

## **A Rebuttal to the Pacific Northwest Waterways Association's June 2015 Review of "The Costs of Keeping the Four Lower Snake River Dams: A Reevaluation of the Lower Snake River Feasibility Report"**

### **Rebuttal Summary**

In the 1960's and 1970's the U.S. Army Corps of Engineers constructed four dams on the lower Snake River without specific measures to allow juvenile salmon and steelhead to migrate downstream and out to the ocean. As a result, these dams killed millions and millions of juvenile salmon and steelhead every year. In the 1990's all four salmon and steelhead runs on the lower Snake River were listed under the Endangered Species Act. In 1995 the Corps began a long-term study purportedly to resolve the problem. In 2002 the study, the *Lower Snake River Juvenile Salmon Migration Feasibility Report*, was released. While this study and especially the biological information therein can support a decision to breach, a non-breach alternative was selected.

To reach the conclusion that the four lower Snake River dams should not be breached, the Corps Walla Walla District (NWW) greatly overestimated the costs of breaching the dams, while greatly underestimating the costs of keeping the dams in place by at least \$140 million on an average annual basis. These estimating errors are important. Under the Corps policies and procedures, if a project costs more than the benefits it provides, the project should not continue.

In 2014, I worked to correct the Corps' errors in a document entitled "*The Costs of Keeping the Four Lower Snake River Dams: A Reevaluation of the Lower Snake River Feasibility Report*." This report focused on reviewing and correcting the cost estimates in the Systems Improvement Appendix of the 2002 LSRFR and not the Economic Appendix. This was not an economic analysis but an effort to correct cost information that was fed into the economic analysis. In this report I show that the Corps Walla Walla District seriously understated the cost of keeping the dams and even when compared to the undervalued economic benefits from breaching and the overstated economic benefits of keeping them as shown in the 2002 LSRFR, give evidence that the dams should be breached. NWW's faulty analysis and the Corps unfounded conclusions to keep the dams have cost the American public hundreds of millions of dollars and is leading to the extinction of salmon, steelhead and Southern Resident Orca populations. The Pacific Northwest Waterways Association, an organization that represents Snake River dam interests, recently commissioned a review to attempt to discredit my report. The review ignores hard data and instead cherry picks economic guidance intended to justify keeping the dams in place. The review also is fraught with faulty premises, and errors and omissions. For example, the PNWA's premise that financial cost cannot be used as economic cost, and therefore must be disregarded when comparing the costs of different alternatives is wrong. This error riddled report is biased and should be disregarded.

My Cost Report can be found at link:

<http://www.damsense.org/index.php/cost-analysis-shows-lower-snake-dams-will-be-an-ongoing-financial-sinkhole/>

## History

In the 1930s the U.S. Army Corps of Engineers determined that commercial navigation on the Lower Snake River could not be economically justified. The Army Corps was correct in that decision. Commercial navigation was still not justifiable in 1947 when the Corps attempted to create a benefit-cost ratio greater than 1 for the Snake River Project. That remains true today. Yet in the 1960's and 1970's the Corps erected four dams on the lower Snake River.

As predicted, the four dams decimated already depleted salmon and steelhead runs, and turned 140 miles of healthy rearing and river habitat into slack water fish-killing reservoirs. In 1995 the Corps began a five-year, \$33 million study to address juvenile salmon mortality caused by the dams. The study was issued in 2002, as the *Lower Snake River Juvenile Salmon Migration Feasibility Report* (LSRFR). As part of that study, the COE erroneously determined that breaching the four Lower Snake River dams was far more expensive than modifying the dams for better juvenile fish passage.

I worked as a civil engineer for the U.S. Corps of Engineers for 35 years and was the Deputy District Engineer for Programs in the Walla Walla District (NWW) during the latter stages of the development of the LSRFR. Other employees and I had serious doubts about the validity of the data that led to the decision not to breach the dams. I expressed concerns at that time about omissions, errors, miscalculations and faulty assumptions in the work at hand, but the study progressed to its predetermined and erroneous conclusion that modifying the dams to improve fish passage was the preferred alternative. The conclusion was based on the faulty premise that breaching the dams would be far too expensive, both short and long term according to the final report.

Actual hard data over the past 15 years confirm the mistakes made in reaching the non-breach decision. A reevaluation of the 2002 report demonstrates that the projected cost of keeping the dams was understated by approximately \$140 million on an average annual basis. This is a huge error. Today the reality is not that breaching the dams would be too expensive, but rather that we cannot afford to keep these dams in place in their present configuration. I reported these findings in "*The Costs of Keeping the Four Lower Snake River Dams: A Reevaluation of the Lower Snake River Feasibility Report*" issued in January 2015 (hereafter "*2015 LSR Dams Cost Report*").

The Pacific Northwest Waterways Association ("PNWA"), an organization that represents interests that make money off the dams, recently requested Dennis Wagner, of PNWA's related Center for Economic Development, Education and Research, to write a review to attempt to discredit the *2015 LSR Dams Cost Report*. Mr. Wagner is retired from the US Army Corps of Engineers and was the Northwest Division Economist and Plan Formulation Team Leader at the time the LSRFR was prepared by the Corps Walla Walla District. Mr. Wagner played a key oversight role in the original formulation of LSRFR alternatives—

their development, presentations and comparisons—that led to the faulty cost analysis in the 2002 LSRFR.

The PNWA/Wagner report can be found at:

[http://www.pnwa.net/wp-content/uploads/2012/10/20150602\\_Analysis-of-Snake-River-dam-cost-claims.pdf](http://www.pnwa.net/wp-content/uploads/2012/10/20150602_Analysis-of-Snake-River-dam-cost-claims.pdf).

### **The 2015 LSR Dams Cost Report**

The *2015 LSR Dams Cost Report* is a reevaluation of the **cost estimates** in the LSRFR contained in *Appendix E: Existing Systems and Major Systems Improvements Engineering of the LSRFR* and **not** the *Economics Appendix*. The 2015 report is solely intended to address errors in cost assumptions, analysis and estimates. Indeed, the *2015 LSR Dams Cost Report* does not mention National Economic Development (NED). However, PNWA's report includes frequent reference to the *Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies*, as published in 1983, referred hereafter as the P&G, and is the federal governments bases for NED Analysis. A complete understanding of these principles will actually validate my work in the *2015 LSR Cost Report*.

One brief note regarding semantics: my initial reevaluation used *escalation* in the sense that changes in real costs were used to develop the annual costs for each feature of the existing projects. The term *inflation* was introduced into the final report as an editorial attempt to improve readability for the general public. The *2015 LSR Dams Cost Report* has since been revised to reflect the term *escalation* rather than *inflation*.

### **The P&G and Corps of Engineers Analysis Requirements**

What do the P&G and the Corps' *Planning Guidance* say about costs? It says first, and fundamental to the planning process, is the need to understand the complete cost of an alternative. This means all costs. To do otherwise prevents the decision makers and the public from seeing what the impacts of alternatives are to the taxpayer and National Economic Development (NED). The P&G repeatedly cites the need to incorporate the concept of complete cost into the project cost to insure a valid comparison of alternatives.

P&G, paragraph 1.6.2 mandates consideration of all necessary investments and the most cost effective means to mitigate the problem, in this case juvenile salmon mortality:

(c) Alternative plans, including the NED plan, should be formulated in consideration of four criteria: completeness; effectiveness; efficiency; and acceptability.

(1) Completeness is the extent to which a given plan **provides and accounts for all necessary investments** and other actions to insure the realization of the planned effects. [emphasis added]

(3) Efficiency is the extent to which an alternative plan is the **most cost effective means** of alleviating the specified problem and realizing the specified

opportunities consistent with protecting the nation's environment. [emphasis added]

P&G, paragraph 1.7.2 requires the report to consider all costs of each alternative:

(a)(3) Adverse effects in the NED account are the opportunity costs of resources used in implementing a plan. These **adverse effects include: Implementation outlays**, associated costs, and other direct costs. [emphasis added]

(g) NED cost categories. For convenience of measurement and analysis, NED costs should be classified as implementation outlays, associated costs and other direct costs.

(1) Implementation outlays. These are the **financial outlays (including operation, maintenance and replacement costs)** incurred by the responsible Federal entity and by other Federal or non-Federal entities for implementation of the plan in accordance with sound management principles. [emphasis added]

Further, the Corps' *National Economic and Procedures Manual-National Economic Development Costs*, June 1993, makes clear that for estimating the cost of operating and maintaining the dams, which can be measured in dollars, the economic and financial costs are the same:

"The vast majority of costs encountered in a water resource project will be both economic and financial costs. All the basic inputs to a project like land, concrete, steel, labor, equipment, etc. require the exchange of money while they cost society the opportunity to use these scarce resources in an alternative way. In virtually all of these cases the money exchanged for the resource will be a good measure of the resource's economic value. When this is so, economic and financial costs are equal, as they are for the vast majority of resources used in project construction and operation."

Finally, Engineering Regulation ER 1105-2 NED Benefit Evaluation Procedures requires accounting *for all life cycle costs*. Paragraph E-5 (d) provides:

Life cycle costs will also be explicitly considered in the development of project cost estimates. These life cycle costs, including operation, maintenance, repair, replacement and rehabilitation (OMRR&R) costs as well as any necessary environmental monitoring and compliance inspection costs, **play an important role in the trade-offs between high capital cost projects and those that have high operation and maintenance (O&M) costs**. [emphasis added]

The PNWA is simply incorrect in claiming that the *2015 LSR Cost Report's* "use of financial data . . . is inconsistent with proper evaluation procedures under the Principles and Guidelines." The financial data in the report represents the actual or projected costs that were or will be expended in the year the costs were or will be incurred, and hence real

exchanges of money. The increases in cost over time reflect real increases in the forgone opportunities realized to the rest of the economy

Because these annual costs require real exchanges of money, pursuant to the Corps' policies and procedures, they must be calculated in then year dollars through some escalation or cost trend method, as in the case for the fish hatchery costs. The *2015 LSR Cost Report* explains how this was done for each of the six cost categories, but uses the term *inflation*, which apparently confused the PNWA. All of the 2015 report's out year estimates were brought back to the same base year using the same discount rate the Corps used in the LSRFR. These were then converted to average annual costs, also as done in the LSRFR.

The LSRFR provided a set of nine alternatives or options for mitigating juvenile salmon mortality by keeping the dams in place. Each option for retaining the dams had similar scopes for Operations, Maintenance and Repair, (OM&R) costs. The only alternative that did not have a similar scope was dam breaching. With dam breaching, there are virtually no out year (OM&R) costs after the dams are breached, when compared to the alternatives for keeping the dams in place.

The P&G and Corps procedures set forth above require accounting for the difference in out year costs. Using current costs without escalation to arrive at an annual cost for each option over a 100-year study period does not make sense and is inconsistent with the Corps' policies and procedures. Yet this is what the Corps Walla Walla District did in writing the LSRFR without escalation. This made dam breaching appear to be a high cost alternative, because its costs were projected to be incurred during the first seven years, and then flat line thereafter. In other words, dam breaching was highly front-loaded, while each alternative for keeping the dams incurred high costs throughout their lifetimes. By using flat line OM&R costs, discounted over a 100 year period, the Walla Walla District under the guidance of the Northwest Division disingenuously lowered the average annual costs for each alternative that retained the dams, while showing high costs for dam breaching. This is because discounting had little effect on the average annual costs for breaching.

ER 1105-2 provides that "With increased ... Federal emphasis on budgetary restraint, commanders must be sensitive to real financial constraints on project scale. Accurate estimates of the costs of alternative plans play a vital role in plan formulation and project scoping." Contrary to this directive, the LSRFR's approach distorted the real costs to society, making tradeoff analysis difficult to understand. The NWW comparisons of dam retention alternatives versus the dam breaching alternative rested on simple, cherry picked words and phrases that allowed indecipherable, if not outright misleading, plan formulation, i.e., alternative comparisons. The comparisons also are at odds with PNWA's recent statement "that the reevaluation cannot be accomplished through utilization of overly simplified approaches, particularly when considering the highly complex nature of the Lower Snake System". Indeed, my reevaluation went to great length to correct the over simplifications in price/cost data that led to distorted comparisons and displays of cost information that was fed into the NED analysis in the Economic Appendix of the LSRFR.

## **The PNWA's Assertion that DREW and IEAB Reviewed the Cost Analysis Is Misleading**

PNWA's statements regarding the work of the Drawdown Regional Economic Work Group (DREW) and reviews by the Independent Economic Analysis Board (IEAB) of the Northwest Power Planning Council are misleading and do not help the PNWA. Neither DREW nor the IEAB worked on or reviewed the Implementation costs developed and displayed in the *Existing Systems and Major System Improvements Engineering Appendix* of the LSRFR, which was the primary focus of my cost reevaluation. Both DREW and the IEAB accepted as correct the faulty LSRFR original cost figures. This was an unfortunate oversight and is indicative of the lack of independent review evident in the planning process of the LSRFR. Other than an internal assessment for decision analysis by Walla Walla District engineers in 2000, that pointed out significant errors in the cost estimates as noted in my cost report, my reevaluation in the *2015 LSR Dams Cost Report* likely stands as the only serious independent review of this key document.

### **PNWA's Critique of the Six Cost Categories in the *Cost Report***

#### **Category 1- Improving Fish Passage (System Improvement Costs)**

The PNWA report accurately describes my method for correcting the underestimates made by the engineers engaged in decision analysis. These errors were pointed out in the decision briefing to the District Commander at the time, but the Commander's and the Northwest Division Planning staff ignored the errors because "it was too late in the study process to correct them."

The PNWA report criticizes my work on *System Improvement Costs* for using financial costs and inflation (more accurately *escalation*), and stated that the "fully funded" cost I used from 12 years of Walla Walla District Activity reports is for budget planning and not a NED cost. These fully funded costs incurred are actual cost for each year that I used to verify my corrections and escalation rates, and are in fact economic costs. Every effort was made to insure there was no "double counting" of costs. PNWA further argues this information is "of no consequence in a NED analysis" in spite of planning guidance to the contrary. As noted above, PNWA's comment represents an inaccurate oversimplification of the *Principles and Guidelines, Corps Planning Guidance* and common sense. The PNWA's comment also disregards economic efficiency and protecting the nation's environmental resources—other key principles of the guidelines.

#### **Category 2- Operations and Maintenance Costs**

Again the conclusions in the PNWA report violate the *Principles and Guidelines* by claiming the LSRFR rightfully ignored future Operations, Maintenance, Repair and Rehabilitation costs associated with keeping the four LSR dams in place. My reevaluation corrects and verifies these costs based on actual expenditures since the completion of the LSRFR, on Means Cost Estimate information, and on 35 years of experience in Corps project planning and cost analysis.

#### **Category 3- Turbine Rehab Costs**

Once again the PNWA report criticizes my use of "financial data", this time from the Bonneville Power Administration, as inconsistent with the P&G. This data reflects the

current estimate of rehabbing three turbine units and validates the corrections to underestimates for all 24 turbines and their escalation using the Corps own construction cost indices. Not using this information in a NED analysis begs the question what cost would PNWA find acceptable in a NED analysis.

Ignoring these necessary cost corrections of rehabbing the 24 turbines in the four lower Snake River dams makes a mockery of the *Principles and Guidelines and Corps Planning guidance*, including the admonition within the P&G that common sense must prevail. The PNWA does appear to agree with the LSRFR's and my own conclusions that a third rehab would be inadvisable for the dams, which by then would be well over 100 years old and turbine rehabs would entail the replacement of surrounding concrete. Finally, my turbine rehab cost estimates used the upper limit of turbine life span projected by NWW, a conservative approach.

#### **Category 4- Lower Snake River Compensation Plan Cost**

One of the fastest growing costs of keeping the lower Snake River dams in place is the OM&R hatcheries constructed to mitigate for the loss of salmon and steelhead. The PNWA report citizens my of use 5% inflation when in fact BPA's own cost and projections reflect a 5.5% escalation rate, as noted in my report. Despite this pretense, compensation plan costs are real and will continue for the life of the project. As noted above, to ignore these costs violates the Corps' own planning guidance and the P&G.

#### **Category 5- BPA Power Services Cost**

Operations and maintenance ("O & M") costs for the four LSR dams in 2014 provide a reasonable estimate for these costs based upon expenditures over the previous dozen years. Further, the use of a 3% escalation rate for future O & M costs during the second half of an aging dam's lifespan is conservative. Once again, the P&G require that these costs be included in any reevaluation of the Snake River Project.

#### **Category 6- Navigation and Flow Conveyance Dredging**

NWW's Lower Snake River Programmatic Sediment Management Plan provides valuable information relevant to a reasonable estimate of future sediment management costs, particularly in the Lower Granite pool. First, annual costs for dam maintenance over the past 14 years do not include costs associated with flow conveyance (flood risk). Second, the cost of sediment management for this purpose will be much greater than that for navigation alone. Finally, as a "major finding," NWW concluded that sediment management for navigation and flow conveyance combined will require the removal of 700,000 cubic yards of sediment annually. To state that NWW does not currently have any plans for further sediment action does not eliminate the need. Alternatives to dredging include the construction of an upstream sediment trap accompanied by the removal of 600,000 cubic yards annually (which sounds like dredging by some other name) or the raising of the entire levee system at Lewiston. The use of \$13/cubic yard in the 2015 LSR Dam Cost Study for sediment removal and disposal has since been shown to be an underestimate. In 2014/15 dredging cost in the original contract was close to \$17/cubic yard. NWW has not announced the actual cost per cubic yard of this project after a contract revision, but the final cost will certainly exceed this cost. One of the alternatives the Corps included in its

initial Lower Snake River Programmatic Sediment Management Plan announcement in the *Congressional Record* was the purchase of flood insurance for all property owners in downtown Lewiston. This cost has not been included in the *2015 LSR Dams Cost Report*. Therefore, the future cost for sediment management in the LSR Project is likely understated in the *2015 LSR Dams Cost Report*.

### **The Analysis Period and Base Years Used in the *Cost Report* Are Reasonable**

The PNWA takes issue with the period of analysis in the *2015 LSR Dams Cost Report*. PNWA attempts to discredit the report by claiming the cost reevaluation used a different base year than did the LSRFR. The LSRFR contains numerous cost discrepancies among appendices and between the appendices and the LSRFR itself. The presentation of costs and/or benefits in the Economic Appendix is often indecipherable, even to seasoned economists. Further, some costs were located in sources other than the LSRFR itself, e.g. the NWW Civil Works Activity Reports. As a remedy to this potential confusion, 2001 was chosen as the base year and all costs converted to that year using the same discount rate and methods NWW applied in the LSRFR

The table using 2015 as a base year was included to show what the cost of operating the dams over a 100-year project life would be starting today. All costs from 2001 to 2014 were eliminated, thus many of the *System Improvement* costs incurred during that period were not included. The turbine rehabs began in 2014, instead of 2004 as projected in the LSRFR. Cost projections for the turbine rehabs are based on actual cost data for the first three turbines, rather than using a 1998 dollar cost estimate that we now know was significantly understated 15 years ago. PNWA's claim that the 3-year discrepancy between starting dates of a 100-year project in the two reports constitutes a serious issue, particularly when corrections in values have been appropriately made to a given base year, appears to be simply a weak attempt to discredit inconvenient information, rather than an attempt at honest review.

### **The LSRFR Understated the Average Annual Cost of Keeping the Dams by at Least \$140 Million**

A final monetary issue is the cost to decommission the four Snake River dams. All dams erected by the federal government must be decommissioned when they have outlived their useful lives. While the *Principles and Guidelines* clearly identify the need to consider ALL future costs of a project, the LSRFR included no cost for decommissioning the LSR dams once their useful lives have ended. The *2015 LSR Dams Cost Report* set forth a \$20 million average annual cost for dam decommissioning. This amount appears to be high given the use of high discount rates over a 100 years period and will be revised. Yet even if the decommissioning cost is omitted entirely, the LSRFR continues to reflect an understatement of average annual cost for keeping the dams of at least \$140 million.

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