Jun 26th, 2:10 PM - 2:30 PM

Concurrent Sessions A: Emerging Engineering Solutions for Downstream Fish Passage at Big Dams - Cowlitz Falls North Shore Collector - Downstream Fish Passage Project

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AGENDA

- Tacoma Power’s Cowlitz Project Overview
- Cowlitz Falls Dam Overview
- Cowlitz Falls Fish Collection Timeline
  - BPA Efforts
  - Tacoma Power Efforts
  - Downstream Fish Passage Team
- Conceptual Design Process for the Cowlitz Falls North Shore Collector (CFNSC)
- CFNSC Schedule
- Design Process Takeaways
COWLITZ FALLS DAM - 1994

DAM OWNER: LEWIS COUNTY PUD (LCPUD)

PROPOSED FISH FACILITY OWNER: TACOMA POWER

FISH COLLECTION FACILITY OWNER: BONNEVILLE POWER ADMINISTRATION (BPA) OPERATED BY WDFW
COWLITZ FALLS DAM SECTION VIEW

- Debris Barrier
- Turbine
  - (2) Hydrocombine Units with total capacity of 10,500 cfs

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COWLITZ FALLS DAM ELEVATION VIEW

FLAP GATE
FISH FLUMES
FLAP GATE
SLUICE GATES
TURBINE INVERT ELEV. 758
ELEV. 862
COWLITZ FALLS FISH COLLECTION TIMELINE

1994
- Dam Construction
- BPA Fish Collection Efforts

2002
- FERC Issues Tacoma Power new Cowlitz License
- Tacoma Power Fish Collection Efforts

2009
- Tacoma Power forms Downstream Fish Passage Team (DFPT)

2012
- DFPT Finalizes Conceptual Design Report
- Tacoma Power continues with their Fish Collection Efforts & Commences with Design of the CFNSC

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BPA FISH COLLECTION EFFORTS
TACOMA POWER FISH COLLECTION EFFORTS

2002
- Convened Fisheries Technical Committee

2003-2004
- Executed an Access Agreement with LCPUD & BPA
- Conducted Fish Studies with LCPUD & BPA

2005-2007
- Designed, Fabricated and Installed the Cowlitz Falls Fish Screen
TACOMA POWER FISH COLLECTION EFFORTS

2008
- Modified CF Fish Screen
- Installed Merwin Traps in Lake Scanewa to supplement collection

2009
- Designed, Fabricated and Installed Siphon Flow Weir Box
- Abandoned after 1 season due to dam safety concerns
- Formed DFPT
Tacoma Power convened the DFPT comprised of consulting engineers and biologists, Tacoma Power and LCPUD Staff, and state and federal agency staff.

Goal of DFPT was to advance the most promising alternatives which considered all of the complexities at the Cowlitz Falls Project that included:

- Variable flows
- Net limitations, flow, bathymetry
- Turbines
- Debris barrier
- Sluice Gate Operation
- Spillway Operation
2010-2011

- Experimented with 2 versions of a Behavioral Guidance System (BGS)
2012- Present
- Experimented with a prototype weir box
- Overflow weir located at Spillbay #3
- Connects to existing spillway flumes
- Flows driven by Unit #2
INITIAL CONCEPTUAL DESIGN
CASES 1-3

Key Features:
- Shore Based
- Various Entrance Configurations
  - Case 1 – Upstream Only
  - Case 2 – Upstream & Downstream
  - Case 3 – Downstream Only
- 625cfs Base Configurations
  Expandable to 875cfs
- Reliant on Effective Guidance Structure
INITIAL DESIGN STEPS

GEOTECHNICAL INVESTIGATION:

KEY TAKEAWAYS:
- DRILLED 10 BORINGS (4 FROM BARGE)
- DISCOVERED THAT ROCK CONTOURS AND PROPERTIES WERE VERY UNFAVORABLE TO CONSTRUCTION OF CASES 1-3
INITIAL DESIGN STEPS

HYDRAULIC MODELING STUDY:
INITIAL DESIGN STEPS

HYDRAULIC MODELING STUDY

- IMPRESSIVE COMPUTATIONAL FLUID DYNAMICS (CFD) ANALYSIS WHICH INCLUDED:
  - Effect of BGS and Guide Net Operation
  - Effect of Sluice Gate Operation
  - Various flow conditions from no generation to spill
  - Velocity vectors (at surface and at depth)
  - Surface streamlines
  - Animated 3-D Streamlines
  - Virtual Injection Analysis
FINAL CONCEPTUAL DESIGN
CASE 4

Capture Zone

500cfs Pumps
(Expandable to 750cfs)

Upstream Face of Dam

Pumpback Diffuser

Entrance thru Dam

Existing CFFF Flume

Bypass Channel

Secondary Screens

Tailrace Diffuser

Primary Screens
FINAL CONCEPTUAL DESIGN
CASE 4

PROPOSED LOCATION
FINAL CONCEPTUAL DESIGN
CASE 4
PROPOSED SCHEDULE

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**Figure 4.1-1** Partial Flow Capture Facility Implementation Schedule
KEY DESIGN PROCESS TAKEAWAYS

- Fish passage design is very site specific.
- The process of selecting a concept is as challenging as the technical design.
- Biology needs to drive engineering, but not always feasible.
- Goal of “fast” design and construction is difficult.
- Hydraulic flow data is useful if used cautiously and as a supplement to biological data.
- Due diligence will reduce risks.
QUESTIONS?