

Long-Term Cost Planning for the Fish and Wildlife Program

Independent Economic Analysis Board

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Summary

The Columbia River Basin Fish and Wildlife Program is a long-term and sustained effort to mitigate the effects of the hydroelectric system development and operation on fish and wildlife. The early years of the program were focused on growing and investing in projects. Recently, much of its activity has transitioned toward a sustained operations and maintenance program. The current ongoing operation and maintenance of the program is the cumulative result of projects approved over many years, each with accompanying costs and benefits for fish and wildlife.

The IEAB has reviewed the process for proposing, approving, funding, and reviewing projects in the program. The general finding is that although many projects are ongoing long-term efforts, projects are approved with limited information about the expected length of the projects and/or their long-term costs. As a result, there is limited understanding of likely future costs beyond the few years needed for budgeting and rate setting. Major funding needs for operations, maintenance, repairs, and equipment replacement have not been adequately anticipated or planned for. The need for repairing and replacing past physical investments has created unanticipated funding needs now required to prevent loss of Fish and Wildlife Program benefits.

This report contains IEAB recommendations that are intended to put the Fish and Wildlife Program on an appropriate long-term planning basis. Below are the five key recommendations of the report.

- 1. Implement an asset management process for the major physical assets of the Fish and Wildlife Program.** Asset management is a well-developed process that is used by many agencies and businesses, including Bonneville for its power related investments. While the general concept is well-understood, specific implementation details will need to consider the unique assets owned and maintained by the Fish and Wildlife Program.
- 2. Develop an information system to encompass the life-cycle activities, costs, and benefits of all Fish and Wildlife Program projects.** The 2014 Fish and Wildlife Program recommends that the federal action agencies provide 20-year cost estimates to the Council annually. The existing systems for collecting cost information need to be expanded. The new system should provide information on the following questions: How long is the expected life of the project? How will benefits of the project be maintained after the project ends? What is the temporal profile of the work activities and costs of the project?
- 3. Utilize the life-cycle project information to improve the management of the long-term costs of the Fish and Wildlife Program, to improve the cost effectiveness of the Fish and Wildlife Program, and to supplement the information available for project reviews.**
The IEAB recommends that, in addition to the 20-year cost forecasts, additional new information should be collected and used to increase the benefits and enhance the cost-effectiveness of the Fish and Wildlife Program. New information would be valuable to answer questions such as: When will there be important opportunities to change the project? Are there alternative approaches to achieving the goals of the project that might be considered in the future? What are the major uncertainties that affect the long-term costs or the benefits of the project? How vulnerable is the project to uncertainties that might affect the effectiveness of the project or require changes to the project approach?

4. Consider establishing a dedicated endowment fund for unanticipated program costs, including but not limited to natural disaster costs.

An endowment fund could be designed to respond quickly and efficiently to provide emergency funding, reducing damages to fish, wildlife and important Program assets following unforeseen events. Such a fund, or funds, would provide the Budget Oversight Group with a flexible source of funding for unanticipated needs. The additional information on project uncertainties and vulnerabilities collected under recommendation 3 would help determine the size of such a fund, or funds.

5. Create one or more staff positions at Bonneville with responsibilities in fixed asset accounting, operations and maintenance monitoring and budgeting, and endowment fund management for the Program.

Introduction

The Columbia River Fish and Wildlife Program (the Program) has resulted in a series of investments amounting by some estimates to over 13 billion dollars over the past 35 years [Northwest Power and Conservation Council 2014]. This represents an ongoing and large commitment to mitigate the effects of the Federal Hydroelectric system on fish and wildlife in the Pacific Northwest. About half of this investment is calculated as foregone revenues from the sale of electricity and the cost of power purchases. The other half includes direct costs of fish and wildlife programs, reimbursements of investments by the Corp of Engineers and Bureau of Reclamation, and various administrative expenses.

Many of the direct costs have involved the purchase and installation of equipment, such as hatcheries and related fish collection facilities, purchases of land or water rights for habitat, and other habitat improvements and protections such as fish screens. Most of these investments represent major physical assets that require operations, maintenance, repairs, and replacement (O&M) to ensure that the benefits provided continue to be realized over time. As these assets age, O&M costs tend to increase, and some equipment becomes obsolete due to changing regulations, standards, or technology.

The Program has matured from a growing and investing program into a sustained operations and maintenance program. Unfortunately, the process for approving and funding past investments often did not adequately consider the long-term commitments required to sustain the benefits of fish and wildlife investments into the future.

The Northwest Power and Conservation Council (Council) and others have recognized that unplanned long-term O&M costs of many existing projects create a need for funding that is growing, but these costs have not been quantified and seem largely uncontrolled. In response, the Council, in its 2014 Fish and Wildlife Program, identified that “...adequate and dependable operation and maintenance support” is a high priority in order “....to ensure ongoing proper functioning of past infrastructure investments” [Northwest Power and Conservation Council 2015].

Appendix P of the 2014 Fish and Wildlife Program defines a process to address the long-term funding needs, which includes a role for the Independent Economic Analysis Board (IEAB). This report reflects part of the IEAB’s role in the regional effort to improve the planning for, and control of, the long-term costs of fish and wildlife investments to maintain the benefits provided by those investments for the future.

The purpose of this report is to contribute to planning for efficient long-term operations, maintenance, repair and replacement costs of the Program. First, we provide an economic perspective on long-term planning. Then, we summarize the project proposal, decision, and implementation process, the cost estimates considered within that process, and the current status of reporting for expected O&M costs. Then, the IEAB offers its suggestions for improving long-term planning for the costs of Program activities.

Economic Perspective on Long-term Planning

This discussion introduces important economic concepts for long-term planning. One goal of long-term planning is to reduce financial uncertainty. Long-term planning also allows for consideration of more alternatives when making project and investment decisions. It allows decisions to take account of factors expected to change in the long term, includes consideration of uncertainty, and considers the timing of project completions, replacements, and reversibility as options that might free up funds in the future for better uses.

Failure to recognize and formally plan for long-term costs of investments in the Fish and Wildlife Program may have serious implications for the efficiency of the program. Unnecessary costs and loss of benefits may occur because:

- Funds needed to maintain specific project benefits may not be available when needed – without a long-term estimate of actual costs, budgets cannot be planned for, and funds needed to maintain program benefits may be unrecognized, and therefore unavailable when needed.
- Choices among alternative projects can be made more efficient if all the benefits and costs, including investment, short-run and long-term O&M costs, are recognized and considered when decisions are made.
- Choices in the design of individual projects can be made more efficient if the availability of time windows for alternative designs are recognized and considered. Time windows can occur when major replacements are required, or projects are proposed to begin or end.
- A lack of planning for costs that should be foreseen can result in inefficient, unplanned, and chaotic emergency spending.
- Failure to plan for foreseeable trends can result in inefficiencies. Changes in regulations can result in new requirements for facilities, changes in technology can create opportunities for more cost-effective investment or management, and climate change might affect optimal project selection. Short-sighted planning can result in excess costs as facilities might need to be replaced before the end of their useful life.

Economics is often concerned with optimization and choosing among alternative opportunities. In this case, the optimization problem for a fish and wildlife project or overall Program management is, generally, to minimize project costs while satisfying project and program objectives. Project benefits can sometimes be measured in physical units such as number of wildlife, smolts released, or habitat units. Alternative opportunities are the various ways in which these benefits can be provided by a project or the Program. Once initial investments have been made there is less flexibility to implement alternative approaches. If the long term is not considered in major project commitments, then some good alternative opportunities are likely to be ignored.

In practice, the comparison of alternatives is complicated by measurement problems. There is always some uncertainty about the future, so there is always uncertainty about outcomes. Uncertainty is not a reason to give up on long-term planning, however. Decisions must be made, and the best decisions will be made in full consideration of all opportunities and all uncertainties.

In the long term, project benefits and costs are often uncertain. Many factors, including laws, regulations, program priorities, technology, climate, other environmental factors, and other funding

sources, are uncertain. The ability of a project to perform under a range of possible future conditions is an important consideration. When conditions are uncertain, options that can be reversed may be preferred. For example, if the benefits of land conservation are uncertain, leasing land may be advantageous over purchasing to the extent that lease transactions are less costly than buying and selling land. Or if two approaches to a project yield similar benefits, but one is more vulnerable to future changes, it might be better to choose the more certain one.

Current Funding and Cost Management Process

The overall management of the Program is a complicated process involving the Council, Bonneville, the Independent Science Review Panel (ISRP), the Budget Oversight Group (BOG), and project sponsors. The Council and the ISRP primarily focus on the scientific review and approval of proposed and existing projects. Bonneville's focus is on the implementation of the program through contracts with, and funding of, project sponsors. Bonneville, not the Council, is primarily responsible for funding ongoing O&M, but the Council's recommendations regarding new and continuing projects have a strong influence on the O&M commitment. The BOG is where short-term emergency and other unanticipated funding changes are addressed. And, of course, project sponsors are responsible for the design and implementation of specific projects within the Program.

In nearly all cases, a proposed project must pass scientific review organized and implemented by the Council and the Independent Scientific Review Panel (ISRP). For new projects, or if Council wishes to review an existing project, the project proponents must fill out a proposal form. The ISRP then reviews the project and decides if the project meets science review criteria. Based on this review, the Council either approves the project, rejects it, or returns the proposal to proponents for additional information to address the ISRP's concerns. Project reviews are a valuable coordination and evaluation tool for ongoing projects to ensure continued effectiveness of the overall program and its components. However, even though elimination of an ineffective project could free up funding for more effective projects, consideration of the long-term costs of projects plays little explicit role in this review process.

As a general rule, the Council does not approve specific annual budgets for projects. In some cases, there is a not-to-exceed amount over maybe 3 to 5 years. Thus, most of the Council's focus for fish and wildlife projects has been on scientific review and coordination. Scientific review helps to ensure the effectiveness part of cost-effectiveness as required by the Northwest Power Act. However, the cost side of the cost-effectiveness assessment requires significant improvement. With some relatively minor changes to the overall project selection and management process the financial planning and control of the program could be significantly improved.

Most of the budget allocations and financial planning are done by Bonneville. In most cases, it appears that Bonneville has discretion to negotiate funding levels and to move budgets to best accomplish its goals. Bonneville's current cost forecasts are developed primarily for immediate cost tracking, and for the Integrated Program Review and rate case purposes which have a 2 or 3 year time horizon [BPA 2014a, 2014b]. There is very little cost forecasting available for three or more years in the future. The basic characteristic of this management process is that Fish and Wildlife Program projects and budgets, many of which are known to carry long-term ongoing costs, are only considered on at most a five year time span. This seems particularly problematic for a program that is aimed at the long-term recovery and mitigation of fish and wildlife impacts.

Consequently, the 2014 Fish and Wildlife Program recommends that

Council will work with Bonneville and the other action agencies to ensure that past fish-and-wildlife-related investments are kept current or properly decommissioned.

To accomplish this expanded role,

The federal action agencies shall define the comprehensive maintenance costs by fish and wildlife investment types for both the direct and reimbursable aspects of the program. Anticipated costs should be developed year by year within a 20-year timeframe and be provided annually to the Council.

The Council will convene a work group ... to define and develop a long-term maintenance plan and process... The long-term plans shall be completed at the end of one year... The plan will be presented to the Council for review and recommendation to Bonneville and the action agencies. Bonneville shall fund the long-term maintenance plan as reviewed and recommended by the Council [Northwest Power and Conservation Council 2015]

Bonneville and Council responsibilities under this initiative could become complicated. Different types of projects have different types of review, approval, and management processes. This is illustrated below for several types of projects.

- Short-term versus long-term - some projects are short lived and require no ongoing costs to accomplish their goals. Most projects, however, are long term and require an ongoing commitment to realize and preserve their benefits. In most cases, the budget information and planning for these projects currently considers only two years of funding even though the projects will require funding over a much longer period of time.
- Reimbursable power share – projects that are undertaken by agencies such as the Corps of Engineers, or Bureau of Reclamation and reimbursed by Bonneville to the extent of the power share of a project's authorization (e.g., a dam). These projects are not normally reviewed by the Council, but they often interact with projects that are reviewed by the Council.
- BiOp projects – projects required by the FCRPS Biological Opinion (BiOp) get priority funding by Bonneville. They still need to pass science review, but their long-term cost requirements are not typically planned for. There may be relatively few alternatives allowed by the BiOp.
- Shared funding – similar to other types of individual projects, but with funding shared with other entities than Bonneville. Future O&M costs need to be allocated between Bonneville and others to understand Bonneville commitments. Funding provided by others may be uncertain or contingent. Uncertainty about future funds from others is an important long-term concern.
- Accords– Accords provide a longer-term multiyear funding agreement for investments and O&M. Individual projects, although they get scientific review, are not individually budgeted by Bonneville. The accord entity has discretion to prioritize and shift funding as they see fit for the best results from their agreed funds. For accords, from the Council and Bonneville perspectives, long-term costs are known for the length of the agreements. Most of the Accords are scheduled to expire at the end of FY 2018.

Obviously, funding needs change and situations emerge that require special attention. Most projects' changed funding needs are addressed by the BOG which is composed of representatives from Council staff and Bonneville. The BOG is used for unanticipated financial needs. Within the BOG, additional funding requests are handled on a case-by-case basis. Project sponsors bring special funding needs to the BOG for prioritization and approval. This process addresses project funding changes and would continue to be a necessary process even if long-term cost planning were improved. However, better cost planning should reduce the number of BOG requests for funding changes, help understand what the level of risk is for emergency funding, and help set an overall budget for such funding at the program level.

There are some examples of progress toward longer-term planning in recent developments. As noted above, settlement agreements, such as the accords, include longer-term and known budgets that remove some of the funding uncertainty faced by Bonneville. Another example is the Oregon Wildlife Mitigation Program, which includes specific estimates of the O&M costs required by the settlement and the basis of those estimates. Such agreements also shift many of the budget allocation responsibilities to the State or local level. In this situation, however, the Council has limited ability to influence future funding decisions.

IEAB Recommendations

The IEAB's review of the long-term cost commitments of the Program confirms a surprising and serious lack of long-term planning for the costs of the program. As a result, the process of dealing with the costs of aging infrastructure that needs repair or replacement has become a problem that threatens the effectiveness of several key aspects of the benefits provided by the Program. The 2014 Fish and Wildlife Program directs Council and Bonneville to develop a long-term maintenance plan which is currently addressing some of the most immediate issues, including screens, hatcheries, and lands.

The IEAB has five recommendations to help improve the control and planning of the long-term costs of the Program.

1. Implement an asset management process for the major physical assets of the Fish and Wildlife Program.
2. Develop an information system to encompass the life-cycle activities, costs, and benefits of all Program projects.
3. Utilize the life-cycle project information to improve the management of the long-term costs of the Program, to improve the cost effectiveness of the Program, and to supplement the information available for project and categorical reviews.
4. Consider establishing a dedicated endowment fund for unanticipated program costs, including but not limited to natural disaster costs.
5. Create one or more staff positions at Bonneville with responsibilities in fixed asset accounting, O&M monitoring and budgeting, and endowment fund management for the Program.

Recommendation 1: Implement an asset management process for the major physical assets of the Fish and Wildlife Program

A good starting point for long-term cost planning and assessment would be to implement an asset management strategy and process for the Program. When an organization, whether a business, government, or nonprofit, invests in an asset, responsible planning requires consideration of costs of the asset over its entire life cycle. Assets are acquired in order to produce some result or product and those benefits need to be maintained. The Fish and Wildlife Program includes hundreds of such assets, but the long-term costs of maintaining the benefits of these investments over their entire lives have usually not been planned for, leaving the benefits vulnerable to funding failures and unplanned changes in funding needs.

There are many established and documented systems for long-term asset management and there is no need for the IEAB to describe the details of such systems.¹ Such life-cycle approaches to asset management have been widely applied in government and business. For example, The Institute of Asset Management and the British Standards Institute jointly developed PAS-55, a two part standard for asset management which is the basis for many asset management systems currently in use. But the same principles apply to the Fish and Wildlife Program where many of the investments are smaller and more diverse, but nevertheless are expected to provide specific benefits to fish and wildlife recovery or protection. The basic principles of asset management strategies are as applicable to the Fish and Wildlife Program as they are to other types of large capital investments.

The Bonneville Power Administration uses a formal asset management strategy for its electrical assets [BPA, 2013]. However, this strategy has traditionally not been applied to Program investments. Asset management strategies require looking at the costs and effectiveness of an asset over its entire life cycle. If the services of the asset may be required for a period longer than its expected life, replacement planning may be important. The Bonneville asset management strategy recognizes

...four phases of asset life; 1) create/acquire (investment), 2) operate, 3) maintain, and 4) renew/dispose. [BPA, 2013]

Implementation of this first recommendation has already started. Based on the Council's 2014 Fish and Wildlife Program, additional efforts are underway to identify and quantify the long-term funding needs associated with key assets within the Program. The Council recommended in the 2014 Fish and Wildlife Program that Bonneville assess needed repairs and maintenance for fish and wildlife assets funded by Bonneville. Appropriately, the focus of the initial effort is to get control of the most pressing issue areas of the program. The Council formed an O&M subcommittee to begin the process of developing the O&M strategic plan. The subcommittee identified four priority areas for initial focus.

- Screens and diversions
- Hatcheries, fishways, and traps
- Land

¹ See, for example: U.S. General Accounting Office (2009), U.S. Bureau of Reclamation (2007), U.S. Army Corps of Engineers (2005), and Fuller and Peterson (1996).

- Budget Oversight Group²

The strategy for this phase of the strategic plan is to inventory the assets in each category and systematically assess the funding needs of each asset. An O&M subcommittee has begun the process of inventorying investments in these areas as an initial step in developing estimates of the long-term backlog of funding needs.

Screens and diversions are the major issue and the most progress has been made in that area. The Fish Screening Oversight Committee (FSOC) has conducted a preliminary assessment for screens. Relevant data are being provided by each agency responsible for fish screens. Draft data are available including, for each screen, the year built, agency responsible for maintenance, location, facility characteristics, useful comments, type of non-recurring maintenance required in the near future, estimated cost of this non-recurring expense, estimated schedule for non-recurring maintenance, and estimated cost of normal weekly maintenance [Q W Consulting 2015].

The preliminary results of the FSOC work reveal the magnitude and complexity of the problem. There are over 2,000 fish screens in the region. Their installation and maintenance have been, and are, funded by many different sources and these have often changed over time. Many of the screens were originally installed using Mitchell Act funding. As more is learned about the life histories of Columbia Basin fishes, there may be new standards for screens involving approach velocities and mesh sizes. Some of these improvements may result in new regulations that require switching to a new design when old screens are updated or replaced.

Similar inventories are underway for lands and hatcheries, fishways and traps. When these inventories are complete they will form a basis for determining overall funding needs for O&M for these priority areas. Bonneville intends to apply an asset management strategy to these key assets.

This outline for implementing an asset management strategy for the key Program assets was presented to Council April 7 2015 [Northwest Power and Conservation Council 2015a].

1. *Inventory*
 - a. *Shared understanding of definitions*
 - b. *Standardize data for development of system support*
 - c. *Clarity on roles and responsibilities*
2. *Condition Assessment*
 - a. *Safety/compliance/condition*
3. *Prioritization*
 - a. *Program criticality and condition*
4. *Strategic Planning*
 - a. *Planning – funding – transition*

² The Budget Oversight Group (BOG) is different from the other areas of focus in that it is not a category of assets that require assessment. However, the BOG may play an important role in prioritizing funding requirements to address the growing O&M needs of the program.

This is a reasonable and important first step in gaining some control over long-term costs of the program. However, it is also important to begin the process of a more systematic and formal accounting of the short- and long-term costs of the Program. Within the existing initiative, these actions might help improve long-term cost planning but it is important to recognize that these steps are only the beginning of a fully implemented asset management strategy. For example, an IBM white paper on “Enabling the benefits of PAS 55: The new standard for asset management in the industry” includes four levels of implementation: individual assets, assets systems, total asset portfolio, and corporate or organizational management [IBM 2009].

Recommendation 2: Develop an information system to encompass the life-cycle activities, costs, and benefits of all Program projects

The IEAB’s second recommendation is to develop an information system consistent with a long-term, life-cycle approach to all of the projects and their assets within the Program. Needed actions relating to key asset management actions identified from inventory assessments of screens, hatcheries and lands have to take place within the overall Program. However, there is currently no organized information on the long-term activities and costs within the program. Without such information, the ability to evaluate and manage the Program is seriously hampered. The 2014 Fish and Wildlife Program recommends that cost estimates for a 20-year timeframe be provided annually to the Council. The IEAB recommends that a new information system be developed to provide this and other important long-term asset management information.

Each project within the Program should include information on the project’s life-cycle. How long is the expected life of the project? What is the temporal profile of the activities and cost of the project? What are the major risks that could affect the costs or the benefits of the project? Are there alternative approaches to achieving the goals of the project that might be considered in the future? How vulnerable is the project to technological developments that might affect the effectiveness of the project or require changes to the project approach? How might changing regulations affect the project? Bonneville should gather this information in a systematic way from all of the existing project sponsors and proposal forms for new projects should require such information.

Appendix 1 provides an example decision tree showing how such a tool might be used to guide reporting of long-term cost information. The IEAB has not determined exactly what information should be provided by different types of projects, or how to efficiently and comprehensively differentiate project types, so the decision tree is intended only to illustrate the potential for this type of tool. Bonneville is likely in the best position to assess the exact type of information needed to implement long term cost and asset management strategies.

The Council’s request for 20-year costs applies to the overall Program and not just the major physical assets currently in need of action. It is important to classify costs in ways that will facilitate the use of life-cycle cost information for program evaluation and assessment. Bonneville does not appear to have standard cost definitions for the Fish and Wildlife Program. A good understanding of the nature of project costs over time is needed to improve the management of costs and to facilitate cost-effective projects and prioritization among projects and actions. Therefore a consistent set of cost definitions would help analyze future costs and provide a basis for budgeting and cost estimation guidance.

The IEAB suggests a more detailed organization for fish and wildlife costs that is integrated with Bonneville's project management systems and the Council's Fish and Wildlife Program. The cost categories that follow are intended to illustrate the concepts and form a starting point for discussion. It is likely that not all cost categories would apply for all types of projects. The size of a project might also affect the appropriate level of detail for cost reporting. Significantly more detail is justifiable for projects that involve investment in major physical assets.

Routine project administrative, management and operating and maintenance costs

These ongoing costs may include management, overhead, record keeping, research, monitoring and evaluation (RM&E), and project reviews. In some cases, variations in these costs are paid using contingency funds that the project sponsors use to help address minor changes in cost patterns over time. Generally, these costs are not directly related to specific major physical assets. These costs may be higher in the early years of a project and vary somewhat year by year based on production levels and other factors, but generally should not vary greatly over time.

Initial investment costs for major physical assets

This category includes the initial cost of major physical assets such as facilities, land and equipment. This could also include investments in management systems and other major assets in a less traditional sense necessary to provide project benefits, such as rehabilitated habitat, for example. Because a major physical asset's cost effectiveness may be improved by considering trade-offs between initial cost and future O&M costs, it is important to consider major physical investments separately from other kinds of start-up costs.

Within this category, additional information and disaggregation to provide might include:

- Initial investment cost of acquired assets;
- The type of assets purchased by the investment;
- The expected life of the assets;
- Who will own the assets;
- Who will be responsible for future O&M costs;
- Cost shares paid by others, both for the investment, and for future O&M.

Routine and ongoing major asset operations and maintenance costs

These are ongoing costs associated with projects' major physical assets that are predictable and reasonably consistent year to year. These costs might include energy costs, and labor required for cleaning and ongoing repairs, regular equipment monitoring, and management. In reporting, these costs should be associated with the asset they support. This category may also include asset damage protection costs. Damage costs may be caused by acts of man or nature, including theft, poaching, vandalism, flood, wind, and fire. Examples of asset damage protection costs include trespass and take (catching and hunting) enforcement, fencing, signage, defensible space for wildfire, and management to avoid invasive species introductions. The funding process should check that projects have budgeted adequately in this category for potential damages given their unique situation.

Major maintenance or overhaul costs

Some maintenance costs for major physical assets may be required on a regular basis but not consistently from year to year. Also called “non-recurring maintenance,” these costs are required to keep an asset in working condition. For many types of assets the cost intervals may be predictable and should be considered in long-term planning.

Major asset replacement costs

Replacement costs are required when an asset must be replaced, or when it becomes cost-effective to replace it. Most types of physical assets have an expected life and the costs of expected replacement needs should be addressed in long-term planning. Replacement may also be required for other reasons than normal asset life. Asset replacement may be related to technology changes, unexpected damage, regulatory changes, or program priorities. Different types of assets may be more or less vulnerable to such changes and the degree of vulnerability to changing factors is an important consideration for long-term planning. Some foresight on replacement points should lead to consideration of alternative approaches or desirable changes in project strategy.

Decommissioning or close-out costs

Finally, there likely are close-out or decommissioning costs associated with the termination of a project when that becomes necessary. This category should include costs needed to remove physical assets, and potentially, revenues from sales of assets. The cost category might be reported just once, and perhaps updated only occasionally, for projects that may require large close-out costs at the end of their expected life.

All other costs

Another cost category may be required to ensure that all costs are reported. Combining information on all of the cost categories should result in a temporal profile of total project costs over 20 years.

Additional project information

Besides the quantified cost information above, information about additional characteristics of projects is important. This information may include such things as alternative approaches considered, cost shares paid by others (amount and source), relationships to other Program projects, and major uncertainties that might affect the projects’ effectiveness or costs in the future. In addition, some projects may produce an output that can be varied year to year, such as a hatchery for example. It would be useful to provide information on how costs would vary with the output of the project.

Recommendation 3: Utilize the life-cycle project information to improve both the management of the long-term costs and the cost effectiveness of the Program, and to supplement the information available for project and categorical reviews.

The third IEAB recommendation is related to how the life-cycle project information should be used to improve the overall cost-effectiveness of the Program. Under the 2014 Fish and Wildlife Program, “anticipated costs” within a 20-year timeframe will be provided annually to the Council, but how should this information be used? When utilized at various stages in the management process it can lead to significant improvements. There are several points in the process where the life-cycle data can be

beneficial. Examples might include individual project design and effectiveness, project review, optimizing program effectiveness within constrained budgets, and deliberations within the BOG.

The availability of life-cycle costs and information about uncertainties can improve long-term planning for the Program both at Bonneville and the Council. Combined future expected costs of Program projects should feed into the Council's project review processes, Bonneville's long-term budget planning, and into the Integrated Program Review (IPR) process. Availability of information about uncertainties, project vulnerabilities and timing windows may provide a basis for contingency planning. This information, and historical experience, could inform funding of unanticipated changes in program costs. An endowment fund could be designed to provide for future funding needs, growing in years with fewer emergency needs and being drawn down in years with more (see recommendation 4 below).

Assembling life-cycle information allows for the consideration of alternative approaches that might have different temporal costs. For example, when will major replacements be required, and what opportunities will there be to improve design at that time? Are there any substantially different project designs that might be employed to obtain this project's objectives at a lower long-term cost? Does the long-term success of this project depend on others? If so, which projects? How will the costs of the other projects be affected by this one? What are the important uncertainties that may affect the long-term success and costs of this project?

Improved long-term cost information and project uncertainties should feature in all project reviews by the Council as an adjunct to biological information. To ignore cost information in project reviews is in effect to reject the concept of cost-effectiveness. If a project is on shaky ground biologically, and carries high cost commitments into the future, that should raise a flag that there may be better resource allocations available. Some flags that might cause a reconsideration of a project, or result in additional information being requested, could include:

1. Project objectives cannot be achieved within a project's planned life and there is not enough information provided to determine the long-term expected costs and chance for success;
2. The long-term costs of the project appear to be under-reported;
3. The project is unlikely to succeed in the long term because it depends on other projects that are not planned to continue;
4. Substantial project cost shares are unlikely to be available within the expected life;
5. There are different materials or methods that could be used to achieve the same objectives at significantly less cost.

Information about the major uncertainties faced by projects and their possible impacts could be combined to help identify possible emergency funding needs in the future. That information could help quantify the size of a possible contingency fund for emergency funding needs as proposed in recommendation 4 of this report.

Recommendation 4: Consider establishing a dedicated endowment fund for unanticipated program costs, including but not limited to natural disaster costs.

Once recommendations 1-3 are implemented, a comprehensive information system will be established to document the life-cycle activities and costs of Program projects, and to ensure that all regularly incurred O&M costs, non-recurring maintenance and replacement costs are budgeted and covered. However, there are additional justifiable costs that cannot be anticipated and budgeted within the ongoing project funding process. Some of these costs are associated with unanticipated events that require rapid response to avoid costly damages. Such events include, for example

- major asset failures,
- natural disasters (wildfire, flooding, windstorms, earthquakes, etc.),
- vandalism or theft,
- chemical spills,
- damage from invasive species

Fast action is often required following these types of events to avoid significant and sometimes irreversible damages to fish and wildlife assets. For example, fast repairs to fish screens or passage facilities that have failed can minimize fish mortality. Fast work on erosion control measures following wildfires can minimize erosion and sedimentation. A fast response to habitat damage can minimize loss of wildlife. When assets are vandalized or stolen, important benefits may be lost until the assets are replaced. Generally, having funding available to pay for necessary work will reduce response times and reduce asset damage.

The existence of such unanticipated events and project vulnerabilities provides a justification for contingency planning and funding. Therefore, Bonneville should consider establishing a dedicated endowment fund, or funds for financing unanticipated program costs. Such a fund should be designed to fluctuate over a range, accumulating funds in years with fewer emergency needs and being drawn down in years with more. The ultimate goal of the fund is to provide a source of liquidity large enough to cover most important unanticipated costs for Program projects.

Currently, emergency and other unanticipated funding needs are brought to the BOG for funding decisions. Bonneville provides an annual budget for such funding requests that might be sufficient in some years and not in others. Information on project uncertainties and vulnerabilities, as proposed in recommendation 2 above, should help determine the needed size of a dedicated endowment fund or funds. Such a fund, or funds, would provide BOG with a more flexible and appropriately sized source of emergency funds.

There are a few examples of dedicated endowment funds in the Program, but they are mostly designed to cover regularly incurred program costs, instead of unexpected costs per se. For example, the Southern Idaho Wildlife Mitigation Memorandum of Agreement (IDFG MOA) between the Bonneville and the State of Idaho (Idaho) establishes three endowment funds: Bonneville provides \$22 million for Acquisition Funding, \$14 million for Stewardship Funding, and \$4 million for Administrative Funding [BPA, 2014]. The Acquisition Funding covers the costs Idaho incurs in mitigating and maintaining at least 8,588 acres of additional habitat in the project. The Stewardship Funding provides Idaho \$14 million to address the stewardship of all project properties acquired under the 1997 IDFG MOA. The Administrative Funding provides \$400,000 annually to Idaho to cover administrative expenses related to the project. Another example is the Willamette Wildlife Agreement, which established an endowed stewardship account to produce a perpetual income stream to fund annual O&M expenses, mostly

regularly incurred expenses.

The proposed dedicated endowment fund would be similar to these existing funds in that it would be used for the permanent protection of Program assets, but unlike the existing funds, it would only be used to cover unanticipated costs. The proposed dedicated endowment fund would serve as an insurance policy for costs associated with natural disasters, vandalism and other unanticipated events.

The design of the dedicated endowment fund must address the following questions: How would the fund be financed? Should the endowment fund sub-accounts be project-specific, project-category-specific, cost-type-specific, or program wide? What would be the appropriate size of the endowment fund? How would the fund be managed and administered? Who or what rules would decide what a justifiable expense would be? How far could the fund be drawn down in a large-scale emergency? To fully address these questions requires some careful research. Below, we briefly tackle each of these questions.

Bonneville is expected to be the primary contributor to the proposed dedicated endowment fund. Bonneville's commitments under existing agreements show how the new fund might be structured. Under the Willamette Wildlife Agreement, a calculated baseline amount (in dollars per acre) is provided to Bonneville along with the State's project recommendations during each funding cycle. For all projects that require Bonneville O&M funding, Oregon will request Bonneville place sufficient principal in the Stewardship Account to generate annual income sufficient to cover baseline O&M funding in perpetuity for each recommended project [BPA 2012]. In addition, unexpended Oregon Department of Fish and Wildlife (ODFW) acquisition fund dollars and unexpended ODFW operation and maintenance fund dollars may also be transferred to the Stewardship Fund each year [BPA, 2012]. As in the case of the Willamette Wildlife Agreement, Bonneville is also the primary contributor to the three endowment funds established under the Southern Idaho Agreement.

Determining the number of sub-accounts involves some tradeoffs. A single dedicated endowment account would simplify management and thus may reduce the administrative costs of the fund. It also has the advantage of smoothing out annual expenditures because different projects may have different emergency needs that may occur in different years. On the other hand, project-specific sub-accounts would facilitate determination of the funding needs and the appropriate size of the endowment needed to produce an income stream that is large enough to cover all the unanticipated costs over a project's life. Given these tradeoffs, it might be appropriate to establish project-type-specific endowment sub-accounts, including sub-accounts for land, hatcheries, screens, fish tags, etc.

In principle, the size of an endowment fund should ensure that it produces a sufficient income stream to cover most unanticipated costs over the life of the projects. Past experiences may provide some information about future needs, but may not offer accurate estimates of maximum justifiable costs in the future. In the past, emergency funding was sometimes requested to cover some of the regularly incurred O&M and replacement costs that should have been foreseen and budgeted during routine project approvals.

There are some possible events whose size and costs cannot be foreseen or planned for. Also, it is possible that unrelated costly events could happen in a short time frame so that the endowment fund would be unable to cover all justifiable expenditures. Under recommendation 5, experts might want to consider the availability of external funds such as federal disaster funds following damaging events of

different types and the potential for insurance policies to provide some of the funding that might be desperately needed.

Finally, given the size and the complexity of the endowment fund, there is a great need for dedicated staff and an overseeing board to manage the endowment fund (see Recommendation #5). Under the Southern Idaho Wildlife Mitigation Memorandum Agreement, Idaho will have its Endowment Fund Investment Board manage the Stewardship Funding. This seems like a good decision because the Board already manages other large endowments, such as the school fund. Efficient management of the endowment fund is essential for achieving the ultimate goal of the fund, that is, to produce a sufficient income stream to cover all the unanticipated costs over the life of the projects. Recommendation #5 below deals with the management of the endowment fund explicitly.

Recommendation 5: Create one or more staff positions at Bonneville with responsibilities in fixed asset accounting, O&M monitoring and budgeting, and endowment fund management for the Program.

This recommendation recognizes that our recommendations #1 – #4 will require dedicated Bonneville staff with the expertise to implement them. In the private sector, a firm of a size similar to the Fish and Wildlife Program would likely have one or two staff to handle fixed asset accounting responsibilities. Recommendations 1-4 will require ongoing fixed asset accounting and establishment of a comprehensive information system to document the life-cycle activities and costs of Program projects to ensure that all regularly incurred O&M costs and other anticipated costs be budgeted and met. In addition, establishing and updating the needs of the dedicated endowment fund for unanticipated program costs will need similar kinds of expertise.

Initially, a larger one-time effort will be needed to inventory all existing Program assets, their condition, and their O&M needs going forward. This task would occur over an initial period of time, perhaps one year. One option would be to hire a private accounting firm to conduct this initial inventory of assets, O&M and life-cycle costs, to estimate the appropriate size for the endowment fund for unanticipated costs, and set up a system for fixed asset accounting that would be managed by the permanent staff member(s) going forward. One or more private consulting firms could be invited to make a presentation and bid for this task.

Once the initial inventory is completed, the ongoing tasks related to recommendations 1-4 would be the responsibility of the newly created staff position(s). In FY 2014 Bonneville reported total fish and wildlife costs of \$782.3 million [Northwest Power and Conservation Council 2015b]. The costs of this staff person or persons would represent a negligible fraction (perhaps 1/100th of one percent) of these annual costs.

References

Bonneville Power Administration (BPA), 2012. Bonneville Power Administration Willamette Wildlife Mitigation Program: Operations and Maintenance. ODFW Baselines, November 13.

Bonneville Power Administration (BPA), 2012b. BPA's Asset Management Strategies Agency Overview (Oct).

Bonneville Power Administration (BPA), 2013. BPA Manual, Chapter 661, Asset Management Strategies (June).

Bonneville Power Administration (BPA), 2014. Bonneville Power Administration Administrator's Record of Decision and Response to Comments: Southern Idaho Wildlife Mitigation Memorandum of Agreement (September).

Bonneville Power Administration (BPA), 2014a. 2014 Integrated Program Review. <http://www.bpa.gov/Finance/FinancialPublicProcesses/IPR/Pages/IPR-2014.aspx>

Bonneville Power Administration (BPA), 2014b. Corps and Reclamation O&M Expense IPR 2016-2017 Supplemental Information. 2014 Integrated Program Review. http://www.bpa.gov/Finance/FinancialPublicProcesses/IPR/2014IPRMeetingMaterials/2014_IPR_Corps-Reclamation_O-M_Supplemental_Information.pdf

Columbia Basin Fish & Wildlife Program, 2015a. All Funds. <http://www.cbfish.org/Fund.mvc/Index>

Columbia Basin Fish & Wildlife Program, 2015b. All Proposals. <http://www.cbfish.org/Proposal.mvc/AllProposals>

Fuller, S. K., and S. R. Petersen, 1996. "Life-cycle costing manual for the federal energy management program, 1995 Edition." *NIST handbook* 135.

IBM, 2009. Enabling the benefits of PAS 55: The new standard for asset management in the industry. White Paper, June. https://www-935.ibm.com/services/uk/bcs/pdf/090622_pas_55_white_paper_6815_tiw14035usen00_final.pdf

Northwest Power and Conservation Council, 2008. May 13 -14 Council Minutes. <http://www.nwcouncil.org/media/39576/minutes.pdf>

Northwest Power and Conservation Council, 2014. Draft 2013 Columbia River Basin Fish and Wildlife Program Costs Report: 13th Annual Report to the Northwest Governors (June).

Northwest Power and Conservation Council, 2015. 2014 Columbia River Basin Fish and Wildlife Program, Appendix P. Document 2014-12, (January).

Northwest Power and Conservation Council, 2015a. Memorandum. To: Council Members. From: Council Staff. Subject: Update on O&M Strategic Plan. March 31.

Northwest Power and Conservation Council 2015b. Draft 2014 Columbia River Basin Fish and Wildlife Program Costs Report: 14th Annual Report to the Northwest Governors (May).

Oregon Department of Fish and Wildlife, 2015. Fish Screening.

<http://www.dfw.state.or.us/fish/screening/>

Q W Consulting, 2015. Fish Screening Oversight Committee. FSOC Inventory of BPA-funded fish screens.

Q W Consulting, 2014. Fish Screening Oversight Committee Draft Action Notes for the October 23, 2014 FSOC Teleconference (October 23).

http://www.qwconsult.com/Committees/FSOC/meetings/2015_01_22/FSOC_draftactionnotes_October232014.pdf

U.S. Army Corps of Engineers, 2005. Workshop on Asset Management for Civil Works Infrastructure. Challenges and Requirements for a Comprehensive Asset Management Process for USACE Civil Works Infrastructure. Hosted by: Technical Directors Office Coastal and Hydraulics Laboratory U.S. Army Engineer Research and Development Center 23-24 August 2005 - Alexandria, VA.

U.S. Bureau of Reclamation, 2007. Reclamation Manual: Directives and Standards FAC 09-01 Cost Estimating (<http://www.usbr.gov/recman/DandS.html>) Form 321: 10/15/2007

U.S. General Accounting Office, 2009. GAO Cost Estimating and Assessment Guide, Best Practices for Developing and Managing Capital Program Costs. March (GAO-09-3SP).

Appendix A. Example Decision Tree for Long-Term Cost Reporting

The figure below provides an example decision tree that might be used to guide project managers to provide information about their long-term costs. The decision tree responds to the Council's need for complete cost data within a 20-year time frame. Many other structures are possible, perhaps responding to different types of projects and additional information needs. Bonneville is likely in the best position to assess the exact type of information needed to implement long-term cost and asset management strategies.

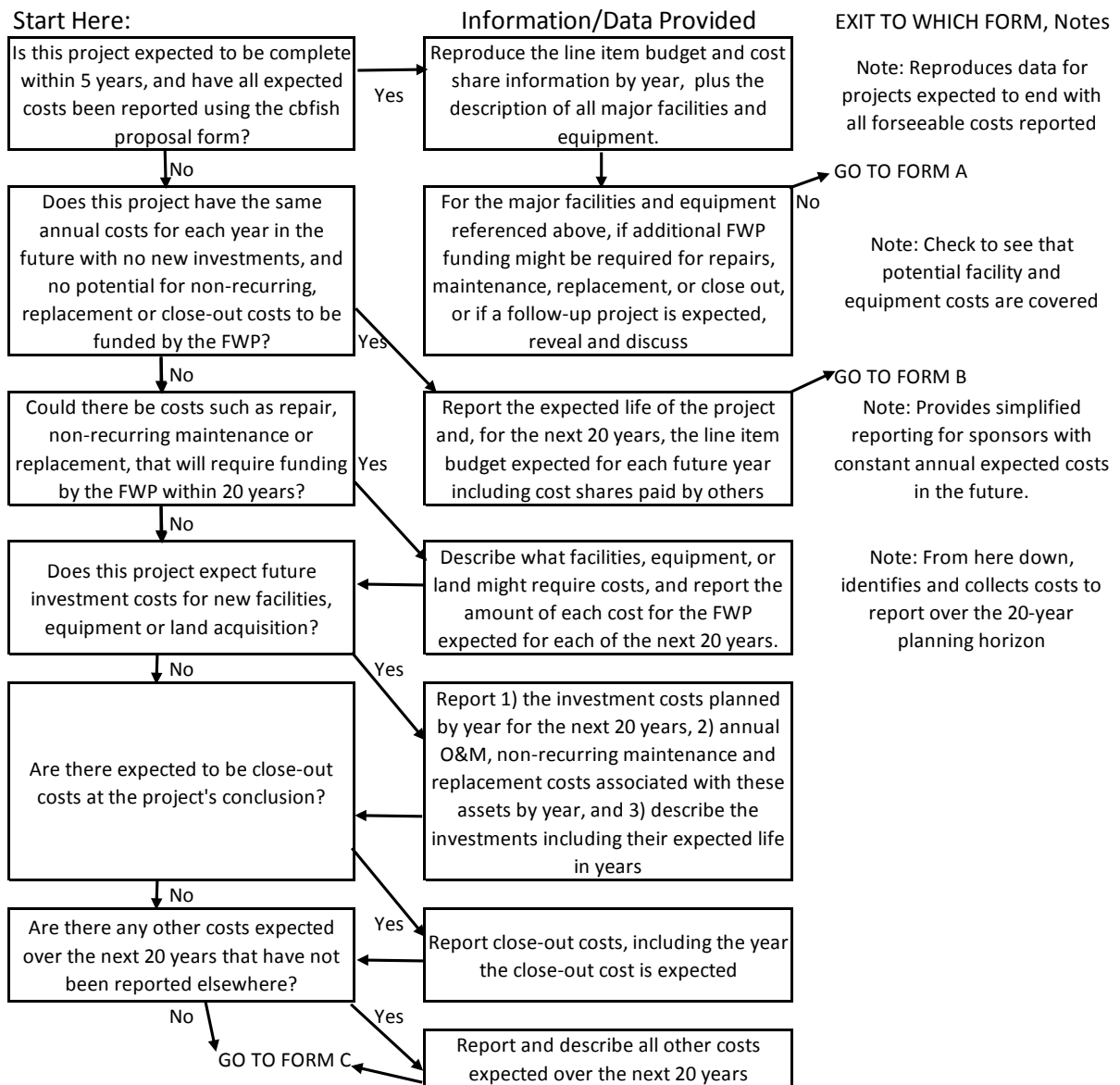
This version provides options for

1. Projects expected to end within 5 years whose managers have already reported their cost forecasts,
2. Projects with constant annual costs expected up to 20 years, and
3. Others.

For each of these types, a form would be provided with additional requests for pertinent information. Some of the questions that should be included are provided below.

Example Decision Tree for Long-Run Cost Reporting by Project Sponsors

Presumes that every project must provide a complete updated 20-year funding forecast



Form A. Data forms and questions for projects expected to be completed within 5 years

- Discuss facilities and equipment that might require unforeseen costs in the next 5 years
- Discuss any follow-on projects that might be expected

Form B. Data forms and questions for projects with constant annual costs expected up to 20 years

- Discuss any uncertainties regarding the amount of expected cost in the future

Form C. Data forms and questions for projects with variable costs expected after five years

- For each cost, discuss planned and potential cost-sharing arrangements
- For each investment, what alternatives are being considered.
- If a decision regarding a selected alternative has been made or is imminent, why?
- What range in scale of operations could occur over the next 20 years, and how would costs be affected?

Discuss significant risks to project effectiveness or costs.

- Change in other FWP projects
- Climate change
- Change in physical environment or operations (for example, dams, hatcheries, diversions, local land use)
- Change in funding from other sources
- New technology, laws, standards, or regulations
- Invasive species
- Change in management or species emphasis
- Changes in prices or costs due to economic conditions

