

November 26, 2002

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Mr. Brian Skeahan
General Manager
Klickitat County Public Utility District
1313 South Columbus
Goldendale, WA 98620

Subject: Evaluation of Condit Hydroelectric Project as a Power Supply Resource

Dear Mr. Skeahan:

This letter report summarizes our review of the Condit Hydroelectric Project as a potential long-term power supply resource to the PUD.

Introduction

CH2M HILL was retained by Klickitat County Public Utility District (PUD) to assess the cost effectiveness of the Condit Hydroelectric Project (Project) as a long-term power supply resource to the PUD and whether or not the FERC process allows the PUD to become the license holder for the Project. The FERC process issues are addressed in a separate memorandum from Preston Gates Ellis, a law firm.

PacifiCorp holds a Federal Energy Regulatory Commission (FERC) License, Project No. 2342, for the Project on the White Salmon River, which is the western border of Klickitat County and the PUD's service area. As a result of its efforts to obtain a new FERC operating license for the Project, PacifiCorp concluded the needed project improvements and required mitigation measures would make the Project economically unattractive and has decided to pursue abandoning the Project and removing the dam.

This assessment of the Condit Project's attractiveness as a power supply resource to the PUD is based on existing, readily available information obtained primarily from the FERC files. We did not conduct a site tour of the Project.

If the PUD were to pursue a FERC license for the project, considerably more legal, technical, and economic analyses is necessary before a final decision could be made.

FERC Relicensing

The Project was constructed in 1913. It was originally licensed by FERC on December 20, 1968, with a license termination date of December 31, 1993. Since the 1993 license termination, FERC has issued PacifiCorp annual operating licenses.

As a result of its efforts to obtain a new operating license for the Project, PacifiCorp concluded that the required mitigation measures would make the Project economically unattractive and negotiated a Settlement Agreement with various parties. This agreement would result in the Project being abandoned and Condit Dam removed. PacifiCorp's efforts to obtain the necessary regulatory approvals to implement the Settlement Agreement have been controversial.

There has been a great deal of press coverage of the relicensing efforts and PacifiCorp's intent to remove the dam, and there have been extensive filings of documents with FERC related to the process and the environmental consequences of dam removal. We have reviewed many of these documents in preparing this letter report. This letter report is limited to the estimated costs of preserving the dam for its value as a power generation resource. The issues associated with dam removal are beyond the scope of this report.

In preparing this assessment, we have reviewed a large number of documents that are available through the FERC web site for the Condit Project, Docket No. 2342. The primary documents of interest are:

- Application for New License for Major Project – Existing Dam, Condit Hydroelectric Project, FERC Project No. 2342, Volumes I and II, December 1991, PacifiCorp Electric Operations, December 1991.
- Final Environmental Impact Statement (FEIS-0103), Condit Hydroelectric Project, FERC No. 2342-055, Federal Energy Regulatory Commission, October 1996.
- Application for Amendment of License and for Approval of Offer of Settlement, Condit Hydroelectric Project, PacifiCorp, October 21, 1999.
- Final Supplemental Final Environmental Impact Statement (FSFEIS-0103), Condit Hydroelectric Project Washington, FERC No. 2342, Federal Energy Regulatory Commission, June 2002.

Condit Hydroelectric Project

The Project’s significant features and parameters are summarized in Table 1.

Condit Dam is a concrete gravity dam located in a narrow steep canyon and is founded on sound basalt rock. The project facilities are essentially the original equipment except as noted below. Over the years, PacifiCorp has updated or replaced some of the equipment to provide improved operation.

Project output under the current operation mode is noted. Average annual Project output resulting from FERC-staff recommended measures is indicated as “proposed.”

TABLE 1
Project Features

General Characteristics		
Dam Location (River miles from confluence with the Columbia River)	3.3	Miles
Dam Length	471	Feet
Dam Height at Spillway	125	Feet
Turbines	2	horizontal Francis
Maximum Generating Capacity	14.7	MW
Maximum Hydraulic Capacity	1,400	cubic feet per second (cfs)
Rated Net Head	167.8	Feet
Normal Pool Maximum elevation	295.0	Feet
Gross Storage Capacity	1,300	acre-feet
Usable Storage Capacity	615	acre-feet
Surface Area	92	acres at elevation 295.0 feet
Dependable Capacity (current)	9.1	MW
Dependable Capacity (proposed)	10.1	MW

Average Annual Energy Production (current)	79,700	MWh
Average Annual Energy Production (proposed)	82,973	MWh
Adverse Water Conditions Annual Energy Production	59,921	MWh
Peak Capacity (current)	14.7	MW
Peak Capacity (proposed)	15.8	MW

Project additions made by PacifiCorp have included:

- A 20-kW propane generator was added in 1986 to provide emergency power for the spillway radial gates, west sluice gate, and intake gates.
- A 45-kW propane generator to provide power for shutdown and restart of the units if there is loss of station service power.
- Improved access to the spillway west lift gate
- Spillway gates side and bottom seals replaced in 1986.
- Unit 1 turbine runners (two) were replaced with rebuilt runners in 1988 and the runner seals, bearings, and wicket gate assemblies were rehabilitated. Unit 2 turbines were rehabilitated in 1986. Note that cavitation damage to the runners has historically required repairs every 4 to 5 years. PacifiCorp owns two spare runners that are rehabilitated and used to replace existing runners on as needed basis.
- Generator rewinds in 1984, Unit 1, and 1980, Unit 2.
- Replacement of an original wood stave penstock with a welded steel penstock in 1962. Reconstruction of the other wood stave penstock in-kind in 1968.

There may be other improvements that we are unaware of.

Project Modifications Proposed by PacifiCorp

In its Application for New License, PacifiCorp proposed the following improvements, enhancements and mitigation measures:

- Replace the turbine runners with modern design and more durable materials
- Upgrade the turbine rating from 9,000 horsepower (hp) (6,711 kW) and 160 feet of head to 11,150 hp (8,315 kW) and 167.8 feet of head
- Upgrade the generator rating from 7,200 to 8,500 kW and increase the generator power factor from 0.8 to 0.1 by rewinding generators and replacing the stator core
- Replace the turbine-driven exciter with new static excitation equipment
- Replace existing transformers with outdoor, three-phase, 9,000-kilovolt-ampere (kVA) rating transformers
- Upgrade all appurtenant electric equipment, the oil circuit breakers, and bus to match the new capacity of the powerhouse

- Restrict reservoir fluctuation from 615 acre-feet to 340 acre-feet by restricting reservoir fluctuation between 290.0 and 294.8 feet
- Place a tailrace barrier in the last 50 feet of the existing tailrace channel to exclude fish that are naturally attracted to the tailrace flows
- Place a Denil-type fish ladder to attract and convey fish out of the tailrace into the bypass reach
- Expand an existing floating fish rearing pen (20 square feet in dimension, 13 feet deep) in Northwestern Lake at the face of the dam to four 20-square-foot nets, 13 feet deep
- Operate on a strict run or river mode with no load factoring when flow downstream of the powerhouse is less than 400 cfs
- Improve Northwestern Park for day use
- Construct a gravel boat ramp
- Provide community docks at the reservoir
- Improve angler access to the bypass reach outside of project boundaries
- Improve the east-side trailhead outside of project boundaries
- Develop a west-side trailhead outside of project boundaries
- Provide for the management of woodlands, protected species, and habitats of special concern, including floodplains and woodlands
- Restrict grazing and other agricultural practices
- Prohibit further residential development and off-road vehicle use
- Conform to the joint Washington Department of Ecology/Department of Wildlife/Hydraulic Project Approval.
- Protocol for traditional cultural properties and Memorandum of Agreement to guide operations and maintenance decisions that may affect archeological and historical resources
- Increase bypass-reach minimum flows to 200 cfs year-round except for 150 cfs from July 1 to August 15 each year
- Install flow management devices to ensure flow continuation during shutdowns and emergency shutoff in the event of a penstock failure
- Install a fish counting station

These cost of these improvements is listed as "Applicant Proposal" in Table 3 later in this report.

Prescribed Conditions for Issuance of A New License

In addition to PacifiCorp's proposed changes, the FERC staff proposed a number of mitigation measures to reduce the Project's environmental impact. The National Marine Fisheries Service (NMFS), the United States Fish and Wildlife Service (USFWS), and the Washington Department of Fish and Wildlife (WDFW) prescribed further measures to reduce Project impacts.

Generally, these measures included:

- Upstream and downstream fish passage facilities and spillway modifications at the dam, together with flows to operate the facilities, and a powerhouse tailrace barrier and a Denil-type tailrace fish ladder.
- A bypass reach minimum flow downstream of the entrance of the fish passage facilities of 200 cfs year-round except for 150 cfs from July 1 to August 15, and 400 cfs downstream of the powerhouse tailrace.
- Gravel enhancement downstream of the dam and powerhouse.
- Run-of-river operations and ceasing project operations at natural flows below 450 cfs.
- Modifying project facilities to incorporate flow continuation capabilities and modified flow relief systems during load rejection episodes and modifying ramping rates during these episodes.
- Monitoring studies testing the effectiveness of prescribed and recommended enhancements.

These requirements are contained in the October 1996 FERC FEIS.

It must be assumed that, if the PUD pursue a new FERC license for the Project, these same license conditions would be recommended by FERC, NMFS, USFWS, and WDFW.

Subsequent to the FEIS, PacifiCorp negotiated the Settlement Agreement and applied for a License Amendment. This was followed by the June 2002 FERC FSFEIS, which recommended removal of the dam.

These modifications are listed as “Section 18 Modifications,” “Initial 10(j) Modifications,” and Supplemental 10(j) Modifications” in Table 3 later in this report. Section 18 Modifications are required under Section 18 of the Federal Power Act, which allows the Secretaries of Commerce and Interior to prescribe fishways at FERC-licensed projects. 10(j) Modifications are required under Section 10(j) of the Federal Power Act, which requires that all licenses issued by FERC contain conditions recommended pursuant to the Fish and Wildlife Coordination Act to adequately protect, mitigate or enhance fish and wildlife; these conditions are the result of recommendations made by NMFS, USFWS, and WDFW.

White Salmon River Hydrology and Power Production

Figure 1 shows the year-to-year average annual flow in the Salmon River for the period 1916 to 1999. It can be seen that there is a significant year-to-year variation in the flow, which directly affects the amount of power generated.

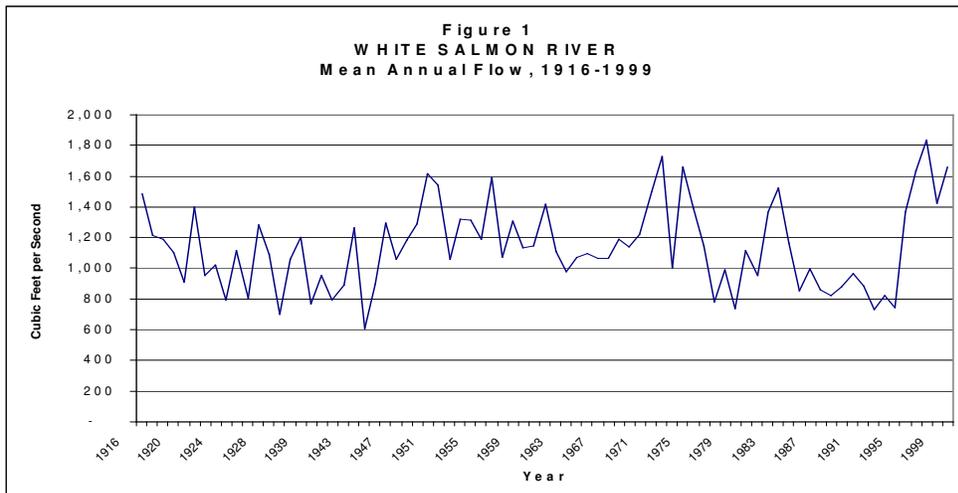
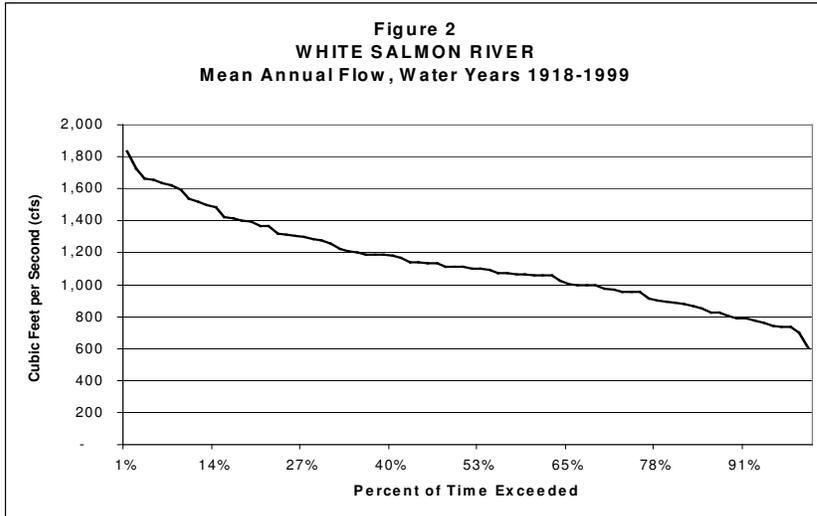
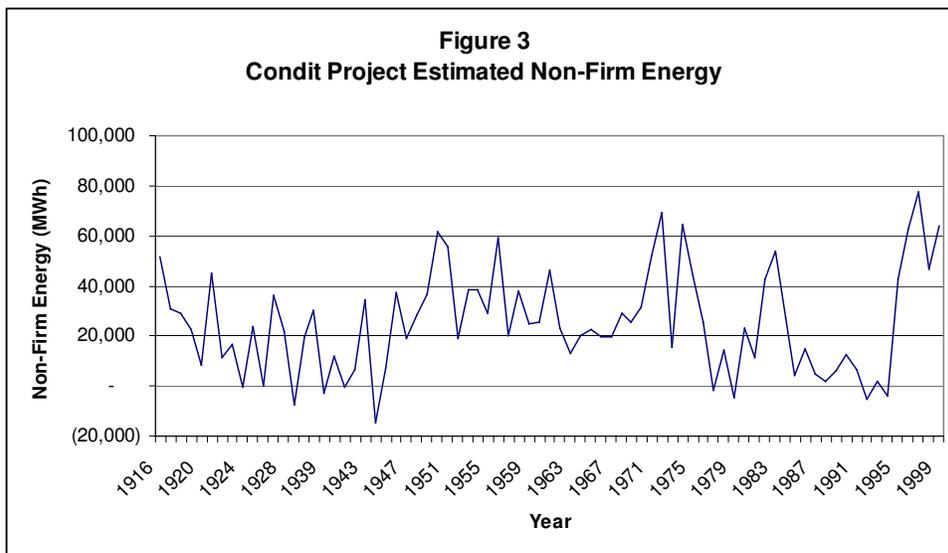


Figure 2 shows the average annual flow, in cubic feet per second, for the White Salmon River for the period 1916 through 1999, arranged from the highest to the lowest. From this Figure, it can be seen that about half of the time, the annual flow exceeds 1,098 cfs and the other half of the time it is less.



If the Project were a PUD power supply resource, the annual flow variability requires the PUD to have other power supply to either replace Condit generation when it is unavailable because of low flows or that can be displaced because of high flows.

As a result, it is common practice in the Pacific Northwest to credit a hydropower resource with only that amount of annual generation that can be assumed to be available under poor water conditions; referred to as firm power. Generation over and above this amount is referred to as non-firm or secondary power and is available to displace other more expensive generation or for sale in the short-term market. From Figure 2 it can be seen that about 90 percent of the time, the annual average flow for the river exceeds 800 cfs.



Based on the FERC staff estimate of 82,973 MWh of **average** annual energy production under the relicensing-with-modifications alternative, we estimate the annual firm power production based on an average annual flow of 800 cfs to be 59,921 MWh. This is an average generation rate of 6.84 MW.

Figure 3 is a plot of the annual non-firm energy, based on a firm annual generation of 59,921 MWh. It can be seen that there have been dramatic changes on a year-to-year basis in the amount of non-firm energy generated (using 800 cfs as the firm annual flow).

Schedule for PUD Project Licensing

On April 24, 2002, PacifiCorp requested FERC abey issuing any order on the Application for Amendment of License until after PacifiCorp had an opportunity to consult with the other Settlement Agreement parties and develop an approach for implementing the Settlement Agreement in a manner acceptable to FERC. On July 26, 2002, PacifiCorp submitted comments on an approach to implementing the Settlement Agreement. Two approaches were suggested:

- The Commission could issue an order approving the Settlement Agreement, amending and extending PacifiCorp’s original license, and authorizing Project removal in accordance with the Settlement Agreement, or could issue a surrender order with similar effect, subject to the contingencies set forth in the Settlement Agreement; or
- FERC could permit PacifiCorp to continue to operate the project under annual licenses until October 1, 2006, until PacifiCorp notifies FERC that it will or will not move forward with removal. PacifiCorp would make this determination no later than December 31, 2005.

Assuming PacifiCorp has until the end of 2005 to determine whether or not it will proceed with removal and that FERC then allows for competitive license applications, we have estimated the following schedule. This schedule is a best guess and might or might not reflect future events with regard to the licensing process. It does suggest however, that it would be a number of years before the PUD would be able to actually take ownership, assuming it was able to obtain a FERC Project license.

TABLE 2
Schedule for PUD FERC License

Date	Activity
Aug-2002	FERC Abeys Licensing Process
Dec-2005	PacifiCorp Notifies FERC of Its Plans
Jun-2006	FERC Allows Competing Applications
Jun-2007	Submittal of Competing Application(s)
Jun-2009	Application Review Process/License Award
Jun-2009	License Awarded
Jun-2010	Financing Completed and Physical Takeover
Jun-2011	Project Improvements Constructed

From this timeline, it appears that PUD Project ownership would not occur before 2009. For our analysis, we have assumed the PUD would operate the Project beginning in 2010.

PUD Power Supply

The PUD is a preference customer of the Bonneville Power Administration (BPA). It has an annual peak demand of roughly 90 MW and annual energy sales of roughly 350,000 MWh. The Project's firm output would represent about 17 percent of the PUD's annual energy sales.

The PUD owns a 50 percent share of the McNary Dam Washington Shore Hydroelectric Project (5 MW); this project produces firm power, there is minimal year-to-year variation in its output. The PUD also owns the H.W. Hill Landfill Gas Power Project, which has a current installed capacity of 10 MW. The output from this project has been sold to other utilities in the region and provides a net income to the PUD. There is projected to be sufficient landfill gas available to expand electric generation to 60 MW by 2029, with output declining thereafter. Both of these projects operate at relatively high annual capacity factors.

Except for the McNary Project, the PUD purchases its energy and capacity needs from BPA. Services purchased from BPA provide for the integration of the McNary Project with the BPA purchases.

When the PUD is able to develop or acquire power supply resources that it believes are attractive options to purchases from BPA, it has the ability to do so. We identified two probable resource alternatives for the PUD.

The incremental power supply resource in the western United States is a combined-cycle combustion turbine, fueled with natural gas, in multiples of approximately 250 MW. This type of generation is best suited to operating at a high load factor, that is, when it runs it runs at close to capacity. This resource type is the most obvious alternative to the Condit Project. The PUD could arrange for a purchase or ownership share in one of these projects at the same output level as the Condit Project.

Another resource alternative for the PUD is expansion of the H.W. Hill Landfill Gas Power Project. Expansion can be done in 1- or 2-MW increments.

To determine the attractiveness of the Project as a resource to the PUD, we estimated the annual cost of power from the Project and compared it with the cost of power from a natural gas fired CCCT and the cost of expansion of the H.W. Hill Landfill Gas Power Project.

Condit Project Economics

Using data from the various PacifiCorp filings and FERC documents, we have updated the cost estimates to 2010 year costs, using Engineering New Record Construction Cost Index for Seattle to update previous year dollar costs to August 2002 and then used 3 percent a year annual inflation to estimate the costs in year 2010.

Table 3 summarizes the estimated costs for the various project improvements proposed by PacifiCorp and the improvements imposed by the interested agencies or FERC staff. It also includes broad estimates for the costs to file and compete for a new license, and if successful, engineer and finance project acquisition. The table suggests that successful takeover of the Project could cost \$63.5 million, in 2010 dollars.

Assuming the project was financed over 30 years at 5 percent interest, the annual debt service would be \$4.1 million dollars a year, or 6.9 cents per kWh. We estimate that annual costs of operation in 2010 would be about 2.2 cents per kWh, for a total cost of energy of 9.1 cents per kWh. This would increase to about 9.7 cents per kWh over a 20-year period. These costs are based on a firm annual energy production of 59,921 MWh. Assuming a credit to the firm power cost from non-firm energy sales ranging from 1 to 3 cents per kWh, the net cost of Project firm energy would range from 7.7 to 8.4 cents per kWh.

Assuming average annual energy production of 82,973 MWh, the energy cost in 2010 would be about 6.4 cents per kWh, increasing to about 7.0 cents per kWh in 20 years.

TABLE 3
Estimated Size of Bond Issue Needed

Cost Category	1st Year of Operation 2010 \$ x 1,000
Cost to File Competing Application and Obtain License	\$3,100
Acquisition of Condit Dam (Payment to PacifiCorp)	\$1,200
Cost of Project Modifications	
Applicant Proposal	\$14,500
Section 18 Modifications	\$29,400
Initial 10(j) Modifications	\$800
Supplemental 10(j) Modifications	\$6,900
Other Payments	\$1,300
Subtotal	\$57,100
Administrative & General	\$300
Legal, Engineering	\$1,100
Debt Service Reserve	\$3,800
Financing Costs	\$1,200
Est. Bond Issue Size to Finance Project Acquisition	\$63,500

We also estimated that the cost of power from a new natural gas fired, combined cycle combustion turbine project in 2010 would be about 5.0 cents per kWh, increasing to 6.0 cents over a 20-year period.

For Condit power to be competitive with the output from a CCCT, the total financed cost would need to be no more than \$32 million (in 2010 dollars), which is less than the estimated costs of the mandated Project modifications shown in Table 3. Condit Project power would be more expensive than power from a new large gas-fired project for at least the first 20 years of PUD ownership.

We also reviewed the PUD's recent economic analysis for expansion of the H.W. Hill Landfill Gas Power Plant. That analysis indicates that the power cost from the project expansion is about 6 cents per kWh, again, less expensive than Condit.

Appendices A and B provide more detail on the calculation of the annual cost of power from Condit and from a large scale gas-fired combined cycle combustion turbine.

Findings

Based on our review of the estimated costs of the FERC and agency recommended Project modifications and the estimated costs of the two most likely resource alternatives, a combined cycle

Page 10

combustion turbine or expansion of the H.W. Hill Landfill Gas Project, the Condit Project is the highest cost resource.

At this level of analysis, the Condit Hydroelectric Project is not a cost-effective resource alternative. Unless many of the required Project modifications are no longer required, it does not appear Condit is an attractive resource.

Sincerely,

CH2M HILL

Curtis L. Bagnall, P.E.
Vice President