines, B1 through B4 will remain out of service until the District can design, procure and install replacement turbine runners.

Remedy

The District has completed the development of specifications for the procurement of turbine runners for units B1 through B4. Competitive bids were received on December 22, 2016 and the contract awarded to Andritz Hydro in a Special Commissioner meeting on December 30, 2016. Site work on unit B4 was initiated in October 2018 and completed in August 2021. Each of the remaining three units (B3, B2 and B1) are scheduled to have the runners replaced at the completion of the B4 turbine replacement. Each turbine replacement is expected to last 18 months per unit. Each turbine replacement project also has the potential of needing discharge liner repairs which is included in the 18-month duration estimate.

1) Expected case scenario (as of February 2023): The remaining units (B1, B2 and B3) will remain out of service until such time the respective turbine is replaced. Each unit is scheduled for turbine replacement and will be returned to service, with the last turbine replacement being complete in August 2026. This scenario performs work on the four units sequentially resulting in the turbine replacement schedule as follows:

Unit	Status	Expected Return
B4	Completed and Returned to Service	Aug 2021
B3	Out of Service	Dec 2023
B2	Out of Service	Apr 2025
B1	Out of Service	Aug 2026

Rock Island B5 through B10 Unit Modernizations

Issue

The District initiated a series of sequential outages in January 2007 to modernize units B5 through B10. The scope of work for the modernization contract included the replacement of turbine runners, governor systems, generator stators and rotor poles, and control systems. By May 2017, the contractor selected for this work had completed work on units B10, B9, and B6. In June of 2017, unit B9 suffered a

Kaplan pipe failure and remained out of service until repairs were complete on October 3, 2018. In June 2019, unit B10 was removed from service to perform an overhaul and conduct turbine inspections. During the inspection, the District discovered a few internal turbine components had failed or were near failure. Subsequent inspections on unit B9 and B6 yielded similar observations of failed internal turbine components as B10. It was determined that it was safe to run the units in this condition until the final repair could be made so B6 and B9 are currently 'in service'.

The modernization contractor conducted a root cause analysis of these failures and reviewed their findings with the District in August 2019. The District concurs with the contractor's findings and is currently negotiating, with the contractor, the cost to the District to restore the units and the also the schedule to complete the work.

Remedy

Four repairs were identified to restore B6, B9 and B10. Once final negotiations with the contractor are completed, the District estimates an additional six-month outage to implement the repairs.

Since the remaining units in the modernization project (B5, B7 and B8) are of similar design, the repairs identified above will be performed during the modernization outage.

Schedule

The remedy described above was completed on units B5, B7 and B10. The remedy for B6 is currently in progress. The schedule for B8 and B9 are as follows:

Rock Island Tentative Modernization and Turbine Repair Outage Schedule

Unit	Description	Outage Start	Expected Return
B5	Remedy complete		Returned to Service in Dec 2022
B6	Turbine repairs	Dec 2022	Aug 2023
B7	Remedy complete		Returned to service in Sep 2022
B8	Modernization project	Feb 2024	Feb 2026
B9	Turbine repairs	Aug 2023	Apr 2024
B10	Remedy complete		Returned to Service in Apr 2021

ROCK ISLAND HYDROELECTRIC PROJECT POWERHOUSE 2:

Current Unit Status:

Unit	Status	Description	Outage Start	Expected Return
U1	In Service			
U2	In Service			
U3	In Service			
U4	In Service			
U5	Out of Service	Unit Modernization	Jan 2023	Jun 2024
U6	In Service			
U7	In Service			

U8	In Service			

Rock Island Powerhouse No. 2 U1-U8 Modernizations

Background

The second Rock Island Powerhouse was constructed in 1979 and consists of 8 horizontal bulb generating units. In the late 1980's, stator frames and stator windings were either replaced or repaired to due deficiencies in design. Since then, no other significant repairs or replacements of turbines or generators has occurred.

A modernization contract is in place for the future replacement of the generator stators and rotors, governor systems, and to convert the turbines to 'oil-free' hubs.

Powerhouse No. 2 Tentative Modernization Schedule

Unit	Description	Outage Start	Expected Return
U1	Modernization	Jan 2030	Jan 2031
U2	Modernization	Feb 2029	Feb 2030
U3	Modernization	Jun 2025	Jun 2026
U4	Modernization	May 2026	May 2027
U5	Modernization	Jan 2023	Jun 2024
U6	Modernization	Mar 2028	Mar 2029
U7	Modernization	Jun 2024	Jun 2025
U8	Modernization	Apr 2027	Apr 2028

Rocky Reach Hydroelectric Project:

Background

Rocky Reach Powerhouse consists of 11 generating units. The seven original units (C1 - C7) were installed and in commercial operation by 1961. The remaining four units (C8 - C11) were added and in operation by 1971. All turbines, generators, main transformers, and control systems were replaced in major upgrade projects beginning in 1995 and completed in 2006.

Current Unit Status:

Unit	Status	Description	Outage Start	Expected Return
C-1	In Service			
C-2	In Service			
C-3	In Service			
C-4	In Service			
C-5	In Service			

C-6	In Service			
C-7	In Service			
C-8	In Service			
C-9	In Service			
C-10	In Service			
C-11	Out of Service	Turbine repairs	Jan 2023	Mar 2024

Rocky Reach C8-C11 Large Unit Turbines

Background

As part of ongoing maintenance of District hydro projects, seven Kaplan style turbines (C1-C7) were rehabilitated and four fixed blade turbines (C8-C11) were converted to adjustable blade (Kaplan) at the Rocky Reach Powerhouse from 1996 to 2003 by RIVA HydroArt/Voith Hydro. The purpose of the project was modernization of the turbines to provide higher efficiency while incorporating fish friendly features with a runner blade design life of 50 years.

Issue

On March 25, 2013, the District's unit C10 tripped off-line due to a blade deviation from setpoint. Initial investigation revealed an internal oil bypass condition in the turbine blade servo-motor system along with deposits of metal in the oil return basin. A partial in-place turbine disassembly identified significant wear to internal servo-motor seal rings and bushings as well as to blade trunnion bushings.

Based on initial findings, District staff determined a full generator and turbine disassembly was required to determine all possible causes of the blade deviation, oil bypass and wear conditions. During the turbine disassembly, a crack was discovered in the main servo-motor operating rod. Through engineering analysis and review with District staff, Voith Hydro and MWH Engineering, the cause of the crack was determined to be a design flaw.

On September 23, 2013, units C8, C9 and C11 were removed from service to protect the public, employees, equipment and environmental safety due to having the same turbine design and internal construction. District staff, with Voith and MWH review, proposed a temporary solution for interim operations as fixed blade (propeller) units that allows generator use until a permanent solution is designed and implemented.

This condition is unique to generating units C8-C11 and does not include units C1-C7.

Remedy

On November 8, 2013, District crews commenced with interim repairs on unit C11 consisting of welding blocks onto the turbine runner hub to lock the blades in the full steep position providing safe reliable operation as a propeller turbine. Successful operational and index testing was performed on unit C11 and modifications continued to C8, C9 and C10. Units C8-C11 will be operated as interim repaired propeller turbines until final designs and permanent repairs return them to full Kaplan operation. In

September 2014, a plan was approved by the District's Board of Commissioners to restore adjustable blade capability to C8-C11, enhancing power generation and assuring continued successful fish passage at Rocky Reach.

Schedule

The implementation of the interim repair program (propeller operation) was completed in April 2014. The final turbine repairs will require unit outages that are estimated to last 14 months and will include the installation of new governor control and exciter systems. The final repair work was completed on unit C8 in Dec 2017 and C9 in Jan 2020. Until all permanent repairs are complete on C10 and C11, each interim repaired turbine will require an inspection at approximately 3800 hours of run time. It is estimated, but not assured, that each inspection requires a unit outage of one week (5 days).

Remedy and Future Schedule

Units C10 and C11 have turbine repairs planned for the final repair discussed earlier in the "C8-C11 Servo-Motor Rod" section to return to variable pitch blade Kaplan operation. The outage schedule for turbine repairs and rewinds is as follows:

Rocky Reach Outage Schedule (as of February 2023):

Unit	Description	Outage Start	Expected Return
C10	Turbine Repairs	Oct 2023	Dec 2024
C11	Turbine Repairs	Jan 2023	Mar 2024

Rocky Reach C1-C7 Small Unit Turbines

Background:

In Jan 2018, it was noticed that unit C1 had a leak so it was removed from service to investigate the cause. The investigation determined that the trunnion bushings on the turbine hub were worn and required repair or replacement. C2 through C7 are of similar design to C1 and require trunnion bushing replacements. The program to replace the trunnion bushing in C1 through C7 is complete with the last unit (C5) currently in the final stages of commissioning and an expected return to service date in March 2023.

Remedy and Future Schedule:

The District completed the trunnion bushing replacements as shown below:

Repair schedule:

Unit	Description	Expected Return
C1	Bushing Replacement (Complete)	Jan 2020
C2	Bushing Replacement (Complete)	Dec 2020

C3	Bushing Replacement (Complete)	Oct 2021
C4	Bushing Replacement (Complete)	Nov 2022
C5	Bushing Replacement	Mar 2023
C6	Bushing Replacement (Complete)	Apr 2022
C7	Bushing Replacement (Complete)	Jun 2021