Revised

Engineering Study Related to Barrier Replacement on the Project Tailrace for Energy Northwest's Packwood Lake Hydroelectric Project FERC No. 2244 Lewis County, Washington

Submitted to

ENERGY NORTHWEST
People · Vision · Solutions

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1.0 INTRODUCTION

Energy Northwest's Packwood Lake Hydroelectric Project, FERC No. 2244, received its initial license in 1960. The majority of the project is located in the Gifford Pinchot National Forest. The Project consists of an intake canal, a concrete drop structure (dam) and intake building on Lake Creek located about 424 feet downstream from the outlet of Packwood Lake, a 21,691-foot system of concrete pipe and tunnels, a 5,621-foot penstock, a surge tank, and powerhouse with a 26,125 kW turbine generator.

The source of water for the Project, Packwood Lake, is a natural lake situated at an elevation of approximately 2,857 feet above mean sea level (MSL), about 1,800 feet above the powerhouse. Water discharged from the Project is released to the Cowlitz River via a tailrace channel. Power from the Project is delivered over an 8,009-foot 69 kV transmission line to the Packwood substation.

Anadromous salmonids are known to spawn in both lower Lake Creek and in the tailrace slough where it adjoins the Cowlitz River. A tailrace barrier previously existed at the terminus of the tailrace before being washed out by a flood in the 1970's; anadromous and resident fish now have access up the tailrace to the pool below the powerhouse.

1.1 Study Plan Goals and Objectives

This Engineering Study will provide a design for a replacement of the fish screens that were present at the downstream end of the tailrace before being washed out in the 1970s.

2.0 AGENCY AND TRIBE RESOURCE MANAGEMENT GOALS AND OBJECTIVES

The US Fish and Wildlife Service (USFWS) and NOAA Fisheries requested a study to obtain information on salmonids in the concrete lined section of the tailrace. Their resource management goals and objectives, as stated by the agencies, are provided below.

2.1 USFWS Goals

USFWS seeks the accomplishment of several resource goals and objectives through the licensing process for the Packwood Lake Hydroelectric Project (Project).

2.1.1 General Goals

1. Ensure that protection, mitigation and enhancement measures are commensurate with Project effects and help meet regional fish and wildlife objectives for the basin.
2. Recover federally proposed and listed species.
3. Conserve, protect, and enhance the habitats for fish, wildlife, and plants that continue to be affected by the Project.
4. Ensure that once the licensing process is complete, there is an adaptive management plan to allow the use of new information or new management strategies over the term of the

license, bringing us closer to the desired level of protection for fish and wildlife resources. The adaptive approach is particularly appropriate where there are insufficient data and/or biological uncertainties about those measures that will be most effective for meeting ecosystem goals and objectives.

2.1.2 Goals for Aquatic Ecosystems

1. Protect, enhance, or restore diverse high quality aquatic and riparian habitats for plants, animals, food webs, and communities in the watershed and mitigate for loss or degradation of these habitats.
2. Maintain and/or restore aquatic habitat connectivity in the watershed to provide movement, migration, and dispersal corridors for salmonids and other aquatic organisms and provide longitudinal connectivity for nutrient cycling processes.
3. Restore naturally reproducing stocks of native anadromous and resident fish to historically accessible riverine habitat, using stocks that are native to the Cowlitz River basin where feasible, with priority given to the restoration of listed native stocks.
4. Provide an instream flow regime that meets the spawning, incubation, rearing, and migration requirements of wild salmonids and other resident fish and amphibian species, throughout the project area.
5. Meet or exceed federal and state regulatory standards and objectives for water quality in the basin.
6. Minimize current and potential negative project operation effects on water quality and downstream fishery resources.

2.1.3 Goals for Endangered, Threatened and Proposed Species

1. Reduce project effects on bald eagles, spotted owls, and other threatened, endangered, and proposed species.
2. Explore opportunities for potential protection, mitigation and enhancement measures for threatened, endangered, and proposed species.
3. If bull trout are discovered within the Cowlitz River basin, gain a better understanding on bull trout population trends, migration, habitat loss, present usage and continuing impacts as related to the Project.

In addition, an overarching USFWS goal for the new licensing of the Project is to succeed in having the Commission include as license conditions, protection, mitigation and enhancement measures that sustain normal ecosystem functional processes including geomorphic, hydrologic and hydraulic patterns, and water chemical and physical parameters. Maintaining and improving these functional processes throughout the term of the new license will, in turn, provide the habitat to support healthy fish and wildlife populations.

USFWS study requests are intended to facilitate the collection of information necessary to conduct effects analyses and to develop conservation measures, reasonable and prudent measures, and protection, mitigation, and enhancement measures pursuant to the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. § 1531 *et seq.),* the Fish and Wildlife

Coordination Act (48 Stat. 401), as amended, (16 U.S.C. § 661 *et seq.),* and the Federal Power Act (FPA) (16 U.S.C. § 791a, *et seq.).*

2.2 NOAA Fisheries Goals

NOAA Fisheries has responsibility and authority under the Federal Power Act, 16 U.S.C. §791 *et seq.,* the Endangered Species Act, 16 U.S.C. §1531 *et seq.,* and the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. §1801 *et seq.*, to manage and protect anadromous salmonid populations.

The Lower Columbia River Salmon Recovery Plan (LCFRB 2004) has identified these specific recovery goals for salmonid populations in the lower Columbia Basin:

2.2.1 Adult Population Productivity and Abundance

1. In general, viable populations should exhibit population growth rate, productivity, and abundance that, in combination, demonstrates an acceptable probability of population persistence. Various approaches for evaluating population productivity and abundance combinations may be acceptable, but must meet reasonable standards of statistical rigor.

2. A population with non-negative growth rate and an average abundance approximately equivalent to estimated historic average abundance should be considered to be in the highest persistence category. To demonstrate this criterion, studies should include a credible estimate of historic abundance, an estimate of current abundance averaged over several generations, and an estimate of growth rate done with adequate statistical confidence.

2.2.2 Juvenile Migrant Production

The abundance of naturally produced juvenile migrants should be stable or increasing as measured by observing a median annual growth rate or trend with an acceptable level of confidence.

2.2.3 Within-Population Spatial Structure

The spatial structure of a population must support the population at the desired productivity, abundance, and diversity levels through short-term environmental perturbations, longer-term environmental oscillations, and natural patterns of disturbance regimes. The metrics and benchmarks for evaluating the adequacy of a population's spatial structure should specifically address:

1. Quantity: Spatial structure should be large enough to support growth, abundance, and diversity.
2. Quality: Underlying habitat spatial structure should be within specified habitat quality limits necessary to support life history activities (spawning, rearing, migration, or a combination) taking place within the patches.

3. Connectivity: Spatial structure should have permanent or appropriate seasonal connectivity to allow adequate migration between spawning, rearing, and migration patches.
4. Dynamics: Changes to the spatial structure should not harm its ability to support the population. The processes creating spatial structure are dynamic, so structure will be created and destroyed, but the rate of flux should not exceed the rate of creation over time.
5. Catastrophic Risk: The spatial structure should be geographically distributed in such a way as to minimize the probability of a significant portion of the structure being lost because of a single catastrophic event, either anthropogenic or natural.

2.2.4 Within-Population Diversity

Sufficient life-history diversity must exist to sustain a population through short-term environmental perturbations and to provide for long-term evolutionary processes. The metrics and benchmarks for evaluating the diversity of a population should be evaluated over multiple generations and should include:

1. Whether substantial proportion of the diversity of a life-history trait(s) existed historically,
2. Whether gene flow and genetic diversity is similar to historic (natural) levels and origins,
3. Whether there is successful utilization of habitats throughout the habitat; and
4. Whether populations show resilience and adaptation to environmental fluctuations.

2.2.5 General Habitat

1. The spatial distribution and productive capacity of freshwater, estuarine, and marine habitats should be sufficient to maintain viable populations identified for recovery.
2. The diversity of habitats for recovered populations should resemble historic conditions given expected natural disturbance regimes (wildfire, flood, volcanic eruptions, etc.). To the extent possible, diversity should be measured against historic conditions. Historic conditions represent a reasonable template for a viable population; the closer the habitat resembles the historic diversity, the greater the likelihood that it will be able to support viable populations.
3. At a large scale, habitats should be protected and restored, with a trend toward an appropriate range of attributes for salmonid viability. Freshwater, estuarine, and marine habitat attributes should be maintained in a non-deteriorating state.

3.0 EXISTING INFORMATION AND NEED FOR ADDITIONAL INFORMATION

3.1 Existing Information

Adult salmonids have been observed holding in the pool below the tailrace outlet, and there are some anecdotal observations of fish in the concrete lined section of the tailrace (Energy Northwest 2004).

3.2 Need for Additional Information

As an alternative to obtaining additional information on salmonids in the concrete lined section of the tailrace, Energy Northwest is proposing to proceed directly to engineering studies on replacement of the tailrace screens.

4.0 NEXUS BETWEEN PROJECT OPERATIONS AND EFFECTS ON RESOURCES

The Packwood Lake Hydroelectric Project began operation in 1964. The tailrace was constructed in order to return flow from the powerhouse to the Cowlitz River. Prior to the 1970's, the tailrace had screens to exclude fish from entering the tailrace. However, the Cowlitz River changed its channel and washed out approximately 1,400 feet of the tailrace, including the fish screens (Energy Northwest 2004). By agreement with WDFW, the fish screens were not replaced. As stated by WDFW (Sandison and Larson 1978), "At the present time very few salmonids are being transported upstream of Mossyrock Dam. Therefore, in the future if anadromous fish runs are re-established in the upper Cowlitz River we would reserve the right to require the construction of an effective fish barrier in the tailrace."

Anadromous fish were reintroduced to the upper Cowlitz River in 1994 using an adult trap and haul program initiated by Bonneville Power Administration (Northwest Power and Conservation Council 2004). Tacoma Power's settlement agreement for Mossyrock and Mayfield Dams dictated that Tacoma Power continue to participate in the reintroduction and provides performance standards for fish collection efficiency (Serl 2005). As anadromous fish continue to be reintroduced to the upper Cowlitz River, there is the potential for fry spawned in Lake Creek to imprint on Lake Creek water. However, when these fish return as adults, they may first encounter the confluence of the Cowlitz River with the Project's tailrace.

The project tailrace, and the flows which it carries, are a necessary component of project operations. However, tailrace flows frequently attract upstream migrating anadromous fish. Fish which are attracted to flows from the powerhouse and move upstream through the tailrace may be injured, killed or delayed. Therefore, this represents an instance where project operations may cause direct injury or mortality, or delay the migration of salmonids.

5.0 STUDY AREA AND METHODS

5.1 Study Area

The study area is the Packwood Lake Hydroelectric Project tailrace.

5.2 Methodology

Both the USFWS and NOAA Fisheries have requested an assessment of fish species, life stages and timing utilizing the tailrace channel. The preferred method of analysis would be hydroacoustic assessment and tailrace monitoring. NOAA Fisheries has stated that if the applicant committed to the construction of a fish barrier on the project tailrace as a condition of the new license, the study to evaluate the presence of fish in the project tailrace would not be

required. Rather, Energy Northwest could proceed directly to engineering studies to develop an upstream migrant barrier.

Energy Northwest is committed to replacing the screen that was previously washed out to meet criteria for the exclusion of adult fish. Energy Northwest will proceed with engineering studies to develop an upstream migrant barrier using WDFW guidelines (WDFW 2000a; 2000b). Replacement would occur within three years of obtaining the new license.

5.3 Products

EES Consulting will consult with fisheries engineers from WDFW and NOAA Fisheries, and produce draft and final design drawings. The preliminary drafts will be reviewed by the agencies and tribes to determine if modifications are necessary. The final design report will be provided to the agencies and tribes for their files.

5.4 Consistency with Generally Accepted Scientific Practice

The adult tailrace barrier design will incorporate consultation with WDFW and NOAA Fisheries engineers.

5.5 Fish Rescue Program Until Barrier Has Been Constructed

After a planned shutdown of the plant, Energy Northwest staff will conduct a fish rescue program in the tailrace to gather any stranded fish and return them to calm flowing water in the side channel of the Cowlitz River near the confluence with the tailrace. The fish rescue plan will be developed in consultation with NOAA Fisheries, USFWS, WDFW, and the Forest Service. The plan will include information on the need for permit(s), the timing of the rescue, triggering flow in the tailrace, fish capture methods for the tailrace and stilling basin, documentation requirements for fish rescued, methods of holding the fish until they reach the Cowlitz River, and method of transport. The need for the fish rescue program to address unplanned outages or at regular intervals during the salmon migration season will be discussed as the plan is developed. The fish rescue program is expected to be initiated in fall 2005, when the plant shuts down for annual maintenance. Agencies will be notified of dates for planned shut downs.

5.6 Temporary Barrier

Energy Northwest is considering the feasibility of installing a temporary barrier, and will consult with EES Consulting, WDFW, and NOAA Fisheries engineers to determine if a temporary barrier, that meets the needs of preventing adults from entering the tailrace, can be installed using funds available in the Project's existing budget. The determination on feasibility is expected by fall 2005.

6.0 CONSULTATION WITH AGENCIES, TRIBES AND OTHER STAKEHOLDERS

Energy Northwest initiated agency consultation in December 2003. A Water Quality and Aquatic Resources Committee was formed in March 2004. Representatives include Energy

Northwest, EES Consulting, WDFW, USFWS, NOAA-Fisheries, Department of Ecology, the Forest Service, the Cowlitz tribe, and the Yakama Nation. The integrated licensing process plan provides for numerous meetings with stakeholders during the months of May through August of 2005 to discuss, revise and finalize the proposed study plans. Preliminary designs for fish screens will be provided to the agencies and tribes for review and comments. The final design report will be provided to the agencies and tribes for their files.

7.0 PROGRESS REPORTS, INFORMATION SHARING, AND TECHNICAL REVIEW

The draft and final designs will be shared with agencies, tribes and stakeholders. Energy Northwest and its consultant will also report on the progress at the Water Quality and Aquatic Resources Committee meetings. Review periods will be 30 days, after which Energy Northwest and its consultant will take review comments into consideration when making revisions and producing a final report.

8.0 SCHEDULE

Providing that the Commission accepts Energy Northwest's commitment to replace the fish screens in lieu of a study, design will begin in 2007 after consultation with the agencies, tribes, and a fisheries engineer from WDFW. Replacement would occur within three years of obtaining the new license.

9.0 LEVEL OF EFFORT AND COST

The cost for developing a fish rescue plan and one fish rescue during Fall 2005 is estimated at $7,234. The cost of the feasibility study for a temporary barrier is estimated at $8,517. The cost of designing the permanent barrier cannot be fully determined at this point, but is estimated to cost $34,250. Installation of a new barrier also cannot be determined until design is complete, but is expected to cost between $200,000 and $400,000.

10.0 LITERATURE CITED

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