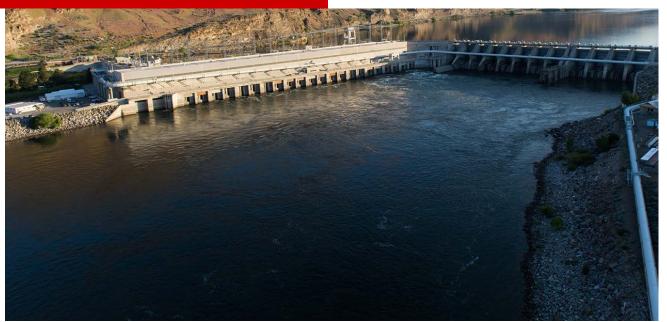
Rocky Reach Small Turbine Program

November 4, 2019





What we will cover today...

Rocky Reach Small Turbine Seal Overview

C2 Status

C3 Status

c1 Progress

Rocky Reach
Small
Turbine
Program

No Board Action Required Today



History/Overview

We're in the midst of an aggressive increase in capital expenditures for our aging hydropower system – Aligned with our Strategic priorities of investing in our assets and our people.

- C1 Removed from service in 2018 for trunnion bushing and seal replacement. Report 187 gallon release in January 2018.
- C2 Currently evaluating trunnion bushing/seal concerns as of 10/11/19. Volume estimated at 83 gallons and to be reported after final review.
- C3 Evaluated new seal designs since Fall 2018. Currently removed from service but with new seal design installed. In parallel, designing a procedure to temporarily remove oil from hub and satisfactorily test to ensure no excessive oil passes through the blade servo rod piston rings and seals. Reported 208 gallon loss on 6-6-19 and another 105 gallon on 10-11-19.

Potential Path Forward

Short Term:

- New seal designs
- Blade blocking (mechanical or hydraulic) with oil removal from hub (temporary)
- Trunnion bushing replacement 3 sets of overstock trunnion bushings ordered

Long Term Solution:

 Replace trunnion bushings and seals and refurbish turbine hubs on C2-C7

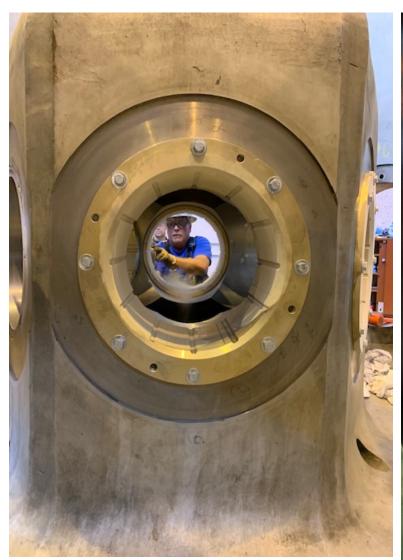


C1 Line Boring



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C1 Trunnion Bushing Replacement







C1 Summary

C1 Next Steps:

- Wicket gate servo motor refurbishment
- Test & dry commission Jan. 2020
- Test & wet commission Feb. 2020
- Return to service Feb. 19, 2020



Summary

Next Steps:

- Test C3 and evaluate results to determine whether or not to return to service
- Develop best blade block option for small units
- Develop long term turbine hub refurbishment schedule for C2 – C7

